

IMPACT OF A BRIEF EXERCISE ADHERENCE INTERVENTION ON PHYSICAL
ACTIVITY AND QUALITY OF LIFE AMONG WORKING MOTHERS

BY

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DISSERTATION

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Abstract

Working mothers face numerous exercise barriers, and thus exhibit high levels of inactivity. The stress associated with fulfilling multiple roles can also compromise quality of life within this population. The purpose of this study was to examine the effectiveness of a brief exercise adherence intervention for improving physical activity and quality of life among working mothers. Participants ($N=141$) were randomly assigned to one of three groups: intervention only, intervention plus follow-up support, or waitlist control. The intervention consisted of two group-based workshop sessions designed to teach behavior modification strategies using Social Cognitive Theory. Data were collected at baseline, immediately post-intervention (1 month), and at a 6-month follow-up. Results showed participants who participated in the intervention exhibited immediate increases in self-reported physical activity, which were partially maintained six months later. Across the six-month duration of the study, increases in physical activity were associated with reductions in stress, fatigue, anxiety, and depression, and increases in global quality of life among participants who received the intervention. The results of the study also suggest the social cognitive framework underlying the intervention content had the desired effects, with changes in self-efficacy and self-regulation emerging as the most potent predictors of changes in physical activity. Overall, the results of this study provide some support for the effectiveness of a brief intervention to increase physical activity among working mothers, and suggest promoting physical activity may be a viable means of enhancing quality of life within this population.

Keywords: working mothers; exercise adherence; social cognitive theory; physical activity; randomized trial; quality of life

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CHAPTER I: INTRODUCTION

The benefits of engaging in regular exercise are well established. There is strong evidence that physically active individuals are at a reduced risk for developing a host of chronic diseases, including cardiovascular diseases, type 2 diabetes, some types of cancer, and osteoporosis (Chiuve et al., 2008; Jeon, Hu, Lokken, & van Dam, 2007; Krall & Dawson-Hughes, 1994; Kramer & Wells, 1996; Powell, Thompson, Caspersen, & Kendrick, 1987). In addition, exercise has been associated with reductions in depression and anxiety and improvements in mood, cognitive functioning, and overall quality of life (Berger & Motl, 2000; Colcombe & Kramer, 2003; Craft & Landers, 1998; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991; Rejeski & Mihalko, 2001). In order to incur such benefits, the United States Department of Health and Human Services (2008) recommends adults accumulate at least 150 minutes of moderate intensity aerobic activity per week. For additional health benefits, adults should strive to engage in moderate to vigorous muscle-strengthening activities at least twice per week.

Although most Americans are aware of the numerous physical and psychological benefits associated with a physically active lifestyle, more than half of U.S. adults do not participate in enough physical activity to realize these health benefits (Centers for Disease Control and Prevention, 2007). Additionally, for those who do decide to become active, 50% will drop out within six months (Dishman, 1982). These abysmal attrition rates can partly be attributed to the

complexity of physical activity behavior. Unfortunately, it is not quite as simple as making a new year's resolution and investing in a gym membership. Individuals must be motivated, have realistic expectations, understand the basic principles of an exercise program, make a commitment to being active, and be prepared to overcome adversity. For those who are not exercising regularly, good intentions are often overshadowed by perceptions of insurmountable barriers, including lack of time, energy, and motivation (Jaffee, Lutter, Rex, Hawkes, & Bucaccio, 1999; Nies, Vollman, & Cook, 1999). Thus, in order to successfully adhere to a regular physical activity program, individuals need to develop an understanding of how to employ behavior change strategies that equip them to overcome such barriers. Use of such strategies might be especially important for groups who are faced with numerous barriers, such as working mothers.

According to the United States Department of Labor (2008), 59.5% of women over age 16 were labor force participants in 2008. In particular, the number of mothers who work has increased from 47% in 1975 to nearly 73% in 2000. Although more and more moms are taking on full-time jobs, their commitment to other more "traditional" female duties, such as childcare and household responsibilities, has not decreased proportionately. In fact, data from the Bureau of Labor Statistics show married mothers spend significantly more time doing household activities and providing childcare than married fathers. This so-called "second shift" phenomenon clearly puts significant demands on women's time and could elicit adverse outcomes such as increased stress, fatigue, anxiety, and depression. As a result of the host of real and perceived barriers with which they are faced, working women spend significantly less time engaged in leisure activities than both their female unemployed and male employed counterparts (Bureau of Labor Statistics, 2008).

Indeed, women are less active than men (CDC, 2009), and mothers report engaging in less moderate physical activity than non-mothers (Sternfeld, Ainsworth, & Quesenberry, 1999). Although meta-analytic evidence suggests that there is a consistent moderate, inverse association between participation in physical activity and depression (Craft & Landers, 1998) and state anxiety (Petruzzello et al., 1991), working mothers are not enjoying the mental health benefits of exercise if they are not engaging in regular physical activity. There is evidence that the stress experienced by mothers may actually inhibit exercise behavior (Urizar et al., 2005), and that female employees exhibit higher levels of depression than males (Ogiwara, Tsuda, Akiyama, & Sakai, 2008). There is also evidence, however, that physical activity can play a role in alleviating stress, anxiety, and depression within this population. For instance, in a sample of low-income mothers, increases in physical activity across a 10-week class-based intervention period were associated with decreases in self-reported stress (Urizar et al., 2005). In another sample of stressed working women, exercise was as effective as progressive relaxation for reducing anxiety and increasing problem-focused coping (Long & Haney, 1988). These studies provide initial evidence to suggest physical activity can be used as an effective means for self-regulating negative emotional states among working mothers.

One of the most widely used theoretical frameworks for understanding health behaviors, including physical activity, is Social Cognitive Theory (SCT; Bandura, 1986, 1997). Bandura proposes a model in which self-efficacy interacts with outcome expectations, goals, and perceived environmental facilitators and impediments to influence behavior. He considers efficacy beliefs (i.e., confidence in one's capabilities to execute a specific course of action) to be the primary impetus to action, arguing that individuals are unlikely to pursue a course of action if they do not believe they are capable of producing the desired effects. Additionally, efficacy

beliefs impact individuals' goals and expectations, which can also directly affect motivation and behavior (Bandura, 2004). SCT appears to be an ideal theory for effecting changes in physical activity behavior among working mothers for several reasons. First, its core constructs are modifiable and can be targeted in interventions. Second, many working mothers may already possess the motivation to change their behavior, but lack the exercise confidence and effective self-regulatory strategies to ensure exercise is a priority. Given that Bandura identifies motivation as a necessary precondition for change, and well-designed SCT-based interventions enhance self-efficacy by providing individuals with the tools to successfully regulate their behavior, SCT seems to be a perfect fit for this population.

SCT-based interventions have often employed an educational approach in order to provide individuals with the tools and strategies they need to change their behavior. A small number of such interventions have specifically targeted mothers, and the results thus far have been promising, with all studies reporting some positive changes in behavioral outcomes (Rhodes, Downs, & Riecken, 2008). However, most of these studies have used small samples, focused on short-term changes only, and could be considered pilot work. To date, no intervention studies have specifically focused on working mothers, an ever increasing segment of the population who face unique challenges and could potentially reap great benefits from such a program. Working mothers, however, are unlikely to be able to devote a large amount of time to learning exercise adherence strategies if they already feel they are too busy. Traditional classroom-based interventions that meet often and span across multiple months, therefore, would be unlikely to be accepted in this population. Rather, an intervention that condenses face-to-face meeting time and uses alternative support mechanisms to promote physical activity maintenance may be optimal.

Specific Aims and Hypotheses

Thus, the primary purpose of this study was to examine the effects of a brief SCT-based exercise adherence intervention on physical activity levels of working mothers. Secondary purposes were: a) to examine the effects of the intervention on psychological well-being outcomes, including perceived stress, depression, anxiety, fatigue, and satisfaction with life; b) to examine social cognitive determinants of changes in physical activity; and c) to determine the effectiveness of telephone counseling support for enhancing maintenance of physical activity behavior change. Specifically, it was hypothesized that:

- 1) Individuals who completed the SCT-based intervention would exhibit higher levels of physical activity at follow-up testing periods compared to those assigned to the standard care control group.
- 2) Increases in physical activity would be associated with reductions in stress, depression, anxiety, and fatigue within the intervention group.
- 3) Individuals who participated in the intervention would exhibit increases in self-efficacy and self-regulation (i.e., goals and planning) compared to those in the standard care control group. Small improvements in outcome expectations and social support would also be observed in the intervention condition. All SCT constructs would be significantly associated with exercise behavior change, with self-efficacy explaining the greatest amount of variance.
- 4) Individuals who received telephone support would report higher levels of physical activity at 6-month follow-up than individuals who did not receive continuing support.

CHAPTER II: REVIEW OF LITERATURE

This chapter will review the following: patterns of physical activity and factors that influence activity levels among mothers, stress and other adverse health outcomes associated with fulfilling multiple roles, effects of physical activity on quality of life outcomes, a social cognitive approach to understanding physical activity behavior, SCT-based intervention research conducted with general populations and specifically with mothers, and specific components of interventions which are likely to enhance their effectiveness.

Physical Activity and Motherhood

Cross-sectional studies have consistently shown self-reported rates of exercise participation among mothers to be significantly lower than those of women without children (Burke, Beilin, Dunbar, & Kevan, 2004; Marcus, Pinto, Simkin, Audrain, & Taylor, 1994; Verhoef & Love, 1994). Stronger evidence comes from several studies that have examined physical activity rates longitudinally across the transition into motherhood. In a small multiethnic sample ($N=79$) of women in Hawaii, Albright, Maddock, and Nigg (2005) found 65% of mothers who were regularly active before becoming pregnant were inactive or irregularly active postpartum. For those whose activity levels dropped following childbirth, the reduction was substantial (i.e., three or more days a week) for 52% of them. A subsequent study mirrored these findings, with results suggesting over 50% of mothers who were regularly active prior to motherhood were no longer meeting the national physical activity recommendations after having

a child (McIntyre & Rhodes, 2009). Although these reported declines are considerable, it is important to note that both studies relied on retrospective reports of pre-pregnancy activity levels.

Several large epidemiological studies have also examined changing physical activity patterns among young adult women and reported similar results. Brown and Trost (2003) followed a sample of Australian women ($N=7281$) during their early twenties and found that while the overall proportion of women categorized as “active” and “inactive” did not change across the four-year study period, the demographic make-up of these groups did change based on selected “life events.” Specifically, a greater proportion of women who reported having a baby, getting married, becoming a single parent, or starting paid work were classified as inactive (i.e., not meeting national recommendations for physical activity) at follow-up. Data from another large cohort study of pregnant women (Project Viva; Pereira et al., 2007) also indicated participation in light/moderate and vigorous intensity activities dropped significantly from before pregnancy to the postpartum period. Perhaps the most notable results of Project Viva, however, highlighted the impact of employment status on activity levels of young mothers. Results showed women who worked 35 to 44 hours per week during pregnancy were 3.25 times as likely to be inactive as women who were not working, and this odds ratio was augmented further ($OR=5.12$) for women working more than 45 hours per week.

The most commonly reported physical activity barrier for mothers is lack of time (Albright et al., 2005; Brown, Brown, Miller, & Hansen, 2001; Pereira et al., 2007; Verhoef & Love, 1994). This is also the most commonly reported barrier within the general population, but Verhoef and Love suggest that mothers’ concern is especially warranted, as their leisure time is

severely limited. They asked women in their sample to report the number of hours per week spent on daily activities (parenting, homemaking, work, school) and the number of “free” hours per week, and mothers reported spending significantly more time on daily activities (87.5 hours) than non-mothers (54.4 hours). Additionally, mothers reported significantly less free time (8.3 hours) than non-mothers (18.7 hours). Not surprisingly, lack of energy is also one of the most commonly endorsed barriers among women with children (Brown et al., 2001; Cramp & Bray, 2011). Barriers related to social support, including lack of spousal support, lack of an exercise partner, and lack of childcare, have also emerged as salient (Pereira et al., 2007; Verhoef & Love, 1994).

Although there is strong evidence that women with children genuinely have greater time demands due to household and parenting responsibilities, the perception of lack of time may be intensified by what has been termed an *ethic of care* (Henderson & Allen, 1991; Miller & Brown, 2005). According to the ethic of care, a woman’s primary responsibility is to provide for the needs of others. Implicit in her role as a mother are selflessness and sacrifice, and because physical activity has come to be viewed as a leisure activity in which one engages to fulfill her own needs, it is incongruent with the tenets of the ethic of care. As a result, women feel guilty for taking time away from family obligations to partake in this “selfish” behavior. Unfortunately, many women subscribe to these traditional notions of what it means to be a “good wife” and a “good mother,” and thus they perpetuate their role as a sacrificial devotee to the family.

Miller and Brown (2005), however, have provided initial indications that the role of “good mother” and “exerciser” can indeed be compatible. They conducted a qualitative study in which they interviewed 12 women with varying levels of self-reported physical activity and

physical activity constraints. Although some of the women viewed exercise as simply another chore to add to the list, others said they made time for exercise because doing so allowed them to make more positive contributions to their families. Rather than emphasizing “selfish” exercise motives such as weight loss, they discussed using exercise as a means for reducing stress, increasing energy levels, and improving mood. They argued that the effects of physical activity on these outcomes were actually beneficial for the entire family, because it enhanced their ability to be an effective, supportive wife and mother. Thus, these women were not abandoning the traditional ideology of motherhood by exercising regularly. They still viewed family as a top priority, and incorporated exercise as a means of keeping the entire family healthy and happy.

Although rates of exercise adherence are poor among women with children, some mothers *do* engage in regular physical activity, so it is important to examine the facilitators that allow them to overcome the barriers that many perceive to be insurmountable. Social support has clearly emerged as a frequently reported facilitator. In particular, mothers say they need support from their partner/spouse in the form of assistance with housework and childcare obligations (Albright et al., 2005). Indeed, there is empirical evidence to support this relationship, with women who report higher levels of partner support also reporting higher levels of physical activity (Brown et al., 2001). Furthermore, in the context of an intervention, Miller et al. (2002) found changes in physical activity behavior were partially mediated by changes in partner support. Clearly, women need help with their daily obligations in order to make time for leisure activities, and research has supported the contention that physical activity levels would improve if women received assistance with household and childcare duties, particularly from their spouse.

Stress and Multiple Roles

Stress occurs in any situation in which mounting environmental or perceived demands require an individual to recruit physiological and psychological resources to meet those demands (Larzelere & Jones, 2008). It can be acute (e.g., following a traumatic event) or chronic (e.g., as a result of daily hassles). Situations that place high demands on an individual when her perceptions of control are low are most likely to induce stress. This has been demonstrated empirically in the occupational environment, where individuals who report high job demands and low perceived job control are most likely to report high stress levels (Hansen, Blangsted, Hansen, Sogaard, & Sjogaard, 2010). The adverse health effects of stress are well-documented and include negative effects on immune function, cardiovascular health, the gastrointestinal system, and mental health. High levels of stress can also trigger increases in negative health behaviors (e.g., substance use, overeating, inactivity), which can further exacerbate the impact of stress on health (Larzelere & Jones, 2008).

There is conflicting evidence in the literature regarding the health effects of fulfilling multiple roles. Some have suggested fulfilling multiple roles benefits women's physical and psychological health by providing opportunities for connecting with others, and by allowing them to achieve financial self-sufficiency and derive a greater sense of purpose in life (Sorensen & Verbrugge, 1987; Waldron, Weiss, & Hughes, 1998). Much of the recent literature, however, seems to indicate the opposite. That is, the demands associated with performing multiple roles can lead to increased stress, anxiety, and fatigue, and decreased life satisfaction. One method for examining stress levels is to measure biological markers (e.g., stress hormones). In a classic study of white-collar workers, Frankenhaeuser et al. (1989) found levels of stress hormones (i.e.,

norepinephrine and cortisol) decreased after 5:00 p.m. among men, but increased in women. For working mothers, the pressure seems to be especially high. Luecken et al. (1997) measured psychological and biological markers of stress in working women over a 24-hour period and found women with at least one child at home excreted significantly more cortisol than women without a child at home, and their self-reported home strain (i.e., perception of high demand and low control) was equivalently high. Together, these results suggest women, and in particular working mothers, are likely to face demands that extend across all hours of the day and may interfere with their ability to “unwind” and de-stress.

In a subsequent study of university employees in The Netherlands, Bekker, de Jong, Zijlstra, and van Landeghem (2000) did not find cortisol levels were related to fulfilling multiple roles. They did find, however, that self-reported health was significantly worse in those fulfilling multiple roles. In particular, women with both work and childcare obligations reported greater psychological stress and a poorer mood profile (i.e., higher anger and depression, lower vigor) than any of the other groups. No such effects of “role overload” were observed among the men in the sample. Similarly, data from a large population-based study in Sweden showed mothers working full-time were significantly more likely to report poor self-rated health, and the odds ratio increased as the number of children increased (Floderus, Hagman, Aronsson, Marklund, & Wikman, 2008). This relationship was not observed, however, for mothers working part-time. Overall, mothers in this study also reported significantly more fatigue and less anxiety than women without children. In this case, the authors surmise the latter relationship could be explained by a “healthy mother effect.” That is, women with long-standing physical or psychiatric illness are less likely to have children.

A series of studies conducted in Sweden by Krantz and her colleagues have examined the relationship between work and family responsibilities and common symptoms in employed women. They argue that symptoms are an appropriate proxy for health because physical and mental symptoms can be viewed as manifestations of stress and poor health. In the first study (Krantz & Ostergren, 2001), domestic responsibilities and job strain were independently associated with elevated symptoms, and the relationship was even stronger (OR=6.91) for women in the “double exposure” category (i.e., those with both high domestic responsibility and high job strain). Results of subsequent studies mirrored these findings, with Krantz, Berntsson, and Lundberg (2005) showing the combined exposure to home and work responsibilities predicted symptom reporting among female white-collar employees, and Mellner, Krantz, and Lundberg (2006) again demonstrating women in the “double exposure” group had an increased risk of both common symptoms and poor self-rated health. Together, these results clearly suggest women experiencing demands both at home and at work are more likely to experience health detriments.

It is important to note, however, that Krantz and colleagues operationalized “double exposure” not as simply having multiple roles, but as experiencing *strain* from each of the roles. This is in line with the assertions of others who have suggested a woman’s perception of her work and family roles may be a better predictor of stress than the actual number or extent of demands. For example, in a study of Israeli working women, Rosenbaum and Cohen (1999) found women with appropriate resources for coping with stress (i.e., high resourcefulness and spousal support) reported lower levels of anxiety and dysphoria. In a different sample of married employed mothers in the United States, Tinger, Kiger, and Riley (1996) found no differences in stress levels based on employment status or division of household tasks, but they did find

differences based on variables related to perceptions of control (i.e., partner's work-family spillover and dissatisfaction with child care arrangements). These underscore the link between stress and a lack of perceived control. Finally, after surveying 156 heterosexual couples in Utah, Stevens, Minnotte, Mannon, and Kiger (2007) found the presence of children under age 5 living in the home was related to negative family-to-work spillover in women. They also found, however, that while work hours and housework hours were not significantly associated with spillover, self-reported *satisfaction* with the household division of labor was related to negative spillover. Thus, it may be equally (or more) important to examine a woman's perceptions of her responsibilities and coping resources, rather than simply quantifying her number of roles and responsibilities.

Based on this premise, McElwain, Korabik, and Rosin (2005) tested a conceptual model whereby high demands at work were associated with a high degree of work interfering with family, which, in turn, was negatively related to family satisfaction. A parallel path depicted high family demands related to family interfering with work, and family interfering with work negatively associated with job satisfaction. Finally, both family and job satisfaction contribute to overall life satisfaction. In a sample of 320 male and female employees, this model fit the data well, with all six paths being significant in the hypothesized direction. An unexpected, but important additional result of this study was the finding that women reported a greater degree of work interfering with family than their male counterparts, even though the amount of time each group reported spending in paid work was equal. These findings highlight the salience of role conflict for women, and suggest that their perceptions of dissonance between roles may be stronger than it is for men, likely because they still feel a strong sense of obligation to their "traditional" female roles of mother and homemaker. Given the evidence that effectively coping

with stress might attenuate the negative effects of multiple roles on mental health, it would be prudent to identify effective means for handling stress. Physical activity could represent one such means.

Physical activity and quality of life

Quality of life is best conceptualized as a subjective, multidimensional construct that encompasses perceptions of physical and mental health as well as overall satisfaction with life. Dimensions of physical, psychological, social, and spiritual well-being are often classified as aspects of health-related quality of life, and may be considered subsets of (and thus, contributors to) global quality of life. Within the physical activity literature, a relationship between physical activity and quality of life has been demonstrated consistently, particularly among older adults. In most cases, the relationship appears to be stronger for health-related quality of life than for global quality of life. For instance, Rejeski and Mihalko (2001) conducted a review in which they examined the influence of physical activity on global and health-related quality of life. For global quality of life, the cross-sectional studies they reviewed unanimously supported a positive relationship between physical activity and satisfaction with life, but the evidence from randomized controlled trials was more equivocal. For health-related quality of life outcomes, however, all of the randomized controlled trials they reviewed showed positive effects of physical activity. Results of a meta-analysis of intervention studies linking physical activity to well-being in older adults (Netz, Wu, Becker, and Tenenbaum, 2005) also lend support to these findings. Overall, the mean change in well-being for participants in treatment (exercise) groups (0.24) was nearly three times the mean change for control groups (0.09), a clear indicator that physical activity has the potential to influence quality of life outcomes. When Netz et al.

compared health-related and global quality of life, however, the weighted mean effect was much stronger for the former (well-being: 0.37) than the latter (life satisfaction: 0.08).

Most researchers have speculated that health-related outcomes show a stronger positive relationship with physical activity than global quality of life measures because they are more proximal to, and thus more likely to be influenced by, physical activity behaviors than a construct as distal as overall life satisfaction. This also suggests that a direct association between physical activity and overall quality of life may be an overly simple way to characterize the relationship. Most likely, physical activity influences a variety of physical, social, and psychological factors, and changes in these intermediate variables are associated with changes in global quality of life. Several models provide support for such a theory. For example, McAuley and colleagues (2006) tested a model in which self-efficacy, physical health status, and mental health status were the intermediate variables. Results supported a direct effect of physical activity on self-efficacy, and those with higher self-efficacy tended to report better physical and mental health status. Finally, health status was positively related to satisfaction with life. This model is consistent with other research that has demonstrated physical activity is related to positive mental health, and positive mental health is related to life satisfaction. Other models (e.g., Elavsky et al., 2005) have also included physical self-esteem and positive affect (emotion) as potential mediators of physical activity effects on quality of life.

For working mothers, perceived stress, depression, and fatigue are likely to be among the most salient health-related quality of life indicators. There is a considerable body of literature that suggests physical activity is associated with reductions in stress and improvements in quality of life. For example, data from the Copenhagen City Heart Study, a large epidemiological study

of 12,028 men and women, showed a significant decrease in the likelihood of an individual reporting high stress as self-reported level of physical activity increased (adjusted OR = .30 for most active group). Importantly, although the lowest levels of stress were seen in the most active group, the greatest advantage was observed when comparing sedentary individuals to those reporting moderate levels of physical activity (e.g., 2-4 hours of moderate walking per week). Findings for life dissatisfaction in this study mirrored the stress findings, with an adjusted OR = .30 for the most active group and significant reductions in dissatisfaction for those in the moderate activity group compared to the sedentary individuals (Schnohr, Kristensen, Prescott, & Scharling, 2005). These results might be particularly encouraging to inactive individuals, for whom moving from doing *no* activity to doing *some* activity could engender significant improvements.

Iwasaki, Zuzanek, & Mannell (2001) looked more generally at physical health, mental health, and well-being and found similar relationships in a large sample of Canadian adults. Their analyses revealed higher levels of leisure time physical activity directly enhanced physical health, mental health, and well-being. The findings were nearly identical when they restricted the sample to only those participants reporting high stress, suggesting involvement in active leisure may aid individuals with high chronic and/or daily stress in maintaining better health. Kull (2002) examined similar relationships in a sample restricted to fertility-aged women (aged 18-45) and the findings were encouraging. Comparison of women categorized as active and inactive revealed inactive women reported significantly greater depression and poorer perceived mental health. Their findings also paralleled those of Schnohr et al. (2005), as the significant differences were observed between inactive and low active individuals, but not between those who reported 1-2 days of activity per week and those reporting 3 or more days per week.

Several studies have specifically examined these relationships among working populations. For example, Wempe and Rosvall (2005) found working women who reported low levels of leisure time physical activity also were more likely to report high non-work related stress. In a study of white-collar workers, higher levels of physical activity were associated with greater perceived energy, and with lower perceived stress in men only (Hansen et al., 2010). Bernaards and colleagues (2006) asked workers to classify their occupations as sedentary or non-sedentary, then report levels of strenuous physical activity, depression, emotional exhaustion, and poor general health. Results revealed greater strenuous leisure time physical activity was associated with less depression, emotional exhaustion, and poor general health, but these associations were much stronger in workers with a sedentary job. In this case, it appears sedentary workers have more to gain from leisure time physical activity in terms of mental health benefits than those who are already active on the job.

Whereas the cross-sectional evidence for the relationships between physical activity and health-related quality of life is clearly strong, longitudinal and intervention studies are needed to substantiate these findings. Tessier et al. (2007) examined the relationship between *changes* in leisure-time physical activity and changes and health-related quality of life across three years. Indeed, they found increases in physical activity were associated with increases in self-reported physical functioning, mental health, social functioning, vitality, and general health among women. The greatest changes were observed for mental health components. Taylor-Piliae, Haskell, Waters, & Froelicher (2006) conducted an intervention in which participants engaged in a Tai Chi exercise program for ten weeks. Results revealed post-intervention reductions in total mood disturbance and perceived stress, and improvements in social support and self-efficacy. Although these findings must be considered cautiously due to methodological limitations (i.e.,

lack of a control or comparison group), the uniform improvements can only be seen as encouraging. Future studies should use randomized controlled trials to further validate these findings.

Social Cognitive Theory

In order to enhance their effectiveness, approaches to promoting physical activity should have a strong theoretical foundation. Social Cognitive Theory (SCT) was developed by Albert Bandura (1986) and has been a widely used theoretical approach in physical activity research. At the heart of this theory is the notion of reciprocal determinism; that is, behavioral factors interact with personal and environmental factors to influence behavior. Thus, although SCT is concerned with individuals' abilities to exercise control over their own health behaviors, it also recognizes the importance of examining environmental factors. SCT is an ideal framework through which to approach behavior change because it goes beyond attempting to explain and predict behavior. It carefully specifies the mechanisms through which behavior changes and, importantly, its core constructs are modifiable variables that can be targeted in interventions.

The central component of SCT is self-efficacy, or one's beliefs in his or her capabilities to carry out a specific course of action (Bandura, 1997). Bandura views efficacy beliefs as the primary impetus of action, arguing that people are unlikely to invest effort in pursuing a behavior if they do not believe they are capable of successfully completing the behavior. Indeed, research has shown self-efficacy influences the activities in which individuals choose to engage, the amount of effort they will invest in those activities, and the extent to which they will persist when they encounter barriers and/or failures. Within the exercise literature, self-efficacy has

been one of the most consistent determinants of physical activity behavior and adherence to exercise programs (McAuley & Blissmer, 2000).

Other core constructs of the SCT model include outcome expectations, self-regulation (i.e. goals), and perceived environmental impediments and facilitators. Outcome expectations are beliefs that engaging in a behavior will lead to certain positive or negative outcomes. They can take the form of physical (e.g., improved muscle strength), social (e.g., more friends), or self-evaluative (e.g., increased self-esteem) outcome expectations (Bandura, 2004). Goals guide action by specifying short- and long-term objectives to be achieved. They serve as powerful motivators and are important for focusing and directing activity, prompting increased effort, and promoting development of new strategies. Goal setting can be enhanced by incorporating complementary self-regulatory strategies such as self-monitoring and reinforcement. Finally, perceived impediments and facilitators account for the environmental influences on behavior. According to Bandura, impediments can be internal (e.g., feeling tired) or external (e.g. bad weather), and they are integral to the assessment of self-efficacy, given that efficacy should be universally high if there are no barriers to overcome. Environmental facilitators can include a number of factors, but social support has been the most commonly studied facilitator in the context of exercise among mothers.

The relationship between self-efficacy and physical activity has been studied extensively, and research has consistently demonstrated self-efficacy to be a powerful determinant of exercise behavior (Keller, Fleury, Gregor-Holt, & Thompson, 1999). Bandura (1997) contends that self-efficacy is particularly salient for challenging, complex behaviors. The abysmal statistics regarding American adults' ability to maintain an exercise program over the long-term suggest

physical activity is a complex behavior ripe for the influence of self-efficacy. Numerous cross-sectional studies have supported the strong relationship between physical activity and self-efficacy, and these relationships have been demonstrated among individuals of all ages, races, sexes, and health statuses. For example, Marquez and McAuley (2006) found Latinos who were classified as high active reported significantly higher self-efficacy to overcome exercise barriers and to exercise on a regular basis. Bungum et al. (2000) studied a number of frequently supported correlates of physical activity and found self-efficacy was related to moderate/vigorous physical activity most strongly and consistently in a large sample of male and female adolescents. Motl and his colleagues (2006) found a significant direct correlation between self-efficacy and physical activity in a sample of adults with multiple sclerosis. Recently, Cramp and Bray (2011) used linear regression analyses to show that barrier and exercise self-efficacy independently predicted leisure-time physical activity among postnatal women. Clearly, the consistency of the relationship between self-efficacy and physical activity has been demonstrated in varied groups of individuals, including mothers of young children.

In line with Bandura's notion of reciprocal determination, self-efficacy can be not only a determinant, but also an outcome of exercise participation. That is, those with higher self-efficacy are more likely to initiate and adhere to a physical activity program, and successful participation in a physical activity program can act as a source of efficacy judgments for the future (McAuley & Blissmer, 2000). This has been demonstrated empirically in several longitudinal and intervention studies. For example, McAuley et al. (2005) found frequency of exercise participation during a 6-month intervention was a significant predictor of exercise self-efficacy at program end. In a subsequent paper, McAuley et al. (2007) provided strong support for the importance of self-efficacy as a predictor of long-term exercise maintenance by showing

self-efficacy levels two years after the termination of the 6-month intervention significantly predicted physical activity levels three years later. Importantly, they also controlled for past behavior in this study.

Williams, Anderson, and Winett (2005) conducted a review of the outcome expectancy construct in physical activity research and made several important observations. Overall, results of studies that have examined the relationship between outcome expectations and physical activity have been mixed. That is, only about half of the studies purportedly based on SCT found significant correlations between physical activity and positive outcome expectations, and the significant correlations were generally weak ($r=.15$ to $.24$). They did find these associations tended to be stronger among older adults, and they argued health-related outcomes may be more proximal and salient to older adults than to their younger counterparts, for whom the health benefits of exercise may seem too far off to be motivating. The review also reinforces several of Bandura's (1986; 1997) assertions regarding the role of outcome expectations in behavior change. First, expectations are likely to play a larger role in the initiation of a new behavior than the maintenance of that behavior. Maintenance will depend more on the individual's satisfaction with *actual* outcomes. Second, when outcomes are closely tied to behavior, outcome expectations will contribute very little to the prediction of behavior after controlling for self-efficacy. This does not imply that outcome expectations are not important; rather, it suggests that the types of expected outcomes will depend on an individual's confidence to succeed in a given situation (Bandura, 1997). Finally, interventions designed to improve positive outcome expectations by educating participants about the benefits of exercise have been relatively unsuccessful. It seems interventions designed to minimize barriers and maximize incentives would be better suited for generating changes in behavior (Williams et al., 2005).

According to Bandura (2004), intention and desire will have minimal effects on behavior if an individual has not developed self-regulatory skills. Specifically, goals serve to direct individual efforts and enhance persistence (Locke & Latham, 2002). Effective goals should be specific, realistic (i.e., challenging but attainable), and focused upon personal action. Most studies utilizing goal setting as a strategy for increasing physical activity among adults have produced positive results (Shilts, Horowitz, & Townsend, 2004). For instance, Dishman, DeJoy, Wilson, and Vendenberg (2009) delivered an intervention using goal setting to promote physical activity among workplace employees. Participants were encouraged to set personal and team goals, and were provided pedometers to aid in setting specific goals and monitoring progress. Results indicated greater increases in physical activity among participants in the goal-setting intervention compared to a health education control condition. Goal setting has also been demonstrated to be highly related to the use of other self-regulatory strategies. For example, Nothwehr and Yang (2007) found increased frequency of physical activity-related goal setting was strongly related to self-monitoring as well as use of positive social, cognitive, and behavioral self-management strategies for increasing physical activity.

Although Bandura was initially vague about the manner in which the core constructs of SCT interact to influence behavior, he has recently laid out the model quite clearly (Bandura, 2004). In his structural model, self-efficacy is the “focal determinant” and directly affects outcome expectations, goals, facilitators and impediments, and behavior. Self-efficacy also impacts behavior indirectly through its effects on outcome expectations and goals. Perceived facilitators and impediments influence behavior indirectly through goals. To date, very few studies have tested the complete SCT model. Recently, however, several research groups have used structural equation modeling (SEM) in an attempt to carry out a more comprehensive

evaluation of the model. SEM has the advantage of allowing for examination of a variable's direct, indirect, and total effects.

Rovniak, Anderson, Winett, and Stephens (2002) employed a prospective design to test the SCT model of physical activity among undergraduate students. After obtaining baseline measures of physical activity, self-efficacy, outcome expectations, self-regulation, and social support, they assessed physical activity eight weeks later and used SEM to test the fit of the SCT model to the data. The design of the model was such that self-efficacy influenced physical activity both directly and indirectly through self-regulation and outcome expectations. Social support was added to the model as a precursor to self-efficacy. Results showed the model provided a good fit and explained 55% of the variance in physical activity at the 8-week follow-up. Self-efficacy had the greatest influence on physical activity, but this effect was largely mediated by self-regulation, which also exerted a strong effect on physical activity. There was a moderate effect of social support on self-efficacy, but the effect of outcome expectations on physical activity was not significant. Overall, these results provide general support for the ability of SCT to explain physical activity behavior. In particular, self-efficacy and self-regulation seem to be important.

Subsequently, Anderson, Wojcik, Winett, and Williams (2006) tested a similar model in a population of adult church members in southwest Virginia. They used both objective (i.e. pedometer) and subjective (i.e. physical activity diaries) measures of physical activity, and they assessed both positive physical outcome expectations and negative time outcome expectations. They also included demographic variables (age, sex, and race) in the model. Results showed the model explained 46% of the variance in physical activity, and age exerted the strongest total

effect on physical activity, followed by self-regulation, social support from family, and self-efficacy. Contrary to hypotheses, positive physical outcome expectations actually had a negative overall effect on physical activity, such that those who expected physical activity to have more positive physical effects (e.g., less stress, better sleep) were less active. To explain this finding, the authors cited the *false hope syndrome*, which suggests inactive individuals may have unrealistically high outcome expectations regarding the benefits of physical activity (Polivy & Herman, 2002). Thus, overall, of the SCT variables tested, these results suggested self-regulation played the largest role in explaining behavior, and the influence of self-efficacy, though significant, was weaker.

These studies provide some support for the SCT model and, in particular, the roles of self-efficacy and self-regulation in predicting physical activity behavior. There is still much work to be done, however, to clarify the relationships between constructs. To date, no studies have explored the specific contributions of the SCT variables in a population of working mothers.

Intervention Research

Several randomized controlled trials (RCTs) have shown classroom-based interventions grounded in SCT can effectively bring about change in physical activity behavior. For example, Project ACTIVE (Dunn et al., 1997; Dunn et al., 1998; Dunn et al., 1999) was a large RCT in which sedentary men and women aged 35 to 60 years were assigned to either a structured exercise program or a lifestyle physical activity program. The lifestyle program consisted of weekly 1-hour small group meetings during which participants learned cognitive and behavioral strategies for engaging in regular physical activity, used a problem-solving approach to develop plans for overcoming barriers, and completed weekly homework assignments designed to

reinforce the material. Participants in the structured exercise program received access to a state-of-the-art fitness center and were given a standard exercise prescription (i.e., aerobic exercise for 20-60 minutes at 50-85% of maximal aerobic power 3-5 days per week). Following the 6-month intensive intervention, both groups showed comparable increases in energy expenditure as estimated by the 7-day Physical Activity Recall (PAR; Dunn et al., 1998). The 24-month follow-up produced some interesting results. Specifically, from baseline to 24 months, participants in the lifestyle intervention had increased moderate physical activity nearly three times more than participants in the structured exercise program. For vigorous activity, however, the exercise group exhibited a greater increase. Activity levels declined slightly for both groups from six to 24 months, but the decreases were not significantly different between groups (Dunn et al., 1999). These results suggest a novel classroom-based approach for promoting maintenance of physical activity is as effective as a traditional structured exercise program approach.

Project GRAD (Calfas, et al., 2000; Sallis, et al., 1999) was a classroom-based intervention for college seniors. The course was implemented across a single semester and was designed to teach students to adopt and maintain physical activity as they transitioned from a university setting to full-time work. Participants were randomly assigned to either the experimental course or a control condition. Post-intervention analyses revealed no significant intervention effects for males, but females who took the GRAD class exhibited significant increases in self-reported strengthening and flexibility exercise compared to those in the control condition. In addition, females in the treatment group who were classified as “active” at baseline showed significant improvements in total leisure time energy expenditure compared to controls. Results from a 2-year follow-up, however, revealed no significant differences in physical activity between the intervention and control groups. These results suggest a behavioral intervention may

positively affect physical activity levels among females during times of transition, but future programs should consider how to better design interventions to promote long-term maintenance.

Project IMPACT (Albright, et al., 2005; Collins, Lee, Albright, & King, 2004) was an 8-week intervention that targeted low-income Latina women attending vocational training classes. Although no women were excluded based on physical activity level, recruitment efforts targeted sedentary women (i.e., those in the contemplation stage based on the transtheoretical model). Participants met for one hour weekly to engage in group activities and discussions designed to promote physical activity behavior change. The intervention materials were adapted from Project ACTIVE and focused on cognitive processes of change (e.g., consciousness raising, increasing commitment and confidence) and strategies for overcoming barriers and developing a safe and appropriate physical activity program. Following the intervention, participants exhibited significant increases in knowledge of and social support for physical activity, but perceived barriers and self-efficacy did not change. Importantly, self-reported minutes of walking during the past 2 weeks nearly doubled. The 7-day PAR, however, did not detect any significant changes in energy expenditure.

In an interesting series of post-hoc analyses, Urizar et al. (2005) restricted the sample from Project IMPACT to mothers with children at home ($n=68$) and examined the relationships between maternal stress, physical activity and class attendance. They used the Mother Role Questionnaire to assess frequency and intensity of maternal stressors. Results showed the intensity of maternal stress at baseline was a significant predictor of physical activity at 10 weeks. Additionally, increases in physical activity from baseline to post-intervention were significantly associated with a decrease in the number of maternal stressors across the 10-week

intervention period. The number of classes attended was not related to changes in maternal stress, suggesting that physical activity, rather than social support received as a function of the intervention, was primarily contributing to stress reduction. These results are very encouraging and provide initial support for the hypothesis that engaging in physical activity might be associated with reductions in stress among mothers.

Interventions for mothers

Recently, several interventions have been designed specifically for women with children. “Moms on the Move” (Fahrenwald, Atwood, Walker, Johnson, & Berg, 2004; Fahrenwald & Sharma, 2002) was a physical activity intervention implemented among low-income mothers enrolled in the Women, Infants, and Children (WIC) program. For this pilot trial, participants ($N=52$) were randomly assigned to a provider-counseled intervention targeting physical activity or breast self-examination (attention control). The counseling was supplemented by four biweekly telephone calls and an interactive brochure. The intervention content was based on the transtheoretical model (TTM) and targeted select TTM behavior change constructs, including decisional balance, self-efficacy, self-liberation, helping relationships, counter conditioning, and environmental reevaluation. Following the 8-week intervention, participants in the physical activity group had increased self-reported physical activity and average daily steps significantly more than participants in the attention control group. Participants in the experimental group also evidenced significantly greater improvements in all of the behavior change constructs and greater stage progression (e.g., movement from contemplation or preparation stages to action stage).

In a separate study of recent mothers, Cramp and Brawley (2006) compared the effects of two exercise interventions on physical activity behavior among post natal women (defined as 6

to 52 weeks after childbirth). They argued this time of behavioral transition is characterized by numerous unique barriers, including sleepless nights, physical changes, and time demands associated with having a new baby. Participants ($N=57$) were randomly assigned to a standard exercise (SE) condition or an exercise plus group-mediated cognitive behavioral counseling (GMCB) condition. All participants were given access to a large commercial fitness facility and received two supervised exercise sessions per week for the first four weeks. This “intensive exercise phase” was followed by a four-week participant-managed home-based phase. For participants in the GMCB condition, the exercise sessions were supplemented by 20-minute training sessions that focused on enhancing self-regulatory skills such as goal setting, developing plans for overcoming barriers, and self-monitoring. Following the 8-week intervention, participants in the GMCB group evidenced significantly greater changes in frequency and volume (i.e., frequency x duration) of physical activity compared to the SE condition. Additionally, there was a significant treatment effect on proximal outcome expectations and barrier self-efficacy, such that participants in the GMCB group reported small increases in these constructs, while participants in the SE group reported small declines.

Cody and Lee (1999) conducted a small pilot study for mothers of preschool children ($N=32$). The 10-week program combined structured, supervised exercise (i.e., walking and aerobic dance) with a behavior change component that used group discussion complemented by a handbook to deliver material. Results showed 69% of those who began the program had advanced to a more active stage of exercise adoption immediately following the program. The program also elicited small but statistically significant improvements in body mass index, resting heart rate, diastolic blood pressure, and flexibility. At a 3-month follow-up, however, only 41% of participants remained in a more active stage than at baseline. Thus, although stage of change

may be considered a limited proxy for an actual measure of physical activity behavior, and the rate of relapse was fairly substantial, this study does support the feasibility of delivering an exercise program designed specifically for mothers constrained by caring for young children.

Miller, Trost, and Brown (2002) compared two intervention approaches designed to promote physical activity to a control condition in a large sample of Australian women with young children ($N=554$). Participants were recruited from childcare centers. Both intervention groups (Groups 2 and 3) received a print intervention consisting of an 8-page booklet with information about the benefits of physical activity and strategies for overcoming barriers specific to mothers of young children. In addition, Group 3 participants attended focus groups to discuss perceived barriers, during which lack of confidence to overcome barriers and lack of partner support emerged as the most salient. The research team then collaborated with the participants, childcare centers, and local exercise facilities to promote a more “mom-friendly” exercise environment. Examples of collaborations included improved childcare services and mom-friendly classes at local gyms, walking groups that met after children were dropped off at childcare centers, and discussions about strategies for soliciting more instrumental support from partners. Results of logistic regression analyses showed participants in Group 3 were significantly more likely to be meeting the national physical activity recommendations than those in Groups 1 or 2. Examination of mediators suggested partner support and self-efficacy were likely to be mediating the change in physical activity behavior. Although the short-term (8-week) results favored the print plus community development intervention, this effect was no longer observed at a long-term follow-up.

Finally, in a randomized controlled trial conducted recently in Australia (Fjeldsoe, Miller, & Marshall, 2010), postnatal women (i.e., <12 months postpartum) were assigned to either an SMS-based physical activity intervention ($n=45$) or a control condition ($n=43$). The intervention lasted 13 weeks and included one face-to-face consultation with a trained behavioral counselor, one telephone-delivered goal setting consultation, a goal setting magnet, standard print-based physical activity information, and 3 to 5 weekly tailored SMS messages targeting social cognitive constructs of behavior change. Results showed the intervention had significant positive effects on frequency of MVPA, with the intervention group increasing more than the control group at both 6 and 13 weeks. No significant interaction effects were observed, however, for duration outcomes. Post-intervention interviews with the participants revealed the women most appreciated the goal setting magnet, the sense of personal connection with their behavioral counselor, and the “mother-centered” nature of the intervention.

Together, the results of these studies suggest classroom-based exercise adherence interventions that utilize a social cognitive framework can have a significant impact on physical activity levels of adults. Interventions that have specifically targeted mothers have elicited promising results, with all such studies reporting positive changes in physical activity and key social cognitive mediators such as self-efficacy, outcome expectations, social support (Rhodes et al., 2008). Although these outcomes are encouraging and suggest focused interventions can be used to successfully change behavior among mothers, they also highlight some important directions for future research. First, with the exception of one study, all of the interventions used relatively small samples, and could be considered pilot work. Second, to date, no intervention has focused specifically on working mothers, an increasingly larger, yet often neglected, group of women who face unique and difficult barriers. Third, most of the aforementioned

interventions consisted of a series of classes (i.e., 8 to 20 sessions) that spanned across 2-6 months. Working mothers are unlikely to be able to invest this amount of time in a behavior change course, so it is important to examine the effectiveness of a brief intervention comprised of only a few intensive sessions. As an added benefit, such a program would be highly disseminable, and thus would have the potential to reach large groups of individuals in order to have a significant public health impact. Finally, few previous studies have assessed the long-term effectiveness of interventions, and among those that have, results have not supported maintenance of initial changes. It will be important to determine whether a brief intervention effectively produces both short- and long-term changes in physical activity behavior, and to explore support mechanisms that may enhance long-term maintenance.

Brief interventions

Several SCT-based interventions have employed a brief intervention approach. Hallam and Petosa (2004) designed a short intervention whereby employees of a service industry enrolled in a four-session intervention. The sessions targeted SCT variables by identifying reasonable expected outcomes from exercise participation, teaching self-regulatory strategies (with a focus on goal-setting), addressing common barriers and strategies for overcoming them, and encouraging participants to solicit social support and develop plans for preventing relapse. Results showed self-regulation increased significantly for those in the intervention group compared to a control condition, and the groups remained significantly different up to a year after the intervention. They also found significant group by time interactions for outcome expectations and self-efficacy, but the results were less convincing, as the two groups did not differ significantly at any point post-intervention. Finally, the authors were most encouraged by

the findings that the group by time interaction was significant for physical activity, such that the intervention group increased slightly while the comparison group declined consistently.

Although these results support the position of targeting SCT variables to promote changes in exercise behavior using a brief intervention format, they should be interpreted cautiously due to several study limitations. Specifically, the groups were not randomly assigned, the strongest effects were not seen until a year after the brief intervention, and the intervention did not adequately address self-efficacy.

Another study employed a brief intervention approach for women with hypertension (Daley, Fish, Frid, & Mitchell, 2009). Contact with participants was limited to two face-to-face counseling sessions and four phone calls across the five-week intervention. Intervention materials were stage-matched to participants' self-reported stage of change and emphasized realistic goal setting, exercise benefits, positive self-talk, and overcoming barriers. Participants were also given a generalized exercise prescription consistent with the national physical activity guidelines. Results showed 70% of participants increased energy expenditure based on the 7-day PAR, and 80% of participants adhered to the exercise prescription (i.e., exercised at least 3 times per week for four weeks). Furthermore, exercise benefits and exercise self-efficacy improved significantly over the course of the intervention, and exercise barriers had decreased significantly after five weeks. Although these results are encouraging, this study also has several major limitations, including a small sample size ($N=40$), a short intervention duration without long-term follow-up, and lack of a control or comparison group. Thus, these results suggest the brief intervention approach may have some merit, but such an approach must be validated by randomized controlled trials before further conclusions can be drawn.

Components of Effective Interventions

Although the existing evidence strongly supports using SCT as an effective framework for delivering a physical activity intervention, it is important to consider *how* to best deliver this information. That is, what do previous intervention approaches teach us about components of interventions that should be included or omitted?

First, it is clear that interventions are more effective when they are tailored to the participants (Marcus & Forsyth, 1998). When designing an intervention, one should pay particular attention to factors such as motivational readiness, life stage, and gender. Women tend to have different psychological motives and activity preferences than men. Working mothers, in particular, are a unique population who likely have group-specific barriers and beliefs related to exercise. Programs to promote exercise adherence should address the specific needs and concerns of the population and design materials to maximize their relevance to the group.

Given that common barriers such as lack of time and fatigue are often maximized for working mothers, interventions for these individuals should include a strong focus on finding time for exercise in one's busy schedule. This may begin with teaching the women to redefine "exercise." Qualitative data have revealed that women often think about physical activity only in terms of structured exercise (i.e., at a gym) or recreational activity (i.e., organized sports). Only when prompted did they discuss occupational, household, or unstructured activity (i.e., walking in the neighborhood; Wilcox, Richter, Henderson, Greaney, & Ainsworth, 2002). For most working mothers, their ability to successfully meet the national physical activity guidelines will depend on the incorporation of activities that are practical and convenient (Nies et al., 1999). For example, participation in home-based activities may enhance adherence. Working mothers might

also be advised to accumulate activity throughout the day by engaging in multiple short bouts, which would likely be more feasible when considering their busy schedules (White, Ransdell, Vener, & Flohr, 2005).

Previous research has found younger women (i.e., less than 40 years old) cite weight loss/maintenance as their primary motive for engaging in physical activity (Scharff, Homan, Kreuter, & Brennan, 1999). Unfortunately, many women do not lose weight as quickly or extensively as they would like when they begin an exercise program, and failure to lose weight has been implicated as a significant predictor of nonadherence. Results of a qualitative study that used focus groups to acquire a better understanding of exercise adherence among women found individuals who had successfully maintained an exercise program were motivated by intrinsic factors related to improved quality of life (e.g., enhanced physical self-worth, feelings of personal accomplishment) rather than weight loss or physical appearance (Huberty et al., 2008). Similarly, Jaffee et al. (1999) compared incentives and barriers to physical activity in a sample of working women and found those in the contemplation, preparation, and action stages had extremely high expectations for weight loss compared to women in the maintenance stage, who placed much greater value on improved cardiovascular fitness and muscle tone, improved self-image, and ongoing good health. Finally, after conducting a review of factors related to exercise adherence in women, White et al. (2005) suggested women who have high (and likely unrealistic) expectations regarding weight loss when they start an exercise program may demonstrate declines in self-efficacy when their progress is not in line with their goals. Thus, they recommend focusing on other markers of success, including improved self-efficacy, functional capabilities, and quality of life.

It is important to consider the evidence for including certain “extras” that might enhance the effectiveness of an intervention. Gardner and Campagna (2009) collected qualitative and quantitative data related to pedometer use in a small sample of middle-aged women. Their results indicated that pedometers can serve as excellent motivational tools in the context of a physical activity intervention. Following baseline data collection, participants received a pedometer and general information relative to physical activity benefits, goal setting, and the 10,000-Steps-a-Day research. Of the ten participants in their study, eight increased their total daily steps across the four-week intervention period. Interviews with the participants indicated the pedometer bolstered motivation by increasing awareness of exercise behavior and prompting development of strategies to accumulate more daily steps. Participants also noted feelings of pride and satisfaction when they met their goals or noticed they were making progress based on the feedback they received from the pedometer. Although these results are limited by the small sample size and short intervention duration, they still suggest pedometers can be used to complement behavior change interventions by enhancing motivation among women seeking to change their exercise behavior.

Pedometer use has also been supported empirically in several intervention studies. Clarke et al. (2007) conducted a brief 8-week intervention to promote physical activity for weight loss among low-income mothers. Weekly lessons that incorporated behavior change discussions with structured exercise were complemented by pedometers that allowed the women to track their weekly steps and estimated energy expenditure. Results showed average steps per day increased from 5,969 at baseline to 9,757 post-intervention. It appears that the self-monitoring promoted by pedometer use makes the device a valuable motivational tool. Speck and Looney (2001) asked working women assigned to an intervention group to complete daily activity records and found

the total number of steps was higher in this group compared to a control group following a 12-week intervention. Similarly, Sidman, Corbin, and Le Masurier (2004) found sedentary women who used a pedometer to monitor their daily steps increased their total step counts across a 3-week period. Interestingly, in this study, for women with low step counts at baseline, those who set personal step goals were more adherent to their goals than those who received a generalized 10,000-step goal. Though all of these studies had methodological limitations, they underscore the points that using pedometers and self-monitoring as motivational tools can enhance activity levels, and that goals should be individualized and realistic to have the greatest effects.

In those interventions that have included follow-up assessments of key outcomes, a large percentage of participants have often regressed back to (or close to) baseline levels despite showing improvements immediately post-intervention (e.g., Calfas, et al., 2000; Cody & Lee, 1999). To this end, it seems important to include some continued contact with participants beyond the termination of the face-to-face intervention. Albright et al. (2005) assigned participants to either a mail-based (i.e., standard health education materials) or telephone counseling support condition following the 8-week classroom-based Project IMPACT intervention. Individuals in the telephone counseling group received a total of 14 calls over the ten months following the intervention, and calls were designed to address current goals and barriers and to increase self-efficacy. Although both groups had increased their activity levels immediately after the 8-week program, those levels were only maintained among those in the telephone support group. Those who received mail-based support relapsed to a level comparable to baseline. These results highlight the value of continuing some type of individualized contact with participants. This is likely to be especially important when the duration of the initial face-to-face intervention is relatively brief. In choosing the mode of support, an important goal should be

to achieve a balance between the effectiveness of the support mechanism and the degree of burden placed on the participants and support personnel.

The Present Study

The present study extended the existing literature in several ways. First, it focused on a population that has largely been neglected in physical activity research thus far, but consistently exhibits low levels of physical activity due to time constraints and other real and perceived barriers. Given that the number of working mothers continues to increase, it is an opportune time to begin developing programs that might improve physical activity adoption and maintenance in this population. Furthermore, the extent to which increases in physical activity are associated with improvements in health-related quality of life indicators, including stress, depression, anxiety, and fatigue, is an important question which this study was designed to address.

This study also employed a brief intervention approach for several reasons. First, working mothers are unlikely to be willing or able to devote a significant amount of their time to a behavior change program. Utilizing a brief format maximized the opportunities for participant recruitment and retention. Second, if efficacious, such an intervention has the potential to be highly disseminable and could be adopted and implemented for working mothers in diverse settings.

This study supplements existing research that has examined social cognitive predictors of physical activity behavior change. SCT has proven to be a useful theory for approaching health behavior change in a variety of populations, but its relevance to working mothers remains to be determined. This study examined not only changes in key social cognitive variables across the

intervention period, but also the extent to which changes in physical activity could be explained by changes in these social cognitive determinants.

Finally, this study employed a design which allowed for the investigation of long-term maintenance of physical activity changes. Half of the participants who received the brief intervention also received ongoing telephone support, which allowed for the following questions to be addressed: 1) Was the brief intervention effective for promoting long-term changes in physical activity; and 2) Does telephone support following the intervention enhance physical activity maintenance?

CHAPTER III: METHODS

Participants

Participants were females in central Illinois aged 25-52 who were employed at least 25 hours per week and had at least one child under age 15 living at home. Although it is conceivable that women with young children (i.e., <5 years old) are a particularly “at-risk” population due to increased time and resource demands, a majority of studies (80%) that have specifically examined parental levels of physical activity in relation to the age of their children have not shown any association between child age and mother’s physical activity (Rhodes et al., 2008). Thus, a broad range of children’s ages were included in this study. Additional inclusion criteria included willingness to be randomized to any of the three conditions, ability to attend the two workshop sessions, ability to access the internet, and completion of the Physical Activity Readiness Questionnaire (PAR-Q). Individuals who responded “yes” to one or more questions on the PAR-Q were required to obtain physician clearance before proceeding with participation. Women who were already meeting or exceeding the national physical activity recommendations (i.e., more than 150 minutes of moderate activity per week for the previous 2 months) based on self-reported activity levels were excluded.

Measures

Demographics

A demographics questionnaire was administered to ascertain participants' age, race, education, income, marital status, employment status, and parenthood status (including number and ages of children).

Physical activity

Physical activity was measured objectively using Actigraph accelerometers (Manufacturing Technology Inc. (MTI), Pensacola, FL). The accelerometer (Model GT3X) is a small (3.8 x 3.7 x 1.8 cm), lightweight (27 g) device that is worn on a belt over the non-dominant hip. It is programmed to distinguish human movement using a pre-determined frequency response range. The activity monitor is powered by a rechargeable battery that lasts up to 20 days when fully charged. It is enclosed in a plain red case that does not provide any feedback to participants while they are wearing it. Participants were asked to wear this device for all waking hours, except when showering or swimming, for seven consecutive days. In addition, participants were asked to record the times they started and stopped wearing the monitor each day on an accelerometer log. Data were downloaded and digitally converted to "activity counts" per minute (i.e., one epoch), which were summed and averaged across the total number of valid days to get a total daily activity score. Additionally, established cutpoints (Freedson, Melanson, & Sirard, 1998) were used to determine daily minutes of moderate/vigorous physical activity (MVPA; >1952 counts per minute).

Self-reported physical activity was also assessed using the Godin Leisure-Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1985). This brief measure asks participants to report the *current* frequency of engaging in strenuous (e.g., running), moderate (e.g., easy bicycling or swimming), and light (e.g., bowling or golf) exercise for at least 15 minutes per session during a typical week. A total weekly leisure activity score was calculated by multiplying the frequencies of strenuous, moderate, and light activities by nine, five, and three, respectively, and then summing the products.

Self-efficacy

The Exercise Self-efficacy Scale (EXSE; McAuley, 1993) and Barriers Self-Efficacy Scale (BARSE; McAuley, 1992) were used to assess self-efficacy. The EXSE measures participants' beliefs in their ability to continue exercising five times per week in the future, at a moderate intensity, for 30 minutes per session. The BARSE assesses participants' perceived capabilities to exercise three times per week over the next three months in the face of commonly identified barriers to participation (e.g., bad weather, schedule conflicts). For both measures of self-efficacy, participants responded to each item by indicating their confidence to execute the given behavior on a 100-point percentage scale ranging from 0% (*not at all confident*) to 100% (*highly confident*). Total strength for each measure of self-efficacy was then calculated by summing the confidence ratings and dividing by the total number of items in the scale, resulting in a maximum possible efficacy score of 100.

Outcome Expectations

The Multidimensional Outcome Expectations for Exercise Scale (MOEES; Wojcicki, White, & McAuley, 2009) consists of three subscales: physical outcome expectations (e.g., “Exercise will increase my muscle strength”), social outcome expectations (e.g., “Exercise will provide companionship”) and self-evaluative outcome expectations (e.g., “Exercise will give me a sense of personal accomplishment”). This scale asked participants to indicate how strongly they agreed with each statement on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Self-regulation

The Exercise Goal-Setting Scale (EGS) and the Exercise Planning and Scheduling Scale (EPS; Rovniak, et al., 2002) were used to assess self-regulatory behavior. The EGS consists of ten items related to goal setting, self-monitoring, and problem solving (e.g., “I usually keep track of my progress in meeting my goals”). The EPS includes ten items related to scheduling and planning exercise as part of one’s daily routine (e.g., “I schedule my exercise at specific times each week.”). For each scale, participants responded on a scale from 1 (*does not describe*) to 5 (*describes completely*).

Social support

The Social Support for Exercise Scale (SSE; Sallis, Grossman, Pinski, Patterson, & Nader, 1987) is a 10-item scale assessing the degree to which friends and family demonstrate verbal (e.g., “Gave me helpful reminders to be active”) and behavioral (e.g., “Helped plan activities around my activity routine”) support for exercise behaviors in the previous 3 months. Each of the 10

items is rated twice, once for family members, and once for friends. Participants rated the frequency of each item on a 5-point Likert scale ranging from 1 (*never*) to 5 (*very often*).

Stress

The Perceived Stress Scale (PSS; Cohen, Karmarck, & Mermelstein, 1983) is a 10-item scale designed to tap general beliefs about perceived stress. It does not reference specific events; rather, it is meant to be an overall measure of generalized stress (e.g., “In the last month, how often have you found that you could not cope with all the things that you had to do?”). For each item, participants responded on a scale from 0 (*never*) to 4 (*very often*). A total perceived stress score was obtained by summing across all items.

Depression and anxiety

The Hospital Anxiety and Depression scale (HAD; Zigmond & Snaith, 1983) is a 14-item scale designed to assess depression and anxiety in general medical (i.e., non-psychiatric) populations. It has been demonstrated to be a valid measure of these two common mood disorders in such populations. Each subscale contains seven items. Sample items for the depression and anxiety subscales, respectively, are “I feel as if I am slowed down,” and “Worrying thoughts go through my mind.” For each item, participants responded on a scale from 3 (*most of the time*) to 0 (*none of the time*). Higher scores reflected greater levels of depression and anxiety.

Fatigue

The Fatigue Symptom Inventory (FSI; Hann et al., 1998) is a 14-item scale that assesses the frequency and severity of fatigue, as well as its perceived interference with quality of life. For the present study, the 4-item fatigue severity subscale was utilized. For each item (e.g., “Rate your level of fatigue on the average during the past week”), participants responded on a scale ranging from 0 (*not at all fatigued*) to 10 (*as fatigued as I could be*). The ratings were averaged to yield a total fatigue severity score.

Quality of life

The Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) is a global measure of quality of life that assesses overall life satisfaction. For each of the five items, participants rated the extent to which they agreed with the statement (e.g., “In most ways my life is close to ideal”) on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). All items were then summed, with higher scores reflecting greater life satisfaction.

Procedures

Participants were recruited via local media outlets (e.g., university email lists, newspaper article, radio segment), local organizations frequented by mothers (e.g., day care centers, public libraries), and local community groups aimed at women, mothers, and/or working professionals. Recruitment materials targeted women who were not currently meeting the national physical activity recommendations but were motivated to start exercising more. Individuals who responded to the advertisements were contacted via telephone or email to provide a description of the study, determine eligibility, and extend an offer to participate in the study. Participants who met inclusion criteria and agreed to participate were mailed a packet that included an informed consent document, the accelerometer, accelerometer log, and instructions for wearing the accelerometer and completing the questionnaires online using Survey Monkey. The packet included a self-addressed stamped envelope to be used to return the signed informed consent document. Participants were instructed to wear the accelerometer for one week and complete the questionnaires during the same week. After wearing the accelerometer for seven days, they sent the accelerometer and log back to the investigator in a provided self-addressed, stamped envelope.

Following completion of all baseline measures, participants were randomly assigned to one of three conditions: intervention only, intervention plus follow-up support, or wait-list control. Randomization occurred in five “waves” to allow for continuous enrollment of subjects into the study. For all groups, follow-up data were collected immediately post-intervention (1 month), and 6 months after baseline. All data were collected in the same manner as baseline data, with the exception of the 1-month accelerometer data for participants in the intervention groups. These participants received the accelerometer at their second workshop session and were asked to mail it back after wearing it for one week. During the 6-month study duration, the control group’s only contact with the researcher was for data collection purposes. After all 6-month follow-up data had been collected for a particular wave, participants in the wait-list control group were invited to attend a 2-hour workshop that summarized the content received by the participants in the intervention groups. They also received a copy of the study handbook and a complementary session with a personal trainer.

The intervention took place during the first month following randomization. Participants in the “intervention only” and “intervention plus” groups were scheduled to attend separate sessions to avoid contamination between groups, but the content each group received was identical. The intervention consisted of two interactive group-based sessions, spaced three weeks apart, which taught participants behavior modification strategies based on SCT principles. The first session was a “workshop” that lasted approximately two hours. Topics addressed included: identifying salient exercise benefits, having realistic expectations, developing strategies to overcome barriers, finding time in schedule for exercise, enhancing self-efficacy, setting effective goals, and utilizing self-monitoring. The session was guided by the study investigator, but was interactive and incorporated small and large group discussions and problem-solving

activities. For instance, participants identified their most common barriers and devised solutions for overcoming these barriers. To do so, the importance of scheduling exercise sessions in advance was emphasized and popular myths (e.g., exercise is selfish, weight loss will happen quickly once I start exercising) were debunked. Participants were encouraged to broaden their definitions of "exercise" to include activities that can be completed at home, are moderate in intensity, and are as brief as 10 minutes in duration. Participants also set individual goals using "SMART" goal setting principles (i.e., specific, measurable, action-oriented, realistic, and time-based) and were instructed to complete activity logs to monitor their progress following the workshop. Each participant received a handbook containing information, worksheets, and resources to use during the session and at home. The content of the handbook complemented the topics addressed during the workshop and incorporated quotes and stories obtained from working mothers in the community during focus group meetings.

The second session lasted approximately 1.5 hours and served as a follow-up meeting to review goals and assess progress, discuss additional facilitators (e.g., social support and rewards), and plan for the future based on early successes and failures. Relapse prevention strategies were also discussed. Participants finished the session by completing a behavioral contract that outlined their goals for the coming months. The number of women attending each session ranged from 4 to 11, with most groups having 6 to 8 participants. Although group discussions and activities were included in the sessions, every effort was made to address individual issues in addition to barriers that are common to all working mothers. Each workshop session also featured several brief video clips of "model" working moms (i.e., successful exercisers) discussing exercise benefits and barriers, and providing advice for other working moms just getting started. Finally, child care was provided on-site during the workshop sessions.

Participants in the intervention groups also received a pedometer and an accompanying electronic log for tracking their daily steps. The Yamax Digiwalker Pedometer (Model SW-200) is an accurate, commercially available step counter that has been used extensively and demonstrated acceptable reliability. It can measure up to 100,000 steps and its battery lasts approximately three years. Participants were advised to wear the pedometer on the hip and record the number of steps they took each day on the provided log. They received instructions for resetting (i.e., zeroing) the pedometer at the end of each day. They were encouraged to set one or more goals that could be tracked using the pedometer and/or pedometer log. The electronic log automatically calculated their average weekly steps and displayed them on a graph next to their goal for the week. Thus, the pedometers served as a source of specific feedback through which participants could monitor their progress and adjust goals accordingly.

In addition, participants in the intervention groups received one complimentary one-hour session with a personal trainer. The purpose of this session was to help participants design an exercise program that would be realistic based on their stated goals, barriers, and outcome expectations. For example, for many working mothers, leaving home to exercise at a gym may not be a viable option. The personal trainer worked with the individuals to devise an exercise program that could be completed at home. The personal training session was scheduled to take place in between the two group meetings. Immediately following the session, the trainer emailed participants a copy of the exercise program they had designed together which included detailed descriptions and pictures of each exercise.

During the follow-up period (i.e., between month 1 and month 6 testing), participants in the intervention only condition received no further contact from the research team. Participants

assigned to the intervention plus follow-up support condition received monthly telephone support calls from a study investigator to monitor their progress following the structured intervention. These contacts were brief (~3-8 minutes) and designed to provide support, feedback, and active problem solving strategies which were individualized based on the individual's current activity level and goal adherence. The phone calls were relatively unstructured in that they focused on the participant's needs as opposed to following a pre-determined script. If the participant could not be reached after three attempts, the investigator contacted her by email and asked her to send an update on her progress during the past month.

Data Analysis

Power Analysis. Until now, no randomized controlled exercise trials designed specifically for working mothers have been conducted. However, several studies have targeted mothers, and these could be used as a benchmark for the expected effect size. The effect sizes reported in these trials have generally exceeded the conventional standard for a large effect for MVPA frequency (Cramp & Brawley, 2006, $d=1.71$; Fjeldsoe et al., 2010, $d=1.22$) and MVPA duration (Fahrenwald et al., 2004, $d=2.42$). Given that the present study targeted a population of women who are likely to have even more barriers than those in the previous studies, and that the intervention duration was briefer, a much more conservative effect size was selected for the power analysis ($d=.3$).

Using this value, an a priori power analysis was conducted to estimate the necessary sample size using G*Power version 3.1.2 (Faul et al., 2009). To detect a 3 (Group) x 2 (Time) interaction for the proposed multivariate analyses with 80% power, the analysis yielded a total

sample size of 111 participants (37 per group). To account for 20% attrition, we planned to recruit a total of 135 participants (45 per group).

Data checking and management. After questionnaire data were submitted online, they were checked for clarity and completeness. If necessary, incomplete or ambiguous results were corrected with follow-up emails or telephone calls. Once all data had been collected for a given time point, they were downloaded from Survey Monkey and saved to a secure, password-protected server. Data were then imported into Predictive Analytics Software (PASW, version 18; Norusis, 2010) and frequency distributions were examined to check for any out-of-range values. Once any errors in the raw data had been corrected, composite files were created in PASW using the published scoring instructions for each of the measures.

The accelerometer data were cleaned and reduced using MeterPlus 4.2 (San Diego, CA; www.santechhealth.com). Using this software, the researcher viewed the raw data for each individual and excluded days that contained any abnormal data (e.g., same number repeating for several hours, counts exceeding the expected threshold for human movement). Additionally, only days with at least ten hours of valid wear time were included in the analysis, and hours with greater than 30 minutes of consecutive zeros were considered invalid (i.e., non-wearing). Finally, data were checked against the written logs submitted by participants to ensure the two corroborated. After the raw data had been processed, scoring the data generated the following variables of interest: total daily activity counts, and total minutes of moderate and hard activity. A mean daily physical activity score was calculated by dividing the total number of valid counts by the number of valid days. Average daily MVPA was calculated by first summing the total valid moderate and hard activity counts, then dividing by the number of valid days.

Data analysis. To test the first hypothesis, a series of three repeated measures analyses of variance (ANOVAs) were used to compare activity levels between those in the intervention and control groups. The three primary physical activity outcomes were composite GLTEQ score, average daily counts (accelerometer), and average daily minutes of MVPA (accelerometer).

To test the second hypothesis, a repeated measures MANOVA was first employed to examine whether the intervention differentially affected stress, depression, anxiety, fatigue, or quality of life. Subsequently, standardized residual change scores were calculated for the three physical activity variables as well as each quality of life outcome, and correlation analyses were used to examine whether changes in physical activity were associated with changes in any of the quality of life variables within each group.

To test the third hypothesis, a series of repeated measures MANOVAs were used to investigate patterns of change in SCT model variables between groups. Dependent variables were grouped as self-efficacy (BARSE and EXSE composite scores), outcome expectations (physical, social, and self-evaluative subscale scores), goals (EGS and EPS composite scores), and social support (friend and family participation subscales of the SSE). Next, correlation analyses were conducted to examine the relationships between changes in physical activity and changes in social cognitive determinants within the intervention condition. Finally, the change scores for all significant correlates of changes in physical activity were entered into a multiple linear regression equation to examine the relative contributions of the changes in SCT variables to changes in physical activity.

To test the fourth and final hypothesis, 2 (Group) x 3 (Time) ANOVAs were used to compare the patterns of change between the intervention only and intervention plus groups. Each of the three primary physical activity outcomes was used as a dependent variable.

For each of the first three hypotheses, analyses were conducted first for short-term outcomes (i.e., baseline to post-intervention), and then for long-term outcomes (i.e., baseline to post-intervention to follow-up). For the short-term analyses, the intervention only and intervention plus groups were combined, as the treatment they received prior to the post-intervention measurement time point was identical. For the long-term analyses, we planned to combine the intervention only and intervention plus groups (2 X 3 ANOVAs) when there were no significant differences between the two groups, but separate them (3 X 3 ANOVAs) in any instances where the two intervention groups differed. Residual change scores from baseline to follow-up were used for all long-term correlation analyses.

CHAPTER IV: RESULTS

Participant Characteristics and Retention

A total of 224 individuals initially expressed interest in the study. Of these, 30 could not be reached to complete pre-screening. Of the 194 individuals who completed pre-screening, 156 were eligible to participate in the study and received the packet including the informed consent document and the accelerometer. Of these, 141 individuals completed all baseline data and were randomized.

Baseline characteristics of the 141 randomized participants are displayed in Table 1. On average, participants were 37.3 years old and had approximately 2 children. There was considerable variation in number and age of their children, but on average, the youngest child was 4.75 years old. A majority of participants were white, married, and working full-time. As a whole, the sample was very well-educated and relatively affluent.

For a detailed view of participant flow through the study, see Figure 1. Of the 47 participants randomized to the intervention only group, 44 attended the first workshop session, 39 attended the personal training session, and 38 attended the second workshop session. The three individuals who never attended a session had schedule conflicts that precluded them from participating. Dropouts between the two workshop sessions were due to lack of interest (n=2), injury (n=1), death in the family (n=1), moving out of state (n=1), and schedule conflict (n=1). Of the 48 participants randomized to the intervention plus group, 43 attended the first workshop

session, 43 attended the personal training session, and 42 attended the second workshop session. All dropouts in this group were attributed to schedule conflicts. Of the 46 participants randomized to the control condition, 39 completed the post-intervention data collection. Participants dropped out due to lack of interest (n=4) or family/personal issues (n=3).

Data regarding the follow-up phone calls are presented in Table 2. Each month, at least 70% of participants were reached by telephone, and on average, 90% of participants were reached via telephone or email. Calls ranged in duration from 1.2 to 10.5 minutes, but generally lasted about five minutes.

An additional ten participants were lost at the six-month follow-up. Four could no longer be reached by telephone or email, three were no longer interested, and three reported family/personal issues that prevented continuing participation.

A series of t-tests was conducted to determine whether participants who completed the study differed from those who dropped out following randomization on any demographic or baseline measures. Analyses revealed participants who completed the intervention were more educated ($t(139)=2.93, p=.005$) and had higher daily activity ($t(139)=2.23, p=.03$) and MVPA ($t(139)=2.82, p=.006$) based on the accelerometer. It is not clear, however, whether the significant differences in accelerometer counts were a function of lower activity levels or poorer compliance with instructions for wear among those who dropped out, as the dropouts also had significantly less valid hours of wear time ($t(139)=2.33, p=.03$) than those who completed the study.

Short-term Results

The primary aim of this study was to examine the effects of the SCT-based intervention on physical activity behavior. The hypothesis that individuals who completed the intervention would exhibit increases in physical activity compared to participants in the control group was partially supported (see Table 3). Results of the ANOVA for self-reported leisure time exercise revealed a significant main effect for time [$F(1,112) = 23.53, p < .001, \eta^2 = 0.17$], with both groups engaging in more exercise post-intervention compared to baseline. The interaction of treatment condition and time was also significant [$F(1,112) = 8.08, p = .005, \eta^2 = 0.07$]. Examination of the mean values and effect sizes suggests that this interaction can best be explained by a larger increase in physical activity in the intervention condition than the control condition.

Subsequent analyses utilized two accelerometer-derived physical activity variables. For average daily counts (i.e., total activity), there was a significant time effect [$F(1,117) = 4.79, p = .03, \eta^2 = 0.04$], with both groups increasing across the intervention period. Although the interaction effect was nonsignificant [$F(1,117) = 2.06, p = .15, \eta^2 = 0.02$], examination of the effect sizes revealed a trend that favored the intervention condition over the control condition. Similar results were observed for MVPA. The main effect was significant [$F(1,117) = 6.06, p = .02, \eta^2 = 0.05$]. Again, the interaction effect was nonsignificant [$F(1,117) = 2.03, p = .16, \eta^2 = 0.02$], but effect sizes revealed a larger increase in MVPA among intervention participants compared to control participants. On average, individuals who participated in the intervention exhibited an increase in MVPA of approximately seven minutes per day.

A secondary aim of the study was to examine the effects of the intervention on psychological outcomes likely to impact quality of life (i.e., stress, fatigue, depression, anxiety, and satisfaction with life) among working mothers (see Table 4). The overall MANOVA for time was significant [$F(5,107) = 5.15, p < .001, \eta^2 = 0.19$], with both groups exhibiting decreases in stress, fatigue, depression and anxiety, and increases in satisfaction with life. The interaction effect was nonsignificant [$F(5,107) = 1.14, p = .35, \eta^2 = 0.05$], but for all variables, outcomes favored the intervention group, as evidenced by the larger effect sizes compared to the control condition. Examination of the individual psychological variables revealed significant interaction effects for stress and anxiety, with the intervention participants demonstrating larger declines than the control participants.

Next, correlation analyses were conducted to determine whether changes in physical activity were associated with changes in the key psychological outcomes. The hypothesis that increases in physical activity would be associated with declines in stress, fatigue, anxiety and depression within the intervention condition was not supported. Overall, the magnitude of all correlations was small in both the control and intervention groups (see Table 5). Within the control condition, none of the correlations were statistically significant, but in general, increases in physical activity were associated with reductions in stress and depression and increases in fatigue, anxiety, and satisfaction with life. Within the intervention condition, the relationships, though not statistically significant, were all in the hypothesized direction, with increases in physical activity corresponding with decreases in stress, fatigue, anxiety, and depression, and increases in satisfaction with life.

A third aim of the study was to examine changes in social cognitive constructs (see Table 6). For self-efficacy, the effect for time was nonsignificant [$F(2,110) = 1.14, p = .32, \eta^2 = 0.02$]. The interaction of treatment condition and time approached significance [$F(2,110) = 2.54, p = .08, \eta^2 = 0.04$], with participants in the intervention condition reporting modest increases in exercise and barriers self-efficacy, and participants in the control condition reporting declines across the same time period. For outcome expectations, the overall MANOVA for time was marginally significant [$F(3,110) = 2.60, p = .056, \eta^2 = 0.07$], and the interaction effect was significant [$F(3,110) = 5.02, p = .003, \eta^2 = 0.12$]. Examination of the means within each group suggest this effect can largely be explained by significant decreases in outcome expectations in the control condition, in comparison to no change in the intervention condition. For self-regulation, both the main effect [$F(2,110) = 16.16, p < .001, \eta^2 = 0.23$] and the interaction effect [$F(2,110) = 20.19, p < .001, \eta^2 = 0.27$] were highly significant. These effects were driven by large increases in use of self-regulatory strategies (i.e., setting goals and planning/scheduling exercise) in the intervention group across the intervention period. Finally, examination of intervention effects on social support revealed a significant effect for time [$F(2,110) = 5.11, p = .008, \eta^2 = 0.09$], with both groups reporting increases in social support from family and friends. The group by time interaction was nonsignificant [$F(2,110) = 2.17, p = .12, \eta^2 = 0.04$] for the overall MANOVA; however, examining the two constructs separately did reveal a significant interaction that favored the intervention group for support from family, but not friends. Thus, the hypothesis that intervention participants would display significant increases in self-efficacy and self-regulation, and small increases in outcome expectations and social support, was partially supported.

Correlation analyses were then utilized to examine whether changes in social cognitive constructs were related to changes in physical activity within the intervention group. Results are displayed in Table 7. Changes in exercise self-efficacy, barriers self-efficacy, goals, and planning/scheduling all displayed positive, significant relationships with changes in physical activity. The magnitude of the correlations was similar for all physical activity measures. To examine the extent to which changes in physical activity within the intervention group could be explained by changes in social cognitive determinants, the four significantly correlated determinants were entered into a multiple linear regression equation, first with self-reported exercise (GLTEQ score) as the dependent variable, and then with total physical activity (measured by the accelerometer) as the dependent variable. For GLTEQ, the overall equation was significant [$F(4, 71) = 7.60, p < .001, r = 0.55, R^2 = 0.30$ (SEE = 0.88)], with changes in planning/scheduling and exercise self-efficacy emerging as significant independent predictors of changes in leisure-time exercise. For total activity, these results were replicated [$F(4, 71) = 7.26, p < .001, r = 0.54, R^2 = 0.29$ (SEE = 0.95)] (see Table 8). Increases in planning/scheduling were most strongly associated with increases in physical activity for both measures. Thus, although changes in self-efficacy were related to changes in physical activity, self-efficacy did not explain the greatest amount of variance, as hypothesized. Furthermore, the hypothesis that changes in outcome expectations and social support would be significantly related to changes in physical activity was not supported.

Long-term Results

Six-month follow-up data were collected to examine the extent to which short-term effects of the intervention were sustained over a longer period of time. The hypothesis that

individuals who received telephone support would report higher levels of physical activity at 6-month follow-up than individuals who did not receive continuing support was not supported. The series of 2 (group) by 3 (time) ANOVAs revealed no significant differences between the intervention only and intervention plus groups (see Table 9 for physical activity data). Thus, the two intervention groups were combined for comparison to the control group for all subsequent analyses of follow-up data.

For self-reported leisure-time exercise, there was a significant main effect for time [$F(2,102) = 9.64, p < .001, \eta^2 = 0.16$], and the interaction effect was also significant [$F(2,102) = 4.80, p = .01, \eta^2 = 0.09$]. Figure 2 shows that intervention participants reported a slight decrease in leisure-time exercise from post-intervention to follow-up, but their 6-month GLTEQ score was significantly higher than both their baseline score and the 6-month score of their control group counterparts. For total physical activity measured by the accelerometer, there was a significant quadratic time effect [$F(2,103) = 5.65, p = .005, \eta^2 = 0.10$]. The interaction effect also approached significance [$F(2,103) = 2.51, p = .09, \eta^2 = 0.05$]. For accelerometer-measured MVPA, results were quite similar, with a significant quadratic time effect [$F(2,103) = 6.77, p = .002, \eta^2 = 0.12$] and a nearly significant quadratic interaction effect [$F(2,103) = 3.00, p = .054, \eta^2 = 0.06$]. The quadratic effects were driven by the intervention group, in which accelerometer-derived physical activity scores regressed to baseline values at the 6-month follow-up. Thus, unlike the GLTEQ results, the accelerometer results did not support maintenance of initial changes in physical activity within the intervention condition.

In examining the long-term effects of the intervention on psychological well-being outcomes, the MANOVA overall time effect was significant [$F(10,92) = 3.30, p = .001, \eta^2 =$

0.26]. Both groups reported decreases in stress, fatigue, anxiety, and depression, and increases in satisfaction with life across the 6-month period. The interaction effect, however, was not significant [$F(10,92) = 0.63, p = .79, \eta^2 = 0.06$]. Furthermore, the interaction effects for each of the individual variables were also nonsignificant, suggesting the treatment and control groups displayed similar trajectories for all psychological outcomes (see Figure 3).

Next, correlations between residual change in physical activity and psychological well-being outcomes from baseline to follow-up were examined. Once again, none of the correlations were statistically significant within the control group. Within the intervention group, however, increases in physical activity were associated with decreases in stress, fatigue, anxiety, and depression, as well as increases in satisfaction with life (see Table 10). The strongest associations were observed for the GLTEQ, but significant relationships also emerged using accelerometer-derived measures of physical activity for stress, fatigue, and anxiety.

To examine long-term changes in social cognitive variables, a series of MANOVAs was conducted in the same manner as the short-term analyses. For self-efficacy, there was a significant effect for time [$F(4,97) = 2.73, p = .03, \eta^2 = 0.10$] and a nonsignificant interaction effect [$F(4,97) = 1.11, p = .36, \eta^2 = 0.04$]. Examination of the mean values showed both exercise and barriers self-efficacy declined across the 6-month period within the control group, and within the intervention group, a small increase in self-efficacy from baseline to post-intervention was followed by a slightly larger decrease from post-intervention to follow-up (see Figure 4). For outcome expectations, both the main effect [$F(6,98) = 0.95, p = .46, \eta^2 = 0.06$] and interaction effect [$F(6,98) = 1.85, p = .10, \eta^2 = 0.10$] were nonsignificant. In general, outcome expectations did not change within the intervention group. Within the control group, outcome expectations

increased somewhat from post-intervention to follow-up after declining significantly from baseline to post-intervention (see Figure 5). For self-regulation, both the main effect [$F(4,98) = 7.91, p < .001, \eta^2 = 0.24$] and interaction effect [$F(4,98) = 10.08, p < .001, \eta^2 = 0.29$] were significant. Although self-reported use of goal setting and planning/scheduling decreased slightly within the intervention condition during the follow-up period, these participants still reported significantly greater use of these self-regulatory strategies at follow-up compared to baseline, whereas goal setting and planning/scheduling remained unchanged within the control condition across the 6-month period (see Figure 6). Finally, for social support, there was a significant quadratic effect for time [$F(4,94) = 2.78, p = .03, \eta^2 = 0.11$], and the interaction effect was marginally significant [$F(4,94) = 2.44, p = .052, \eta^2 = 0.09$]. In the control group, social support decreased during the follow-up period after not changing across the intervention period. In the intervention group, social support decreased slightly during the follow-up period after increasing across the intervention period, but remained significantly higher than baseline (see Figure 7).

Correlation analyses revealed the relationships between changes in physical activity and changes in social cognitive constructs from baseline to follow-up were very similar to the short-term relationships (see Table 11). Once again, increases in self-efficacy and self-regulation were significantly associated with increases in physical activity. Additionally, increased social support from family was significantly related to increased self-reported, but not accelerometer-measured, physical activity. For GLTEQ, a multiple linear regression analysis was significant [$F(5, 64) = 12.79, p < .001, r = 0.71, R^2 = 0.50$ (SEE = 0.76)], with changes in exercise self-efficacy and planning/scheduling once again emerging as significant independent predictors of changes in leisure-time exercise across the 6-month duration. In this case self-efficacy explained the greatest amount of variance in change in physical activity. For total activity measured by the

accelerometer, although the overall equation was significant [$F(4, 64) = 3.84, p = .007, r = 0.44, R^2 = 0.19$ (SEE = 1.06)], the social cognitive variables explained a much smaller proportion of the total variance in physical activity, and none of the individual variables was a significant predictor of physical activity change (see Table 12).

Process Evaluation Results

A total of 78 intervention participants (97.5%) completed the process evaluation at the end of the second workshop session. Overall, participants rated the intervention positively. Mean scores were 4.36, 4.23, and 4.62 (range: 1-5) for questions assessing the amount of useful knowledge gained, the degree of confidence that regular exercise would continue following the workshop sessions, and the extent to which the instructor was engaging, respectively. Participants were also asked to rate how useful various aspects of the intervention were for increasing their physical activity levels. Generally, they believed all aspects were useful, with mean scores ranging from 2.78-3.68 (range: 1-4). Specifically, they ranked the components from most useful to least useful as follows: 1) session with personal trainer, 2) social interaction with other participants, 3) pedometer, 4) setting smart goals, 5) scheduling sessions on calendar, 6) CHAMP handbook, 7) pedometer step tracker, 8) video vignettes.

Participants also had the opportunity to provide written comments on the process evaluations, and these comments generally supported the quantitative ratings. Many women cited the opportunity to interact with other moms who were facing similar barriers and challenges as one of the most beneficial aspects of the program. Others' comments focused on the benefits of the self-regulatory aspects of the intervention, stating that the program forced them to set manageable goals, schedule exercise into their lives, and develop strategies for overcoming their

barriers. Still others reported the intervention forced them to be more mindful of their activity patterns and provided the motivational boost they needed to make a change. A majority of participants spoke very enthusiastically about the session with the personal trainer, and many suggested additional personal training sessions as an improvement for future studies. Other suggestions for improvements reflected participants' desire to have more contact with the instructor and/or each other (e.g., more workshop sessions, online support group for participants to interact with each other following the workshops).

CHAPTER V: DISCUSSION

Overview of Findings

This study proposed to examine the short- and long-term effects of a brief exercise adherence intervention on physical activity and quality of life among working mothers. Overall, the short-term results were encouraging and suggested that the brief intervention elicited changes not only in physical activity behavior, but also in key social cognitive determinants of physical activity. The long-term (six-month) results were more ambiguous, with intervention participants demonstrating maintenance of initial changes for self-reported leisure-time exercise, but not for accelerometer-measured physical activity. At both time points, there was evidence that changes in physical activity could be partially attributed to social cognitive factors (i.e., increases in self-efficacy and self-regulation). Furthermore, six-month increases in physical activity were associated with improvements in psychological outcomes thought to influence quality of life within this population, including stress, fatigue, anxiety, and depression. A detailed discussion of all findings, including study strengths, limitations, and future directions, is provided below.

Short-term Results

The results of this study add to a growing body of literature that suggests theory-based interventions can be used to improve physical activity behaviors among women with children (Cody & Lee, 1999; Cramp & Brawley, 2006; Fahrenwald et al., 2004; Fjeldsoe et al., 2010). In the present study, a brief, SCT-based intervention was found to produce short-term changes in

physical activity among working mothers. The strongest effects were observed for self-reported exercise, and accelerometer-measured physical activity also increased to a lesser degree.

Participants believed meeting with the personal trainer, wearing a pedometer, setting SMART goals, and having the opportunity to interact with other working moms were most instrumental in prompting changes in their activity levels. Although the physical activity measures utilized did not allow for changes in different modes of activity to be distinguished, one might speculate that participants increased both aerobic and non-aerobic activity. Most women were very enthusiastic about their personal training session, which focused on resistance training, so it is possible that the larger increase in self-reported exercise reflects an increase in resistance exercise, which would not likely have a significant impact on accelerometer counts, but certainly could have meaningful physical and mental health implications.

The examination of intervention effects on indicators of psychological well-being yielded some intriguing findings. Individuals who participated in the intervention did report reductions in stress, fatigue, anxiety, and depression across the intervention period, and these declines were significantly greater than changes reported by participants in the control condition for stress and anxiety. Interestingly, however, correlation analyses indicated these changes were not significantly related to changes in physical activity. Thus, it seems that the intervention elicited reductions in stress and anxiety by some mechanism other than increasing physical activity. One explanation might be that simply interacting with other working mothers provided a sense of camaraderie and helped women see that they were not alone in their struggles. Certainly such feelings of solidarity could relieve some stress and anxiety. Another possibility is that after attending the workshops, participants embraced the notion that engaging in activities to promote one's own well-being is healthy, as opposed to selfish. Adopting this perspective could alleviate

some of the ever present “mom guilt” and the associated stress and anxiety. Finally, one might expect that participants utilized the self-regulatory skills they learned during the intervention to manage other aspects of their lives that may have been inducing stress and anxiety. Indeed, increases in goal setting and planning/scheduling were significantly associated with reductions in stress, fatigue, anxiety, and depression (analyses not presented).

Although the correlational analyses did not yield significant findings for either the control or intervention groups, all relationships, though weak, were in the hypothesized direction for intervention participants. That is, increases in physical activity were associated with reductions in stress, anxiety, fatigue, and depression, as well as increases in satisfaction with life. Within the control condition, however, increases in physical activity were associated with declines in stress and depression, but slight increases in fatigue and anxiety. Although these findings should be interpreted with great caution due to the very small magnitude of the correlations, they do support the perspective that the intervention allowed participants to view exercise as a means of taking action to relieve anxiety, whereas control participants may have viewed exercise as another necessary evil on their long to-do lists, further amplifying feelings of anxiety and fatigue in this group.

The short-term effects of the intervention on social cognitive variables all favored the intervention group, although the magnitude of the effects varied by construct. The strongest effects were observed for the two measures of self-regulation: goal setting and planning/scheduling. This is not surprising, as these were skills that were explicitly incorporated into the intervention content. Participants set both short- and long-term exercise goals for themselves, and they added exercise sessions to their personal calendars to position themselves

to be successful in meeting their goals. The pedometer also allowed for them to set measurable goals and monitor their progress objectively. Although some individuals admitted they were having trouble treating the exercise “appointments” as obligations of equal importance to their other responsibilities, others said scheduling exercise forced them to plan ahead and set aside time to be active.

The significant interaction effects for self-efficacy were driven by modest increases in self-efficacy in the intervention group and decreases in the control group. Such decreases have been observed in other studies and have been demonstrated to be a function of participants overestimating their capabilities at baseline (McAuley et al., 2011). In fact, such miscalculations may be so strong that they are not overcome by an intervention, even when the intervention successfully changes physical activity behavior (Mailey et al., 2010). Thus, it is promising to note that self-efficacy increased even modestly following the present intervention. In particular, participants apparently felt better equipped to overcome physical activity barriers after developing strategies to do so during the workshop sessions. It is also important to note that the mean self-efficacy scores are remarkably low; even after the intervention participants’ confidence in their abilities to adhere to a regular exercise program was below 50%, and in the control group exercise self-efficacy at follow-up dropped to 25%. When considered in the context of other studies that have shown efficacy scores in the range of 70-90% even in inactive samples thought to face a variety of barriers (e.g., sedentary older adults, individuals with multiple sclerosis or coronary heart disease), this statistic highlights the extent to which numerous barriers make regular exercise a significant challenge for working mothers, and underscores the need for interventions within this population (McAuley et al., 2011; Motl, McAuley, Snook, & Gliottoni, 2009; Woodgate, Brawley, & Weston, 2005).

The intervention also sparked improvements in social support from both family and friends, although only the interaction effect for family support was statistically significant. During the second workshop session, participants were encouraged to consider how others in their lives could provide support which would help them meet their physical activity goals. They were provided a “social support contract” which could be used to generate conversations with their friends or family members about specific actions they could take to support the other’s active lifestyle (e.g., a co-worker serving as a walking buddy during the lunch hour, a spouse getting the children ready for school in the morning so his wife can exercise). The data suggest that these discussions did prompt participants to seek out social support following the intervention. In particular, they appeared to focus on support from family, which is consistent with previous studies that have identified family and/or partner support as a key facilitator of physical activity among working mothers (Albright et al., 2005; Brown et al., 2001; Miller et al., 2002).

Finally, the significant interaction effects for outcome expectations can be explained not by increases within the intervention condition, but by decreases within the control condition for all three types of outcome expectations. It appears that participants were optimistic about the benefits of physical activity at baseline, which one would expect among individuals who are excited about the prospect of becoming more active and have signed up for a physical activity study. Within the intervention condition, these expectations were upheld by discussions of physical activity benefits, and perhaps by first-hand experience of such benefits through physical activity engagement. Control participants, on the other hand, were not engaging in more activity, and thus did not retain the same degree of optimism post-intervention. Although outcome expectations often do not change drastically across time, such declines in outcome expectations

are uncommon and may be related to the unusually low levels of self-efficacy reported within this specific population.

The results of the multiple regression analysis further illuminate the social cognitive mechanisms that may have been driving changes in physical activity within the intervention condition. Together, changes in self-efficacy and self-regulation accounted for approximately 30% of the variance in change in physical activity, and the results were comparable for self-reported exercise and total activity measured by the accelerometer. In particular, increases in planning/scheduling and exercise self-efficacy contributed to increases in physical activity. These results are consistent with results of previous studies that have shown self-regulation and self-efficacy play the largest role in explaining changes in physical activity (Anderson et al., 2006; Rovniak et al., 2002). Furthermore, the findings support Bandura's assertions that outcome expectations are unlikely to contribute significantly to the prediction of behavior after controlling for self-efficacy.

Long-term Results

The long-term effects of the intervention were not as straightforward as the short-term effects. When examining changes in self-reported leisure-time exercise, results showed intervention participants, despite reporting slight declines in exercise from post-intervention to follow-up, were still exercising significantly more than at baseline after six months. Unfortunately, the same maintenance effects were not observed for the objective (i.e., accelerometer-based) physical activity outcomes. After six months, intervention participants had regressed back to baseline activity levels for both total activity and MVPA.

There are several potential reasons for the differential effects based on the physical activity measure used. First, one obvious possibility is that intervention participants were over-reporting their exercise at follow-up in order to provide socially desirable responses. They were aware that the intervention was designed to increase their physical activity levels, so they may have (consciously or subconsciously) provided responses that would support the study objectives. Because the intervention content encouraged participants to broaden their definitions of “exercise” to include a wide range of traditional and non-traditional forms of physical activity, another possible explanation is that intervention participants reported activities that control participants would not have considered exercise, and thus did not report. It is important to consider that the GLTEQ focuses only on leisure-time exercise, whereas the accelerometer encompasses *all* physical activity accumulated across the course of one’s day. Thus, it is possible that participants genuinely increased the amount of planned, structured exercise in which they engaged without significantly changing their overall physical activity levels. As previously mentioned, this explanation would be very logical if the increased exercise was primarily non-aerobic in nature. One also must be cautious in assuming objective measures are always superior to subjective measures of physical activity. Although accelerometers do eliminate some of the biases associated with self-reported data, their accuracy is limited by the extent to which participants adhere to instructions for wear. Accelerometers also may be more sensitive to temporary physical activity impediments (e.g., illness or travel during the assigned week), whereas the GLTEQ instructs individuals to report their activity levels during a “typical week.”

Nonetheless, regardless of measure, intervention participants did exhibit at least some decline in physical activity during the follow-up period. These results are consistent with previous studies that have shown similar declines (e.g., Calfas, et al., 2000; Cody & Lee, 1999),

and underscore the difficulty of promoting long-term changes in a complex behavior such as physical activity. Although the brief intervention approach is appealing for intervention work with this population, the long-term results suggest such minimal contact may not be sufficient to produce long-term changes in physical activity. The challenge for future interventionists will be to devise strategies for bolstering sustained intervention effectiveness without unduly burdening participants.

Unfortunately, the hypothesis that follow-up telephone support would attenuate declines in physical activity during the follow-up period was not supported. The patterns exhibited by the intervention plus group were not significantly different from those exhibited by the intervention only group for all physical activity variables. There are several possible explanations for these findings. First, it is possible that the “dose” of the support provided was not sufficient to have a significant impact on participants’ behavior. Phone calls were only received monthly and were, on average, about five minutes in duration. Perhaps participants would have benefitted from more intensive contact, given that the brief nature of the intervention did not afford them much time to establish a new habitual pattern of behavior. Another possible explanation is that participants would have preferred another type of follow-up support. Their comments on the process evaluations indicated that many individuals believed the opportunity to interact with other working moms was a strength of the study, and that they would have liked to have more contact with the other participants following the brief intervention. Alternatively, because spending time with family is an important priority for most working mothers, enlisting support from their partners and/or children may also have been beneficial. Thus, one might speculate that some type of follow-up support from their peers or family members, as opposed to a member of the research team, would have been more effective for promoting maintenance. Furthermore,

working mothers may prefer web-based support offered via email or social networking sites, which would allow them to access support when it's convenient for them. Phone calls may be perceived as a nuisance when they interrupt individuals during work or family time.

For the psychological well-being outcomes, the six-month pattern of change did not differ significantly between the intervention and control groups for any of the variables. In general, all participants reported comparable declines in stress, fatigue, anxiety, and depression. Interestingly, correlation analyses showed these declines were related to increases in physical activity within the intervention condition, but not the control condition. It is noteworthy that such relationships emerged in the long-term, but not short-term analyses. In the short-term, we speculated that declines in stress and anxiety may have been attributable to immediate effects of the intervention, such as group interaction, as opposed to changes in physical activity per se. After six months, however, such intervention effects would no longer be influential, thus allowing for the genuine relationships between changes in physical activity and changes in psychological well-being outcomes to be elucidated. Furthermore, it is likely that greater variability in change scores at follow-up enhanced these analyses. Perhaps after six months those participants who had maintained a higher level of physical activity had successfully incorporated exercise into their lives as a means to regulate negative emotional states. Since high levels of stress and fatigue are likely to compromise quality of life among working mothers, the evidence that increasing physical activity may improve these outcomes is an important contribution of this study, and one that should generate excitement in physical activity researchers and working mothers alike.

Follow-up analyses of the social cognitive determinants were favorable for several outcomes, with results indicating some maintenance of improvements in self-regulation and social support. Although self-reported use of self-regulatory strategies decreased slightly across the follow-up period, participants in the intervention group still reported significantly greater use of such strategies compared to baseline. This suggests these important skills were not abandoned following the brief intervention. Participants were still attempting to set physical activity goals and make exercise a priority in their schedules. And, regression analyses do indicate that increases in planning/scheduling from baseline to follow-up significantly contributed to increased self-reported physical activity among intervention participants. For working mothers, maintaining a regular exercise regimen is likely to necessitate advance planning to make exercise a priority in one's schedule. Future interventions should continue to equip participants with a variety of strategies for successfully regulating their behavior. As an added benefit, mastering self-regulatory skills could carry over to other aspects of mothers' lives, creating a sense of control that would reduce stress and anxiety and ultimately improve quality of life. Participants also reported social support from family and friends was greater than baseline at the 6-month follow-up. Apparently, they continued to work to build and maintain support networks after the intervention ended. Analyses did indicate increases in family support across the six-month study duration were related to increases in self-reported leisure-time exercise. These relationships did not hold, however, for accelerometer-measured physical activity or for changes in friend support.

Increases in self-efficacy, on the other hand, were not maintained during the follow-up period. Self-efficacy estimations, though typically robust as a determinant of behavior, are fairly unstable beliefs that can change rapidly, particularly in groups with many barriers to overcome. Although mean-level changes were not sustained, correlation analyses still supported a

moderately strong relationship between changes in self-efficacy and changes in physical activity within the intervention condition. In fact, long-term changes in exercise self-efficacy emerged as the strongest predictor of long-term changes in self-reported physical activity. The ongoing challenge for physical activity researchers, then, will be to design interventions that target self-efficacy in such a way that improvements in confidence to adhere to an exercise regimen are generated and maintained in a majority of participants. Of course, mastery experiences are the most potent source of self-efficacy, so any strategy that improves exercise adherence should also have a positive influence on self-efficacy. Interventions with working mothers should continue to focus on teaching self-regulatory strategies and promoting social support as means for reducing perceptions of barriers and ultimately enhancing self-efficacy and physical activity maintenance.

Strengths and Limitations

This study has a number of strengths. First, this was the first randomized controlled trial to focus specifically on working mothers, a segment of the population with an ongoing need for physical activity intervention. Results showed that despite the large number of physical activity barriers working mothers face, it is possible to improve physical activity through a well-designed, theory-based intervention. The study design allowed for the examination of both short- and long-term effects of the brief intervention, as well as the extent to which follow-up telephone support could enhance physical activity maintenance. Although support for the long-term effects of the intervention was equivocal, the inclusion of these follow-up data is valuable and gives rise to many possible ideas for future research. Considering the sample population, participant retention was quite satisfactory, with nearly 85% of participants completing the post-intervention assessments, and 77% participating in the six-month follow-up. Attendance to workshop sessions

was 100% among those who participated in post-intervention data collection. The intervention content was tailored to working mothers and was designed using a social cognitive framework, which has emerged as one of the most effective behavioral intervention approaches. Indeed, regression analyses showed that a moderate amount of the variance in physical activity change could be explained by changes in social cognitive determinants. The use of both subjective and objective measures of physical activity was another strength of the study, since there are distinct advantages and disadvantages to each method of assessment.

The limitations of the present study must also be acknowledged. The study sample was quite homogenous, particularly with regard to socioeconomic status. Nearly 90% of participants were college graduates, and half of participants possessed an advanced degree. Additionally, annual household income exceeded \$40,000 in approximately 85% of the sample. Unfortunately, >\$40,000 was the highest category on the item assessing income, so it was impossible to obtain more descriptive demographic data, but certainly further testing will be necessary to determine the extent to which the intervention content could be implemented effectively in less advantaged groups. On the other hand, the sample was quite diverse in that participants' children ranged in age from infants to teenagers. It would have been ideal to match participants with similar mothers to facilitate social interaction and modeling during the workshop sessions, but because of participants' busy schedules and the staggered nature of participant enrollment, time of availability was the limiting factor in scheduling. Unfortunately, this limitation would be difficult to overcome in any interventions with working mothers, unless the initial sample is limited by stricter inclusionary criteria. Although we opted to include a broad range of children's ages for the present study, it would be prudent to conduct additional analyses to determine whether the intervention effectiveness and/or social cognitive determinants varied in subsets of the total

sample. The sample size in the present study was sufficient to conduct the proposed analyses, but a larger sample would allow for further analyses within subsamples, as well as the possibility of using structural equation modeling to test the full social cognitive model as it was designed by Bandura.

Future Directions

Because the exercise literature targeting working mothers is in its infancy, this study raises many possible avenues for future study. First and foremost, it is clear that future studies will need to consider alternative means of providing support following the brief intervention. The brief nature of the intervention, though appealing for promoting recruitment, retention, and replication, was not sufficient to promote lasting changes in behavior when physical activity was measured objectively. Some participants expressed interest in having additional meetings with the group, so perhaps the addition of several follow-up workshop sessions in the months following the initial intervention could improve maintenance without placing a substantial burden on participants. Continued interaction and support could also be delivered virtually via websites that allow participants to communicate with each other. Such forums could be used to seek out suggestions for overcoming barriers, establish exercise groups that meet regularly, inform others about events in the community, or simply provide encouragement to moms who are facing similar struggles. Future studies might also consider enlisting support from participants' immediate families to encourage maintenance. There is good evidence that partner support is an important facilitator of physical activity among mothers, and because most mothers view promoting the well-being of their children as a top priority, involving the children in a plan to pursue a healthy, active lifestyle could indeed be highly effectual. In fact, future researchers

should consider developing family-based interventions that encourage parents and children to be active together and support each other's physical activity goals. Although a six-month follow-up does provide valuable insight regarding behavior maintenance, following participants for a year or more should be considered for future studies designed to test the effectiveness of various support mechanisms to develop an even better understanding of long-term activity patterns.

Future studies might also consider ways in which the intervention could be modified for subsets of the working mother population. For example, parents of very young children likely face different barriers than parents of school age children. Single mothers and low-income mothers would be other groups with unique sets of challenges. The existing intervention could be modified to further tailor the content to address the specific needs of such groups. Some participants also expressed an interest in engaging in more exercise as part of their participation. This could take the form of an additional session with the personal trainer to follow up on one's progress, or several group exercise sessions that introduce participants to a variety of activities they might enjoy. These exercise sessions could be especially helpful for participants who do not have much exercise experience and may have difficulty devising an exercise routine on their own. Finally, future studies should continue to strive to collect accurate, descriptive physical activity data. Gathering qualitative data that asks participants to detail *how* their physical activity behavior has changed will provide valuable input that could inform the design of subsequent interventions. Additionally, since reducing sedentary behavior is now recognized as an important health objective in addition to increasing physical activity, and the content of the present intervention emphasized not only making time for planned exercise sessions, but also simply moving more throughout the day, administering a measure of sedentary behavior is warranted.

Conclusions

Overall, the results of this study provide some support for the effectiveness of a brief exercise adherence intervention to promote physical activity and quality of life among working mothers. Individuals who participated in the intervention exhibited short-term increases in self-reported physical activity, which were partially maintained six months later. Across the six-month duration of the study, increases in physical activity were associated with reductions in stress, fatigue, anxiety, and depression, and increases in global quality of life among participants who received the intervention. Thus, it appears that promoting physical activity may be a viable means of enhancing quality of life within this population. The results of the study also suggest the social cognitive framework underlying the intervention content had the desired effects, with changes in self-efficacy and self-regulation emerging as the most potent predictors of changes in physical activity.

Developing interventions to promote physical activity among working mothers is an important public health priority, and this study provides a foundation which future studies can build upon to work towards the ultimate goal of developing an effective, sustainable program which can be disseminated to have broad impact on health and quality of life among working mothers.

CHAPTER VI: REFERENCES

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CHAPTER VII: TABLES

Table 1. Participant demographics at baseline

Variable	Mean (SD)/Frequency (%)	Range
Age	37.3 (6.66)	25-52
Number of children	1.92 (0.99)	1-7
Age of youngest child	4.75 (3.85)	2 mos.-15 yrs.
Employment status		
Full-time	125 (88.7%)	
Part-time	16 (11.3%)	
Hours worked per week	39.9 (6.78)	20-70
Marital Status		
Married	119 (84.4%)	
Divorced/separated	12 (8.5%)	
Partnered/significant other	5 (3.5%)	
Single	5 (3.5%)	
Race		
White	113 (80.1%)	
African American	13 (9.2%)	
Asian	10 (7.1%)	
Other	2 (1.4%)	
Education		
<College Graduate	18 (12.8%)	
College Graduate	52 (36.9%)	
Advance Degree	71 (50.4%)	
Annual Household Income		
<\$40,000	19 (13.5%)	
>\$40,000	119 (84.4%)	

Table 2. Follow-up phone call data

Month	% reached	% email contact	Average call duration (min)
2	77.5%	12.5%	4.93
3	70.0%	20.0%	4.90
4	77.5%	7.5%	4.48
5	77.5%	17.5%	4.97
6	70.0%	20.0%	5.23

Table 3. Short-term intervention effects on physical activity

		Baseline	Post-intervention	<i>Cohen's d</i>	<i>p (interaction)</i>
		<i>M (SD)</i>	<i>M (SD)</i>		
GLTEQ	Intervention	19.16 (16.0)	32.93 (18.5)	.80	.005
	Control	16.15 (19.9)	19.74 (13.4)	.21	
MVPA	Intervention	22.14 (13.1)	29.08 (19.7)	.41	.16
	Control	21.08 (13.1)	22.81 (15.7)	.12	
Total Counts	Intervention	226569 (74532)	257219 (101390)	.34	.15
	Control	221234 (64476)	227603 (80474)	.09	

Note. GLTEQ=Godin Leisure Time Exercise Questionnaire; MVPA=Moderate/Vigorous Physical Activity

Table 4. Short-term intervention effects on psychological well-being outcomes

		Baseline	Post-intervention	<i>Cohen's d</i>	<i>p (interaction)</i>
		<i>M (SD)</i>	<i>M (SD)</i>		
Stress	Intervention	18.2 (6.83)	14.7 (7.09)	-.50	.05
	Control	17.9 (6.35)	16.6 (7.71)	-.18	
Fatigue	Intervention	4.82 (1.67)	4.21 (1.47)	-.39	.17
	Control	4.88 (1.66)	4.64 (1.40)	-.16	
Anxiety	Intervention	7.26 (4.02)	5.68 (3.05)	-.44	.05
	Control	6.46 (2.69)	6.22 (3.71)	-.07	
Depression	Intervention	6.53 (3.93)	5.01 (3.71)	-.40	.16
	Control	7.16 (3.84)	6.49 (3.65)	-.18	
SWLS	Intervention	23.9 (8.05)	25.3 (8.34)	.17	.24
	Control	23.7 (6.97)	24.0 (7.21)	.04	

Note: SWLS=Satisfaction With Life Scale

Table 5. Within-group correlations among residual change (baseline to post-intervention) in physical activity and psychological well-being variables

	Perceived Stress	Fatigue Severity	Anxiety	Depression	Satisfaction with Life
<i>Control group</i>					
GLTEQ	-.03	.11	.19	-.19	.13
MVPA	-.15	.07	.27	-.22	.01
Daily counts	-.17	.06	.22	-.29	.05
<i>Intervention group</i>					
GLTEQ	-.10	-.10	-.12	-.14	.07
MVPA	-.10	.05	-.17	-.04	.16
Daily counts	-.10	-.03	-.19	-.02	.17

Note. GLTEQ=Godin Leisure Time Exercise Questionnaire; MVPA=Moderate/Vigorous Physical Activity

Table 6. Short-term intervention effects on social cognitive variables

		Baseline <i>M (SD)</i>	Post-intervention <i>M (SD)</i>	<i>Cohen's d</i>	<i>p (interaction)</i>
BARSE	Intervention	45.6 (17.9)	49.8 (20.3)	.22	.04
	Control	38.6 (19.4)	33.7 (21.9)	-.24	
EXSE	Intervention	45.3 (30.3)	47.1 (29.9)	.06	.06
	Control	39.8 (31.3)	30.2 (27.8)	-.32	
Physical OE	Intervention	28.0 (2.40)	27.9 (2.20)	-.04	.04
	Control	28.0 (1.94)	26.7 (4.22)	-.40	
Self-evaluative OE	Intervention	22.2 (2.48)	22.5 (2.24)	.13	.001
	Control	22.2 (2.43)	20.6 (3.93)	-.49	
Social OE	Intervention	12.0 (2.88)	12.2 (2.76)	.07	.003
	Control	12.5 (2.89)	11.1 (3.13)	-.46	
Goals	Intervention	20.0 (7.65)	27.8 (7.90)	1.00	<.001
	Control	20.2 (9.72)	18.3 (8.62)	-.21	
Planning	Intervention	16.7 (5.64)	24.0 (8.31)	1.03	<.001
	Control	15.9 (6.16)	16.4 (6.24)	.08	
Family support	Intervention	22.7 (8.08)	26.7 (9.07)	.47	.04
	Control	21.9 (6.74)	22.7 (8.49)	.10	
Friends support	Intervention	17.7 (7.32)	20.5 (9.33)	.33	.26
	Control	18.4 (7.47)	19.1 (10.2)	.08	

Note. BARSE=Barriers Self-Efficacy; EXSE=Exercise Self-Efficacy; OE=Outcome Expectations

Table 7. Correlations among residual change (baseline to post-intervention) in physical activity and social cognitive determinants (intervention participants only)

	GLTEQ	Daily Counts	MVPA
EXSE	.41**	.39**	.42**
BARSE	.32**	.34**	.40**
Physical OE	.05	.11	.11
Self-evaluative OE	.11	.12	.13
Social OE	.07	-.02	-.02
Goals	.38**	.38**	.40**
Planning	.48**	.48**	.49**
Family support	.05	-.08	.00
Friend support	.15	.00	.07

Note. GLTEQ=Godin Leisure Time Exercise Questionnaire; MVPA=Moderate/Vigorous Physical Activity; BARSE=Barriers Self-Efficacy; EXSE=Exercise Self-Efficacy; OE=Outcome Expectations

** $p < .01$

Table 8. Multiple linear regression results: Social cognitive determinants of short-term changes in GLTEQ and total activity

SCT variable	Standardized Beta	<i>t</i>	<i>p</i>
<i>GLTEQ</i>			
EXSE	.305	2.26	.03
BARSE	-.107	-0.74	.46
Goals	.125	0.97	.34
Planning/scheduling	.339	2.45	.02
<i>Total activity</i>			
EXSE	.271	1.99	.05
BARSE	-.051	-0.35	.73
Goals	.114	0.87	.38
Planning/scheduling	.327	2.35	.02

Note. SCT=Social Cognitive Theory; GLTEQ=Godin Leisure Time Exercise Questionnaire; EXSE=Exercise Self-Efficacy; BARSE=Barriers Self-Efficacy

Table 9. Six-month changes in physical activity, by intervention group

		Baseline	Post-intervention	Follow-up	<i>p</i> (interaction)
		<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
GLTEQ	Int Only	22.06 (16.4)	35.89 (19.3)	31.23 (22.4)	.70
	Int Plus	16.94 (15.7)	30.64 (18.7)	29.30 (20.8)	
MVPA	Int Only	22.59 (11.7)	33.33 (25.7)	22.44 (16.0)	.26
	Int Plus	22.32 (14.8)	26.04 (12.8)	20.18 (9.9)	
Total Counts	Int Only	238180 (80122)	287021 (131122)	234588 (99051)	.18
	Int Plus	219832 (72041)	235553 (67798)	211385 (60419)	

Note. GLTEQ=Godin Leisure Time Exercise Questionnaire; MVPA=Moderate/Vigorous Physical Activity; Int=Intervention

Table 10. Within-group correlations among residual change (baseline to follow-up) in physical activity and psychological well-being variables

	Perceived Stress	Fatigue Severity	Anxiety	Depression	Satisfaction with Life
<i>Control group</i>					
GLTEQ	-.03	.06	-.05	-.12	.00
Daily counts	.04	.13	.24	.26	.06
MVPA	-.09	.12	.19	.22	.13
<i>Intervention group</i>					
GLTEQ	-.36**	-.28*	-.30**	-.25*	.32**
Daily counts	-.28*	-.25*	-.21	-.13	.20
MVPA	-.31**	-.25*	-.24*	-.14	.23

Note. GLTEQ=Godin Leisure Time Exercise Questionnaire; MVPA=Moderate/Vigorous Physical Activity

* $p < .05$ ** $p < .01$

Table 11. Correlations among residual change (baseline to follow-up) in physical activity and social cognitive determinants (intervention participants only)

	GLTEQ	Daily Counts	MVPA
EXSE	.62**	.32**	.33**
BARSE	.55**	.30*	.33**
Physical OE	.19	.10	.03
Self-evaluative OE	.16	.13	.06
Social OE	-.06	-.21	-.22
Goals	.45**	.39**	.36**
Planning	.55**	.40**	.39**
Family support	.32**	-.01	.01
Friend support	.07	.00	-.06

Note. GLTEQ=Godin Leisure Time Exercise Questionnaire; MVPA=Moderate/Vigorous Physical Activity; EXSE=Exercise Self-Efficacy; BARSE=Barriers Self-Efficacy; OE=Outcome Expectations

* $p < .05$ ** $p < .01$

Table 12. Multiple linear regression results: Social cognitive determinants of long-term changes in GLTEQ and total activity

SCT variable	Standardized Beta	<i>t</i>	<i>p</i>
<i>GLTEQ</i>			
EXSE	.532	3.57	.001
BARSE	.057	0.40	.69
Goals	-.124	-0.85	.40
Planning/scheduling	.291	1.96	.05
Family support	-.033	-0.31	.76
<i>Total activity</i>			
EXSE	.123	0.67	.51
BARSE	-.032	-0.18	.86
Goals	.116	0.64	.52
Planning/scheduling	.274	1.47	.15

Note. SCT=Social Cognitive Theory; GLTEQ=Godin Leisure Time Exercise Questionnaire; EXSE=Exercise Self-Efficacy; BARSE=Barriers Self-Efficacy

CHAPTER VIII: FIGURES

Figure 1. Participant flow through the study

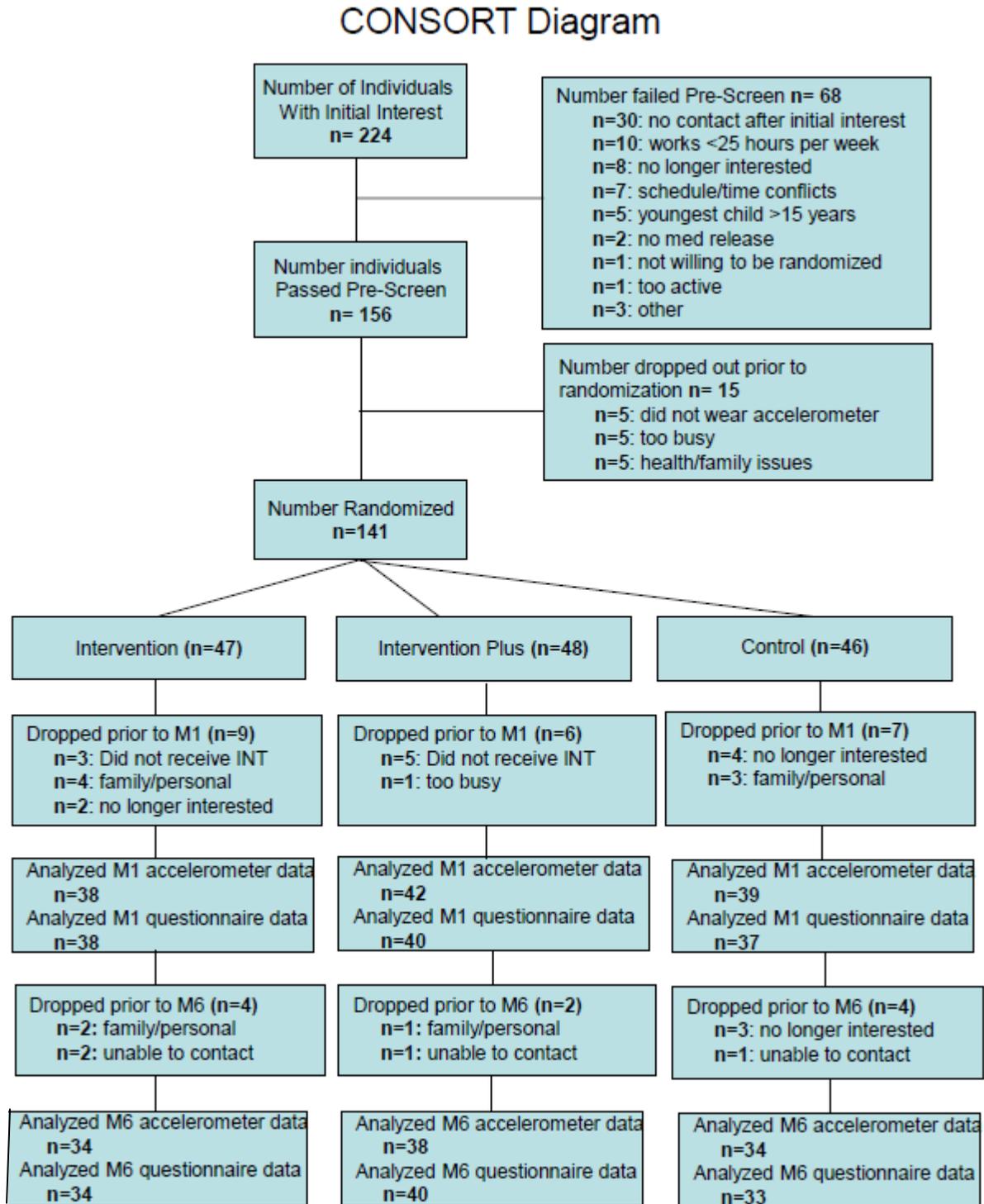


Figure 2. Long-term physical activity results by group

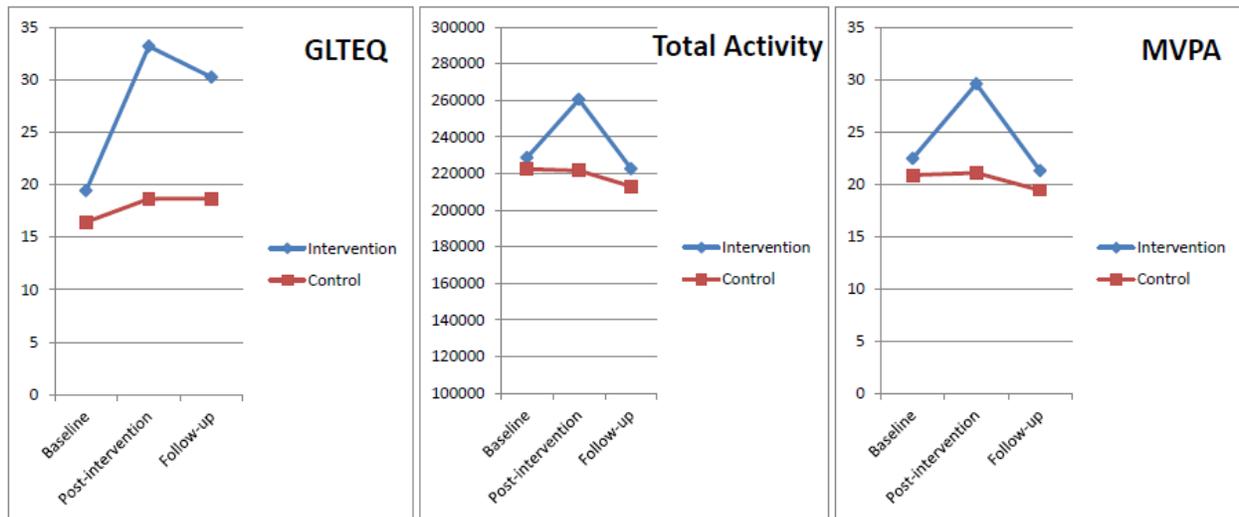


Figure 3. Long-term psychological well-being outcomes by group

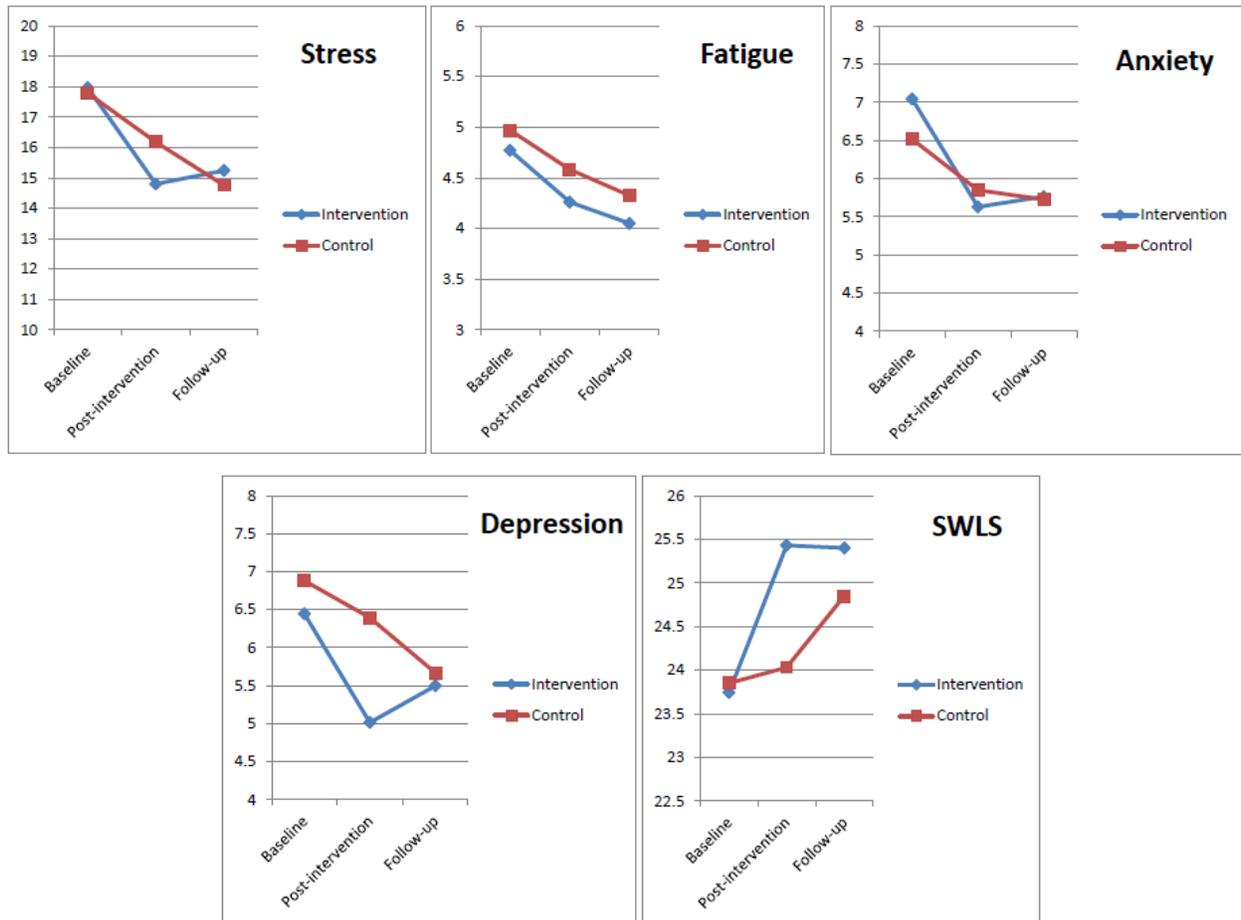


Figure 4. Long-term self-efficacy results by group

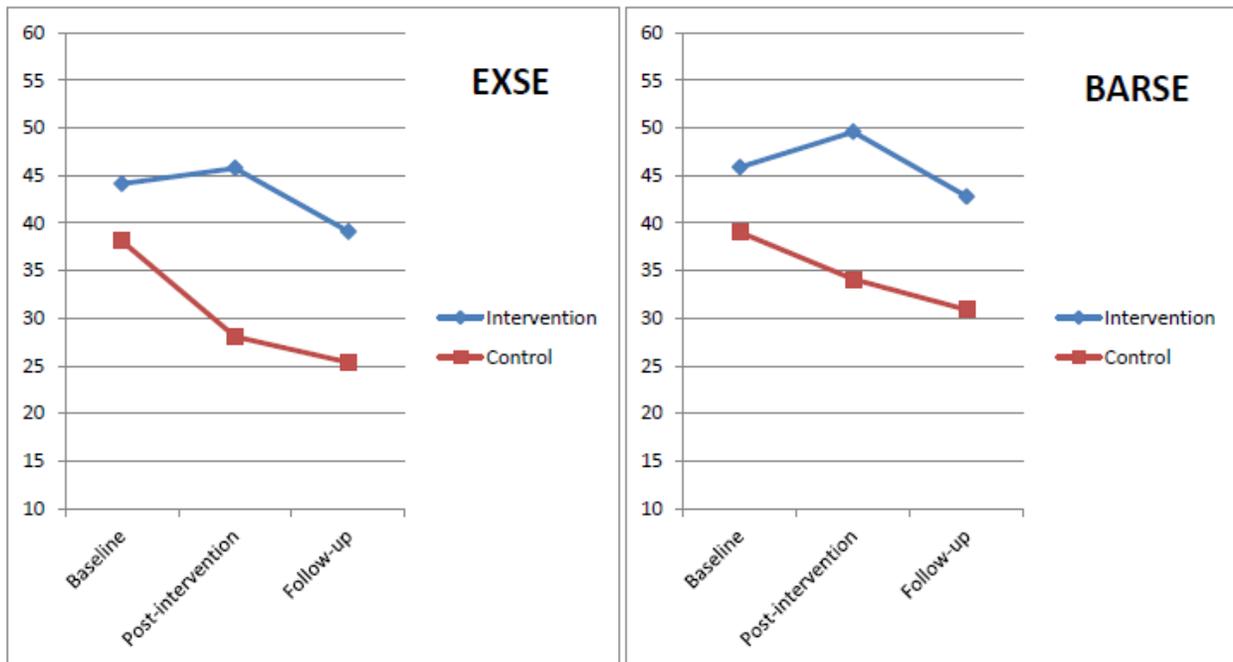


Figure 5. Long-term outcome expectations results by group

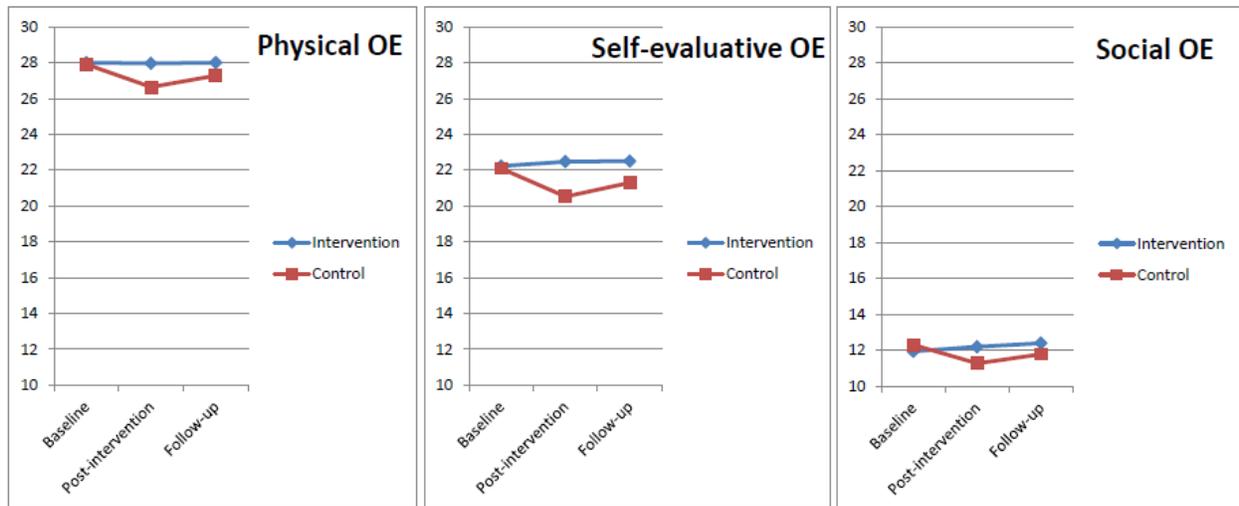


Figure 6. Long-term self-regulation results by group

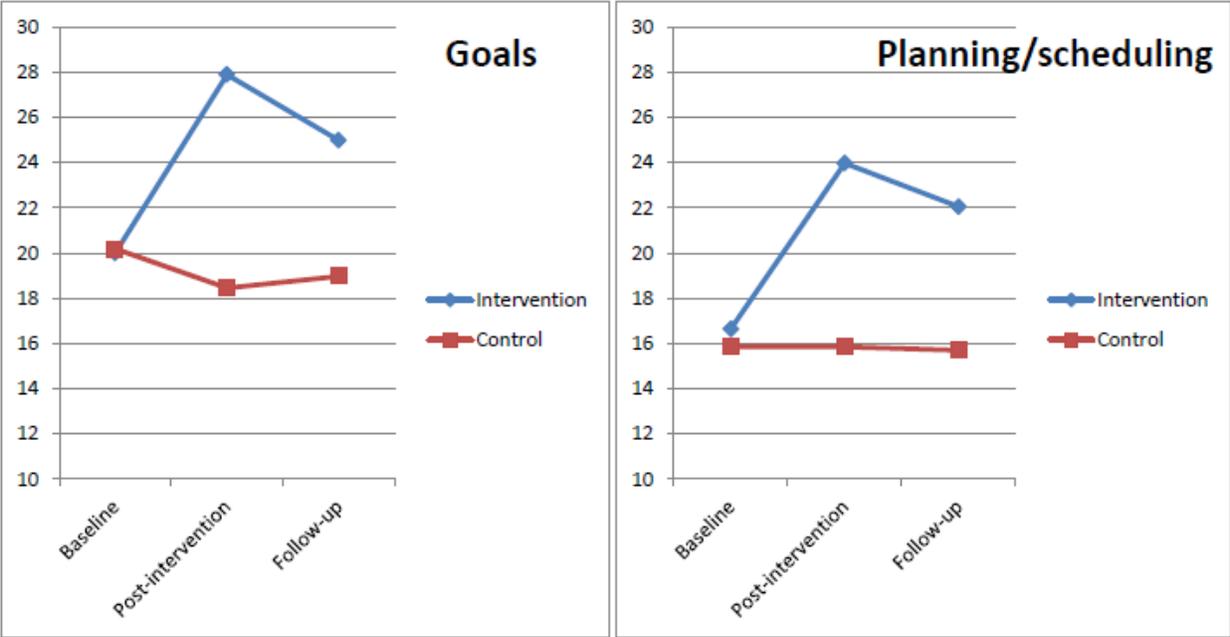


Figure 7. Long-term social support results by group

