ABSTRACT: Social Support among Mothers Enrolled in a Physical Activity Intervention PURPOSE: Previous studies have shown that mothers does not participate in recommended amounts of physical activity. Research has identified social support as a factor associated with physical activity among mothers. The purpose of the present study is to: determine if social support changes across a physical activity intervention, assess the relationships between social support and physical activity (step counts and activity minutes), body mass index (BMI), depression, and satisfaction with life, and examine the relationship between social support and intervention adherence among mothers enrolled in a physical activity intervention. METHODS: The study sample consisted of 70 mothers aged 18-64 years. Participants were randomized into a standard or intervention group. At baseline, demographic information, social support (total, tangible, affectionate, emotional, and positive), physical activity (pedometer-measured average daily step count and average daily activity minutes), BMI, depression, and satisfaction with life were assessed. Data were collected following at post-intervention and after a 3-month no intervention period (follow-up). The intervention consisted of participants meeting 3 times a week for 6 weeks. Each meeting included a short (approximately 10 minutes) health education lesson followed by a group walk that increased in duration each week. The standard group was informed the goal was to increase their individual level of physical activity while the intervention group was informed the goal was to increase the group's level of physical activity and received supplemental messages about collective efficacy. RESULTS: There were no statistically significant changes in social support across the intervention and follow-up for the standard or intervention groups. A repeated measures ANOVA revealed no significant main effect of time [F(2,130) = 1.223, p =

0.298] or time by group interaction [F(2,130) = 0.963, p = 0.385]. Social support subscales showed similar results. There was a statistically significant association between emotional social support at baseline with average daily step count (r = 0.29, p = 0.03) and average daily activity minutes (r = 0.29, p = 0.03) at baseline. At baseline, satisfaction with life was significantly associated with social support (total and all subscales, r-values ranging from r = 0.32 - 0.47, p-values ranging from p = 0.00 - 0.03). Relationships between social support and depression, BMI, and satisfaction with life were similar at post-intervention. An independent t-test revealed tangible, emotional, and total social support were all significantly higher at baseline for mothers who completed the intervention compared to mothers who did not provide post-intervention data (t = 1.141 pt = 0.009, t = 1.597 p = 0.023, t = 1.388 p = 0.008, respectively). Spearman correlations further revealed that among completers, baseline levels of tangible social support ($\rho =$ 0.27, p = 0.049), positive social support ($\rho = 0.315$, p = 0.023), and total social support (ρ = 0.314, p = 0.02) were associated with percent of sessions attended during the intervention. DISCUSSION: Mothers in the present study had high levels of social support that did not change during a physical activity intervention. Social support was moderately and positively associated with satisfaction with life but not associated with physical activity, BMI, or depression. Finally, social support at baseline was associated with adherence to the physical activity intervention. Future studies might consider creating a new social support scale that includes subscales and is specific to physical activity, recruiting mothers with low levels of social support, and assessing social support before an intervention to identify individuals who might have a higher risk of dropout during a physical activity intervention.

Social Support among Mothers Enrolled in a Physical Activity Intervention

A Thesis Presented to The Faculty of the Department of Department Kinesiology East Carolina University

In Partial Fulfillment of the Requirements for

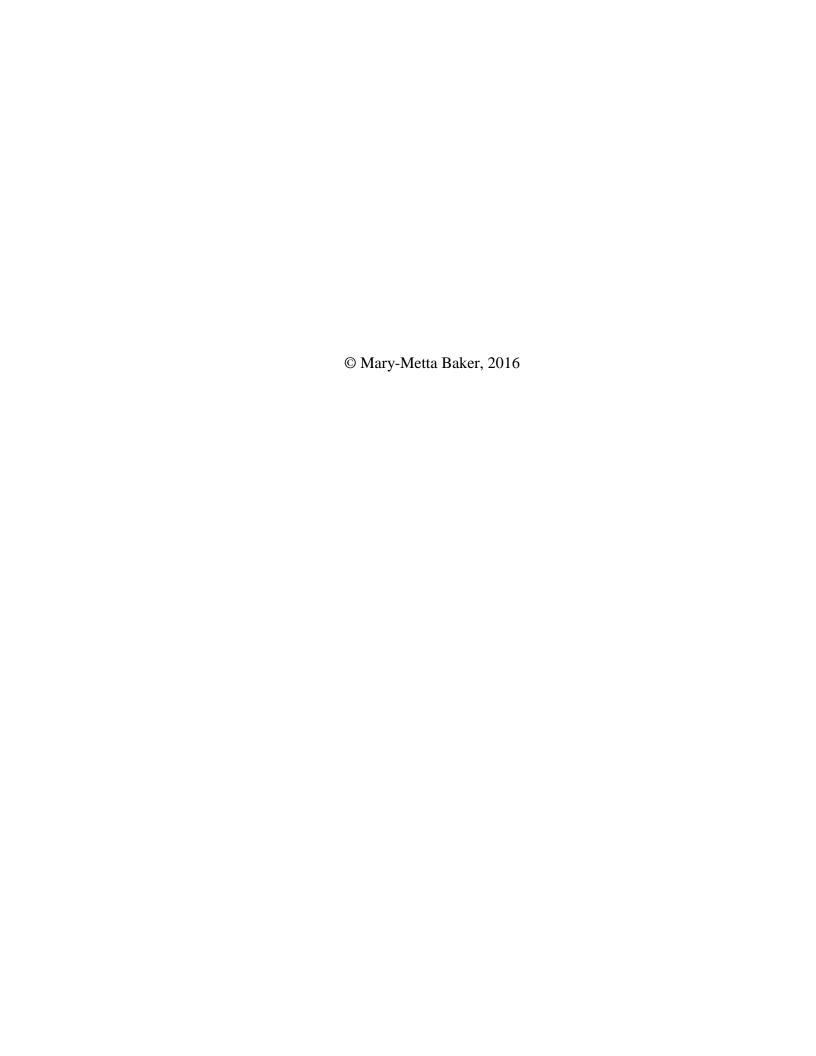
Master of Science in Kinesiology

Exercise Physiology

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Chapter I: Introduction

Physical activity has an abundance of positive and beneficial effects, yet only a small proportion of the United States population meets recommended guidelines for physical activity (U. S. Department of Health and Human Services, 2000; Centers for Disease Control and Prevention (CDC), 2013). Barely over half, 51.6%, of the population are meeting aerobic activity guidelines, 29.3% are meeting muscle-strengthening guidelines, and only 20.6% are meeting both aerobic and muscle-strengthening guidelines (Centers for Disease Control and Prevention (CDC), 2013). Data from subpopulations of adults in the United States suggest that women are less active than men and parents are less active than non-parents leading some research to suggest that mothers are less active than fathers (Burton & Turrell, 2000; Centers for Disease Control and Prevention (CDC); McIntyre & Rhodes, 2009; Nomaguchi & Bianchi, 2004; Verhoef & Love, 1994). Women, and especially mothers, are two populations that should be given particular consideration when designing interventions to increase and sustain physical activity.

There are many factors associated with physical inactivity among mothers that should be considered in the design of interventions to increase physical activity. Some of these include lack of time, other obligations, self-efficacy, social support, and childcare (Mailey & McAuley, 2014; McIntyre & Rhodes, 2009; Miller, Trost, & Brown, 2002; Verhoef & Love, 1994). Mothers spend significantly more time on other obligations (family and household) than non-mothers and report that physical activity takes up too much time (McIntyre & Rhodes, 2009; Verhoef & Love, 1994). In addition to time and other obligations, levels of self-efficacy have been found through experimental research

to be correlated with physical activity (Miller et al., 2002). Higher levels of self-efficacy, known as one's belief in their capability to successfully complete a course of action, has been known to increase physical activity (Bandura, 1997; Miller et al.). Both cross-sectional and experimental studies have found that childcare and social support were associated with physical activity levels among mothers (Cramp & Brawley, 2006; Miller et al.; Verhoef & Love). Lower levels of social support and the lack or inconvenience of childcare have been directly connected to decreased levels of physical activity (Cramp & Brawley, 2006; Miller et al.; Verhoef & Love). Interventions designed for mothers should aim to incorporate childcare, social support, and self-efficacy building strategies to increase physical activity.

Analyzing past interventions designed to increase physical activity among mothers provides insight on strategies to use in future interventions. Some strategies that have been included in interventions that have successfully increased physical activity include: incorporating childcare, group informational and discussion sessions that focus on self-regulatory skills, overcoming barriers, increasing self-efficacy and social support, and the use of behavioral theories, such as self-determination and social cognitive theory (Cramp & Brawley, 2006; Mailey & McAuley, 2014; Miller et al., 2002). For example, Cramp and Brawley conducted an intervention that successfully increased physical activity among mothers by using group-based conditions that provided information about self-regulatory skills and overcoming barriers and providing childcare (Cramp & Brawley, 2006). The intervention consisted of comparing the effects of a standard exercise program to one that included group mediated behavioral sessions along with the standard exercise protocol (Cramp & Brawley). Mothers who received the group

mediated behavioral sessions had greater improvement in their levels of physical activity than the standard exercise group (change in mean physical activity frequency score: 5.9 versus 3, p < .01) (Cramp & Brawley). In another intervention, self-efficacy and partner social support increased after an intervention that applied discussion groups among women that focused on exploring physical activity barriers and techniques to increase physical activity (Miller et al., 2002). There was a positive relationship between levels of support, self-efficacy, and physical activity of mothers suggesting that these variables may be mediators of physical activity behavior change (Miller et al.). The importance of using behavioral theories to guide intervention development was highlighted in another intervention among working mothers (Mailey & McAuley, 2014). The intervention involved evaluating changes in physical activity elicited from participating in a control group and an intervention group that participated in two group-based sessions focused on teaching strategies on behavior modification through increasing self-efficacy and other social cognitive theory constructs (Mailey & McAuley). Mothers within the intervention group experienced a greater increase in physical activity than those in the control group (intervention group effect size d = .93; control group effect size d = .42) (Mailey & McAuley). These studies show the effectiveness of previous interventions that have used group sessions focused on developing behavioral techniques that are grounded in theoretical models such as self-determination theory and social cognitive theory. These might be important factors to include in future studies for increasing and sustaining an active lifestyle.

Social support has a consistent, positive relationship with physical activity across many diverse populations (Allender, Cowburn, & Foster, 2006; Treiber et al., 1991; Van

der Horst, Paw, Twisk, & Van Mechelen, 2007; Wendel-Vos, Droomers, Kremers, Brug, & Van Lenthe, 2007). Social support is defined as, "an affiliation with social networks that provide emotional support and assistance with aspects of daily living" (ACSM, Resource Manual For Guidelines for Exercise Testing and Prescription p 247). Social support is associated with the management of stress and life events, health, and physical activity (Allender et al., 2006; Brummett et al., 2001; Horsten, Mittleman, Wamala, Schenck-Gustafsson, & Orth-Gomer, 2000; Murberg & Bru, 2001; Orth-Gomer, et al., 1988; Swain, Brawner, & American College of Sports Medicine, 2012; Treiber et al., 1991; Trost, Owen, Bauman, Sallis, & Brown, 2002; Uchino, Cacioppo, & Kiecolt-Glaser, 1996; Van der Horst et al., 2007; Wendel-Vos et al., 2007; Williams et al., 1992). Social support can take many forms including emotional (encouragement of expression of feelings such as empathy), informational (offering of advice or feedback), tangible (material items), and affectionate and positive social interaction (sharing positive experiences with someone and their expressions of affection) (Sherbourne & Stewart, 1991). A review completed by Trost et al. (2002) indicated that receiving social support and having a strong support system is positively associated with physical activity participation. Women with high levels of social support were two times more likely to be active than women with low social support levels (Trost et al.). Two cross-sectional studies evaluated social support and physical activity specifically in mothers (McIntyre & Rhodes, 2009; Verhoef & Love, 1994). In the first study, mothers (N=139) completed physical activity and behavioral constructs questionnaires (McIntyre & Rhodes, 2009). Mothers who continued physical activity after pregnancy reported higher levels of social support compared to those who discontinued physical activity after having a child

(McIntyre & Rhodes). The second study included a much larger sample (N = 1,113) of mothers where physical activity along with perceived barriers and benefits of exercise were evaluated using questionnaires (Verhoef & Love, 1994). Mothers were more likely to experience a lack of social support from family and friends compared to social support from spouse (Verhoef & Love). These studies suggest that when creating an intervention to increase physical activity in mothers, social support needs to be implemented, and group settings might be one approach for enhancing social support.

The relationship between social support and health outcomes such as body mass index (BMI), depression, and satisfaction with life has been well-documented. Previous studies have documented relationships between social support, depression, and life satisfaction, but not in mothers (Newsom & Schulz, 1996; Strine et al., 2009). In a study assessing the general population, results showed that inadequate social support has a strong relationship with depression and impaired satisfaction with life (Strine et al., 2009). Individuals rarely or never receiving social support were 12.3 times more likely to report being depressed and 3.8 times more likely to report being dissatisfied with life (Strine et al.). The strong relationship between social support and depression and satisfaction with life was replicated in a slightly different study on members of a Cardiovascular Health Study (Newsom & Schulz, 1996). Regression showed a strong relationship in both depression and satisfaction with life with social support (Newsom & Schulz). Low tangible support was associated with high depression scores (p < .001) and perceived social support (tangible, belonging, and appraisal) was the strongest predictor of a high satisfaction with life (p < .001) (Newsom & Schulz). The strong positive relationship between social support and satisfaction with life and the strong inverse

relationship between social support and depression has been both been previously documented. However, there is a current need for research that reexamines this relationship with the addition of the specific population of mothers going through a physical activity intervention.

Many intervention studies have successfully increased physical activity; however, adherence of physical activity after an intervention is a topic of interest and fewer studies have explored the maintenance of behavior following an intervention (Fjeldsoe, Neuhaus, Winkler, & Eakin, 2011). A systematic review was conducted to assess three questions in relation to maintenance of physical activity: the frequency of maintenance reports of behavioral change, frequency of behavior change achieved, and the characteristics of interventions with successful behavior change (Fjeldsoe et al., 2011). Highlighting the lack of maintenance reported for change in behavioral outcomes, only 18% of physical activity interventions include a post-intervention follow-up phase (in addition to having a comparison group) (Fjeldsoe et al.). However, of the studies that did report on maintenance, 90% of them reported a positive change in at least one behavioral outcome (Fjeldsoe et al.). The review highlights that positive change can occur and be maintained in behavioral outcomes, but very few studies have explored it in depth; the review concludes by calling for future research that includes evaluation of maintenance in change of behavioral outcomes (Fjeldsoe et al.). However, one study conducted on coronary heart disease rehabilitation patients found that individuals (who received no intervention) were less likely to sustain physical activity behaviors in comparison to individuals who received a supplemental intervention after rehabilitation (Aliabad et al., 2014). The supplemental intervention included a health action plan that focused on

intention/motivation and self-efficacy (Aliabad et al., 2014). This study reported contradictory findings to the above review; this may be because the lack of studies reporting on maintenance does not produce findings that can be generalized. In addition, given the clinical and very restricted study population, it is debatable if these findings can be generalized to a larger, non-clinical demographic group. In another study that included a group-informational based intervention, data were collected on the participants at baseline, post-intervention, and at a 5 month post intervention follow-up (Mailey & McAuley, 2014). At follow-up, individuals receiving the group intervention had decreased levels (relative to post-intervention) of physical activity, self-efficacy, and ability to plan and schedule physical activity; self-efficacy levels of those individuals even dropped below initial baseline measures (Mailey & McAuley, 2014). This study produces the similar findings that maintenance of behavior change is hard to achieve (Mailey & McAuley). Although there was an initial increase, it was not maintained and some values were reported to decline below baseline values (Mailey & McAuley). Lacking in this study is the addition of social support. Social support could be related to physical activity maintenance so there is a need for a study that examines not only the change in social support across an intervention, but also how social support is associated with physical activity maintenance. By being able to initially increase physical activity through an intervention, then having the ability to facilitate maintenance of the physical activity mothers can become more physically active and accrue the many health benefits associated with physical activity.

Physical activity levels are low among mothers and many factors have been identified that are associated with this trend. Social support is one factor that has

consistent positive associations with physical activity and may facilitate the maintenance of physical activity among mothers. With few interventions exploring factors to physical activity adherence, the current study aims to combine previously compiled knowledge to create an intervention that will initially increase physical activity among mothers then explore the likelihood of adherence through social support.

Purpose Statement

The overall purpose of this study is to better understand social support among mothers enrolled in a physical activity intervention by examining changes in social support and the relationship between social support and physical activity, health outcomes, and adherence to the intervention. The following are specific aims that will be investigated:

- Assess change in social support across three time points of a physical activity intervention
- Explore the relationships between social support, physical activity, and health outcomes such as BMI, depression, and satisfaction with life at baseline and postintervention
- Compare completers and non-completers on levels of social support at baseline.

Hypotheses:

Based on previous research, mothers with low social support are at an increased risk for physical inactivity. Upon creating a physical activity intervention that incorporates factors of successful past interventions for increasing physical activity, the change in social support will be assessed along with its relationship to health outcomes (such as

depression and quality of life) and the ability of social support levels to predict adherence to the intervention. It is hypothesized that:

- Social support will increase across the intervention.
- There will be a positive relationship between social support, physical activity, and satisfaction with life and a negative relationship between social support and depression at baseline and post-intervention.
- Social support will be higher at baseline among mothers who had higher levels of adherence to the intervention.

Significance

Previous studies involving physical activity interventions fail to explore whether social support changes over an intervention and is maintained through a follow-up period. In addition to assessing the change in social support, there is a lack of research that has assessed the relationship between social support and health outcome measures (such as BMI, depression, and satisfaction with life) across an intervention. Further, the ability of initial social support levels to predict adherence to an intervention has yet to be investigated. By being able to predict adherence based off baseline social support levels, individuals can be targeted to increase their adherence through social support. The present study will evaluate the social support of mothers and its relationship with physical activity, health, and intervention adherence.

Delimitations

- 1. The study population will consist of females, 18-64 years old, with a child under the age of 26 residing in the household
- 2. All subjects will be healthy without any major health complications

3. All subjects will be able to participate in moderate physical activity (i.e. walking).

Limitations

1. Mothers with independent children versus mothers with dependent children

Assumptions

 Each educational lesson will contain no bias from different members of the team delivering the information

Operational Definitions

- 1. Physical activity: any bodily movement produced by skeletal muscles that results in energy expenditure.
- 2. Mothers: female parent of a child less than 26 years of age who lives in the household.
- 3. Social Support: an affiliation with social networks that provide emotional support and assistance with aspects of daily living

Chapter II: Literature Review

Physical activity—defined by the World Health Organization as bodily movement produced by skeletal muscles that results in energy expenditure— is associated with many physical and psychological benefits including improvements in cardiovascular health, decreased morbidity and mortality, decreased anxiety and depression, and enhanced feelings of well-being (Swain et al., 2012). Across the lifespan, life events and life stages may impact physical activity. Motherhood is one such life event that impacts physical activity. This literature review will explore physical activity rates of mothers, factors associated with physical activity of mothers, the importance of social support in combination with physical activity, and adherence to physical activity behaviors.

Rates of Physical Activity

Physical activity, specifically aerobic activity has numerous positive health benefits that range from psychological improvements such as mood to physiological improvements such as decreased blood pressure (U. S. Department of Health and Human Services, 2000). Despite these benefits, only a small percentage of the United States population achieves the recommended levels of physical activity.

General Population

In 2011, only one in five adults (20.6%) met aerobic and muscle-strengthening national guidelines for physical activity (Centers for Disease Control and Prevention (CDC), 2013). In addition, 51.6% and 29.3% of adults met the aerobic activity guidelines and the muscle-strength training guidelines, respectively (Centers for Disease Control and Prevention (CDC), 2013). These data suggest that there is a significant need for increasing the amount of both aerobic and muscle-strength training among adults in the

United States. Rates of meeting physical activity guidelines varied among different demographic characteristics (Centers for Disease Control and Prevention (CDC)). The percent of individuals with a college degree who were meeting both aerobic and strength training guidelines was 27.4% compared to 12.0% for those who have less than a high school diploma (Centers for Disease Control and Prevention (CDC)). The percentage of females meeting guidelines was consistently lower in both aerobic and muscle-strength training physical activity compared to males (Centers for Disease Control and Prevention (CDC)). A higher percentage of males compared to females met both aerobic and strength training guidelines (23.4% versus 17.9%), strength training guidelines (34.4% versus 24.5%), and aerobic guidelines (53.1% versus 50.2%) (Centers for Disease Control and Prevention (CDC)). The aforementioned studies suggest that although the general population has difficulty meeting physical activity guidelines, females are at a higher risk of not meeting physical activity guidelines compared to males.

Physical Activity Among Mothers

Mothers are one subpopulation of women who have even lower levels of physical activity compared to other groups of women. Bellows-Riecken and Rhodes (2008) compiled 25 independent studies to examine the relationship between physical activity and parenthood. The articles included in this literature review focused on a variety of populations: male and female non-parents and mothers and fathers (Bellows-Riecken & Rhodes, 2008). The authors examined physical activity between parents versus non-parents, mode of physical activity, gender differences in physical activity, barriers to physical activity, and socioeconomic status (all of which were self-reported) (Bellows-Riecken & Rhodes). Overall, there was a negative relationship between parenthood and

physical activity (effect sizes ranging from 0.41 – 0.48), suggesting that parents were less active than adults without children. However, several studies indicated that mothers were affected more negatively than fathers by parenthood (Bellows-Riecken & Rhodes; Burton & Turrell, 2000; McIntyre & Rhodes, 2009; Verhoef & Love, 1994). Bellows-Riecken and Rhodes concluded by calling for an additional understanding of the context in which parental physical activity transpires; specifically how social support can facilitate physical activity (Bellows-Riecken & Rhodes). The current study aims to explore the relationship between social support and physical activity during a group-based physical activity intervention for mothers.

One study that evaluated physical activity levels of a diverse population revealed that motherhood was positively associated with physical inactivity (Burton & Turrell, 2000). Burton and Turrell (2000) performed a study evaluating occupation, hours worked, and leisure-time physical activity by using the Australian National Health Survey. Face-to-face interviews with Australians 18 years and older were used to collect data using a survey that assessed occupation, hours worked, physical activity, living arrangement, smoking status, body mass index (BMI), and self-reported health (Burton & Turrell). Among parents with a dependent child, 76% of mothers were insufficiently active and 71% of fathers were insufficiently active; compared to individuals with no dependent children, 72% of females and 66% of males were insufficiently active (Burton & Turrell). Rates of insufficient physical activity for females were highest in current smokers, those with dependent children, and those who reported poor health (Bellows-Riecken & Rhodes). Although only a small percentage of the sample in this study were

mothers, these data further support the fact that mothers have low levels of physical activity.

In another cross-sectional study, using objective physical activity measures, Dlugonski and Motl (2013) aimed to investigate the physical activity difference between mothers and non-mothers. Mothers and non-mothers (N=66) completed a battery of physical activity questionnaires and also wore an accelerometer for one week (Dlugonski & Motl, 2013). The data showed that mothers were less physically active than non-mothers using self-reported and objective measures of physical activity (Dlugonski & Motl). Objectively measured moderate-to-vigorous physical activity minutes ranged from 21.63 for mothers to 40.13 for non-mothers (p < 0.05) (Dlugonski & Motl). This again focuses on the fact that mothers continually show inadequate physical activity levels.

A longitudinal study also demonstrated high levels of inactivity among mothers (Brown & Trost, 2003). Young women (18-23) (N=7,281) provided self-reported measures of physical activity, life events, body mass index (BMI), and sociodemographic variables at baseline and after a 4-year follow-up (Brown & Trost, 2003). Among this sample, 20% of the participants changed from being active to inactive from baseline to follow-up (Brown & Trost). After adjusting for age, sociodemographic variables, BMI, and physical activity at baseline, the women who reported getting married (p < 0.0001), having a child (p < 0.0001), or beginning paid work (p < 0.01) were more likely to be inactive than those not reporting any of those events (Brown & Trost). Specifically, women who had a child were 20.1% more likely to be inactive compared to their childless counterparts (Brown & Trost). This suggests that women who encounter life

events, such as the birth of a child, are at a higher risk for being inactive and not reaching recommended physical activity guidelines (Brown & Trost).

The pattern of the physical activity of women from pre-natal to post-partum as well as barriers and facilitators of physical activity was investigated in a study by Albright Albright, Maddock, and Nigg (2006). Mothers (N=79), with children 18 months to 2 years old, were asked to complete a survey regarding physical activity behaviors before pregnancy and after child birth in addition to attending one 60 minute session where physical activity issues were discussed (Albright et al., 2006). From the data collected, 43% were active (engaged in physical activity that moved the arms and legs and resulted in an increased heart rate, e.g. walking) before pregnancy but inactive or irregularly active postpartum (p < 0.0003) (Albright et al.). Mothers, especially new mothers, are not only at an increased risk for inactivity but also at a high risk for a decline in physical activity following motherhood (Albright et al.).

Rhodes et al. (2014) conducted a longitudinal study that examined the physical activity patterns of couples across three different cohorts: couples with no children, expecting their first child, and expecting their second child. Participants (N=314; 102 not expecting a child, 136 expecting first child, 76 expecting second child) completed assessments of demographics and 7-day accelerometry at baseline, 6, and 12 months (Rhodes et al., 2014). At baseline, mothers without children engaged in more minutes of moderate to vigorous physical activity (MVPA) compared to first time mothers (β = -.17) (Rhodes et al.). However, when looking at the change of physical activity in mothers who had a second child, there was still a significant decrease in minutes of MVPA compared to women without children (β = -.20) (Rhodes et al.). Since mothers

showed a decline in physical activity regardless of number of children, it highlights that women in all phases of motherhood might benefit from a physical activity intervention.

With numerous studies reporting that mothers have higher levels of physical inactivity (compared to non-parents), motherhood is an important time to promote physical activity (Bellows-Riecken & Rhodes, 2008; Burton & Turrell, 2000; McIntyre & Rhodes, 2009; Verhoef & Love, 1994). However, promotion of physical activity in mothers can be difficult as there are numerous barriers to physical activity that are specific to mothers.

Factors Associated with Physical Activity among Mothers

With research showing lower levels of physical activity specifically in mothers, it is important to dissect why this trend is so prevalent. Many different types of research have previously been done to try and help understand the physical inactivity levels in mothers. Each of these studies has provided information that is useful for understanding and promoting physical activity among mothers

Cross-Sectional Research

Verhoef and Love conducted a study in 1991 among women (N=1,113) aged 20-49 who were not pregnant or immediately postpartum (Verhoef & Love, 1994). Exercise, which was defined as "leisure time physical activity", was broken down into exercise intensity, frequency, and duration and was assessed using the Godin and Shephard 7-day recall questionnaire (Verhoef & Love, 1994). Number of times per week exercise was performed in the last 6 months was also assessed (Verhoef & Love). In addition to the measurement of physical activity, perceived barriers and benefits of physical activity were measured (Verhoef & Love). In terms of intensity, frequency, duration, and pattern

(over the last 6 months), mothers were found to be less active than non-mothers in all categories (Verhoef & Love). Fewer mothers engaged in physical activity at least once a week during the past six months compared to non-mothers (29.6% versus 42.5%) (p < 0.01) (Verhoef & Love). Mothers perceived barriers to a higher degree than non-mothers for fifteen out of twenty-one barriers. The most common barriers reported by mothers were lack of time ("because of work": 46.4%, "because of family obligations": 63.3%, "because of other obligations": 32.7%), lack of childcare (24.7%), and lack of support ("from spouse": 10.5%, "lack of exercise partner": 30.1%, "from family or friends": 14%). The most frequently reported perceived barrier from non-mothers was lack of selfdiscipline (46.7%) (Verhoef & Love). Lack of social support was evaluated as a perceived barrier to exercise for both mothers and non-mothers. Mothers were more than two times more likely to report a lack of social support from family and friends as a barrier to physical activity than non-mothers (Verhoef & Love). The relationship between social support from spouse and physical activity followed the same trend (Verhoef & Love). These findings suggest that mothers perceive a lack of: time, support, and lack childcare as primary barriers to physical activity (Verhoef & Love). Social support might be particularly important to consider given the many barriers associated with physical activity among mothers.

McIntyre and Rhodes conducted a study with mothers aged 25-36 years with one child between the ages 0-4 living in a specific region of Canada (McIntyre & Rhodes, 2009). Questionnaires were distributed to eligible participants that evaluated physical activity and theory of planned behavior constructs (i.e., attitude, behavioral beliefs, subjective norm, normative beliefs, control beliefs, and intentions) (McIntyre & Rhodes,

2009). Physical activity was measured using the Godin Leisure Time Exercise Questionnaire to assess the frequency and average duration of mild, moderate, and strenuous intensity activity. Participants were asked to report current and pre-pregnancy levels of physical activity (McIntyre & Rhodes). The findings reported that 65.6% of mothers were not reaching the recommended amount of physical activity (accumulation of 150 minutes of moderate-to-vigorous physical activity per week) currently compared to 40.2% prior to motherhood (McIntyre & Rhodes). From the same population, 31% of the participants completely discontinued physical activity after having a child (McIntyre & Rhodes). The mothers also reported (via questionnaire) barriers of physical activity to be "takes too much of my time", "other time commitments", "fatigue/tiredness", "childcare", and "intention" (McIntyre & Rhodes). However, they account that "friends would approve of me engaging in physical activity" and that physical activity relieves stress (McIntyre & Rhodes). These findings suggest that involving a social component such as friends to physical activity as well as overcoming the barriers of time, fatigue, and childcare, mothers can increase their levels of physical activity.

Similarly to the above stated findings, Brown, Brown, Miller, and Hansen (2001) studied the levels of social support Australian mothers have available to them and their constraints towards physical activity. The sample of 543 mothers responded to self-reported surveys that measured demographics, physical activity, social support, and barriers/constraints to physical activity (Brown et al., 2001). A series of discussion groups were organized to further understand aspirations, barriers, and support levels regarding physical activity (Brown et al.). More than two thirds of the mothers were inadequately active; however, almost all of the mothers (93%) stated that they would like

to be more active (Brown et al.). The number one constraint (98.6%) was "no time due to commitment to children", other constraints included a lack of time due to commitment to housework, shopping, work, and spouse, and lack of energy and money. Regarding social support, 69% of mothers were encouraged by their partner to be physically active and among the households with partners present, 54% of mothers reported having help from their partner to watch the children so they could participate in physical activity (Brown et al.). Statistical analysis uncovered a significant relationship between partner support and active leisure (p < 0.0001 for both values). These discoveries represent a positive relationship between physical activity and social support among mothers (Brown et al.).

Mailey, Huberty, Dinkel, and McAuley, 2014 examined the barriers and facilitators to physical activity among working mothers and fathers. Both mothers (N=19) and fathers (N=12) who worked at least 20 hours a week and had at least one child under the age of 18 residing in the home were included in the study (Mailey et al., 2014). Based off a self-reported physical activity questionnaire, each participant was grouped in three different activity categories: active (engaging in more than 150 minutes per week of moderate to vigorous PA), irregularly active (doing some activity but not meeting guidelines), and inactive (reported no current PA) (Mailey et al.). Facilitators and barriers to physical activity were assessed through focus groups led by a trained research assistant using a semi-structured interview guide (Mailey et al.). Both mothers and fathers reported family responsibilities (childcare, household duties), guilt (related to family and work), lack of support, scheduling restraints, and work as barriers to physical activity (Mailey et al.). Of those barriers, scheduling restraints, lack of support (especially from their spouse), and work were more prevalent in mothers than fathers (Mailey et al.). The facilitators of

physical activity for fathers and mothers were reported to be being active with family, being a role model for the children, prioritizing (making physical activity a priority), benefits of physical activity to health, and support (Mailey et al.). Mothers specifically reported that physical activity made them more alert in their role for being a parent and that support from other healthy people motivated them to be active (Mailey et al.). Social support was seen as both a facilitator and a barrier to physical activity specifically in mothers, illustrating how important it is to increase social support as a means to further increase physical activity.

Prospective/Longitudinal Research

Hull et al completed a 2-year prospective analysis that assessed life transitions and their impacts on the physical activity levels of young adults (Hull et al., 2010). Self-reported questionnaires were completed at two separate time points: baseline and follow-up (taken two years apart at 2000 and 2002) (Hull et al., 2010). Physical activity was analyzed during the two year period in individuals who: stayed single, became married, had a first child (no child at baseline, child at follow-up), never had children (no child at either testing points), and had a subsequent child (increased number of children from baseline to follow-up) (Hull et al.). Among the sample of 638 participants, change in marital status (single to married or cohabitation) resulted in no significant changes in physical activity; however changes in parenthood were statistically significant (Hull et al.). Individuals who had a first or subsequent child decreased physical activity by an average of 3.7 hrs/wk, which was significantly more than individuals who stayed childless (decreased physical activity by an average of 0.8 hrs/wk, p = .01) (Hull et al.). Breaking down further, parents who had a subsequent child lost an additional 3.5 hrs/wk

compared to parents who maintained the same number of children (p = .02) (Hull et al.). Although there are many life events that take place, not all have them have the potential to decrease physical activity; however, parenthood is one that has been seen numerous times to effect physical activity in a negative way.

Experimental Research

The following experimental studies provide data on the factors that are associated with increasing physical activity among mothers. In a previously explained study by Albright, Maddock, and Nigg, mothers completed a questionnaire and attended one informational session about physical activity (Albright et al., 2006). From the questionnaires that they completed, mothers reported personal issues (including lack of support from a spouse) and parental duties to be barriers to physical activity and social support and availability of childcare as facilitators to physical activity (Albright et al., 2006).

Cramp and Brawley (2005) conducted a study on post-partum (6-52 weeks post-delivery) women (N=57) to compare the impact of a group-mediated cognitive behavioral intervention (GMCB) versus a standard exercise program (SEP) on physical activity. The GMCB intervention was based on social cognitive theory and included six group-mediated counseling sessions (Cramp & Brawley, 2006). All participants received the four-week interventional SEP phase that involved an instructor led fitness class (warm up, aerobic, strength, and cool down) twice a week (Cramp & Brawley). In addition to the SEP, mothers in the GMCB condition were given informational training sessions geared towards increasing self-regulatory skills and combating barriers in self-managed physical activity (Cramp & Brawley). During all sessions, childcare was provided for a

nominal cost (Cramp & Brawley). Compared to the SEP condition, mothers in the GMCB condition reported higher physical activity frequencies (increase of 5.9 days/week for GMCB, increase of 3 days/week for the SEP condition) and durations (increase of 19.07 minutes/physical activity bout for GMCB, increase of 8.29 minutes/physical activity bout for SEP condition) (Cramp & Brawley). There were statistically significant increases in self-efficacy (1-10, 10 being "absolutely confident) and outcome expectation scores (1-9, 9 being "very likely") in the GCMB group whereas there were no significant changes among the SEP condition (increase of .15 and -.11 for self-efficacy and increase of .21 and -.6 for outcome expectations in GMCB and the SEP condition respectively) (Cramp & Brawley). Results from this study suggest that incorporating childcare and group conditions that provide knowledgeable informational sessions geared towards self-regulatory skills and overcoming barriers may enhance the likelihood of success of the intervention.

Another study utilized an intervention to specifically focus on the presentation of information designed to enhance self-efficacy. Miller et al. (2002) investigated the efficacy of informational handouts versus combining the handouts with a discussion group with other mothers for investigating perceived barriers to engaging in physical activity. The informational handout that was distributed to both groups contained information on strategies for overcoming physical activity barriers specific to mothers and the benefits of physical activity (Miller et al., 2002). The discussion group utilized collaboration among the mothers and explored the barriers to physical activity and strategies to increase physical activity (Miller et al.). The sample consisted of mothers (N= 554) randomly assigned to three different groups: control, print intervention, and

discussion (Miller et al.). The control group had a mean BMI of 25.3(SD: 5.1) and an average of 2.3 (SD: 0.09) children (Miller et al.). The print intervention group had a mean BMI of 25.1 (SD: 5.5) and an average of 2.2 (SD: 0.07) children (Miller et al.). The discussion group had a mean BMI of 24.5 (SD: 4.9) and an average of 2.1 (SD: 0.09) children (Miller et al.). Data were collected at baseline, post-intervention (8 weeks after baseline), and after a 5 month follow-up (Miller et al.). When comparing baseline to postintervention, the change in percentage of women adequately active differed by group: control group increased by 4.1% (from 41.9% to 46%), print intervention increased by 5.5% (from 44.5% to 50%), and the discussion group increased by 12.3% (47.7% to 60%) (Miller et al.). The community involvement approach (discussion group) resulted in an increase in self-efficacy and partner support which can be effective in increasing physical activity in mothers, especially mothers with young children (Miller et al.). The discussion group was 14% and 10% more likely to meet physical activity guidelines respectively in comparison to the control group and the strictly handout group (Miller et al.). These results indicate that group/community discussion interventions may increase efficacy and support which leads to increased physical activity levels and should be incorporated in future interventions to increase success.

Similar to these previously stated findings, Mailey and McAuley (2014) discussed the importance of behavioral theories for designing physical activity interventions. Mailey and McAuley aimed to examine the effects on physical activity, self-efficacy, and self-regulation based on a behavioral change intervention in working mothers. All participants completed questionnaires that evaluated physical activity, self-efficacy, self-regulation, and stress at baseline, post-intervention (1 month), and follow-up (6 months

after baseline) (Mailey & McAuley). The participants receiving the intervention attended two, two-hour group sessions within one month aimed towards teaching behavioral modification strategies and increasing self-efficacy (Mailey & McAuley). Physical activity and self-regulation (e.g., planning/scheduling) in both the intervention and control groups increased throughout the study (baseline through post-intervention); however, the intervention group had higher increases compared to the control group (Physical activity effect size = .93 for intervention and .42 for control; Planning/scheduling effect size = 1.25 for intervention and .37 for control) (Mailey & McAuley). Based off the findings, it was concluded that behavioral theories, such as Self-Determination Theory and Social Cognitive Theory, should be used to increase confidence in implementing and sustaining an active lifestyle (Mailey & McAuley). The authors suggest the following strategies for increasing physical activity among mothers: highlight the benefits of physical activity, providing adequate support, creative and convenient physical activity modes, and whole family involvement (Mailey & McAuley). The combination of these components in an intervention might help to increase physical activity in mothers.

Knowing the barriers (lack of time/other obligations, lack of self-efficacy, lack of social support, and lack of child care) that were expressed specifically by mothers allows for the transformation of these barriers to facilitators of physical activity. A physical activity intervention in mothers that encompasses transforming these barriers to facilitators is needed to understand how it will affect their physical activity levels.

Social Support

Although there are many factors that have been associated with physical activity among mothers, social support is particularly notable. Social support is positively associated with physical activity and has the potential to be developed through group-based physical activity interventions (Allender et al., 2006; Castro & King, 2002; Sallis, Owen, & Fisher, 2008; Treiber et al., 1991; Trost et al., 2002; Van der Horst et al., 2007; Wendel-Vos et al., 2007). This study will aim to identify that relationship. This section aims to discuss the relationship between social support and physical activity.

Definition and Types of Social Support

The American College of Sports Medicine (ACSM) defines social support as "an affiliation with social networks that provides emotional support and assistance with aspects of daily living" (Swain et al., 2012). Social support can come in many different forms including behavioral assistance, feedback, guidance, information, comfort, intimacy, money, services, social networks, etc. (Shumaker & Brownell, 1984; Swain et al., 2012). ACSM created two broad categories to better differentiate types of social support: functional and structural (Swain et al.). Functional social support is known as the perception of support and can be further broken down into instrumental support and emotional support (Semmer et al., 2008; Swain et al.). Instrumental can be defined as having informational or tangible support from another individual, much like having someone to help you with activities of daily living (Semmer et al., 2008; Swain et al.). In terms of physical activity, tangible social support can be compared to someone giving you a ride to the gym or tennis shoes for you to be physically active. Emotional social support is related to feelings of caring and esteem and can be explained as having someone to talk to and whom you believe loves or cares for you (Semmer et al.; Swain et

al.). Communicating with someone about physical activity by sharing your weekly activity plans, goals, and your progress is an example of emotional social support related to physical activity.

Sherbourne and Stewart (1991) created a social support survey that includes several different types of social support in the following five subcategories: emotional (expression of positive affect, empathetic understanding, and the encouragement of expressions of feelings), informational (the offering of advice, information, guidance, or feedback), tangible (provision of material aid or behavioral assistance), affectionate (involving expressions of love and affection), and positive social interaction (the availability of other persons to do fun things with you). These subcategories focus on one's perception of social support (Sherbourne & Stewart, 1991). Although these differ slightly in terms of verbiage, they are very similar to how ACSM defines functional social support in terms of clinical definition and application. Structural support indicates social networks such as number of friends, frequency of visiting friends, marital status, and participation in organizations (Cohen & Wills, 1985; Semmer et al., 2008; Swain et al., 2012). These examples of structural support can be applied to physical activity. For example: number of friends involved in regular physical activity, frequency of friends participating in physical activity, spousal involvement/support of physical activity, and also engagement in physical activity organizations. Overall, social support comes in many different forms and can be perceived differently by each person. It is important to assess the types and amount of social support present as they relate to physical activity participation and health.

Social Support and Physical Activity

With many barriers related to physical activity, it is important to focus on facilitators that will increase physical activity. For some, a lack of social support may be a barrier; however, having strong social support can be a facilitator to physical activity. Individuals receiving social support from significant others are more likely to continue physical activity than those with little or no support (Trost et al., 2002). Trost et al. compiled a review to summarize results of studies examining the environmental, personal, and social factors associated with physical activity. The review described the trend of continuing physical activity through social support from significant others (Trost et al.). The review also reported that individuals reporting low levels of social support were 23-55% more likely to be insufficiently active compared to those reporting high levels (Trost et al.). Women with high levels of social support were two times more likely to be associated with being physically active than with low social support levels (Trost et al.). Regardless of the population (varying ages, sexes, and ethnicities), social support has been seen to be a positive influence in physical activity (Allender et al., 2006; Treiber et al., 1991; Van der Horst et al., 2007; Wendel-Vos et al., 2007). In terms of the form of social support, even forms as simple as telephone calls, letters, emails, or newsletters has been shown to influence physical activity (Castro & King, 2002).

A second review evaluated observational studies (N= 47) on determinants of physical activity in adults (Wendel-Vos et al., 2007). When looking specifically at social support, 3 out of 4 women experienced a positive association with social support and general physical activity (Wendel-Vos et al., 2007). In a cross-sectional study among teachers in a public school, social support was positively correlated with physical activity (Treiber et al., 1991). When examining the data from female teachers only, there was a

positive association with physical activity and friend and family support (Treiber et al., 1991). These studies have shown that across many populations, social support has a positive relationship with physical activity; however, there might be a specific population that is more influenced than others by social support.

Given that social support is positively associated with physical activity levels, it is important to examine this relationship specifically among mothers. In one study, women (N=2,912) completed a Physical Activity Social Support (PASS) questionnaire and the results found that individuals with high PASS scores were significantly less likely to be sedentary than those with low scores (Eyler et al., 1999). In another study among mothers, having access to social support was found to help them better combat other constraints to physical activity (P. R. Brown et al., 2001). Given that mothers are at such a high risk for falling below adequate physical activity levels due to parenthood, a facilitator needs to be established that can reverse this downward spiral and social support has the ability to be that facilitator.

Social support has a direct, positive association with physical activity among mothers (McIntyre & Rhodes, 2009; Verhoef & Love, 1994). A previously described cross-sectional study highlighted the importance of social support as a correlate to physical activity among mothers (McIntyre & Rhodes, 2009). Mothers who were not physically active experienced a lack of confidence to participate in physical activity due to a lack of social support more than mothers who were active: 4.33 (1.57) (non-active mothers) and 5.21 (1.53) (active mothers) (1-extremely unconfident, 7- extremely confident) (McIntyre & Rhodes). This shows that mothers who experience increased levels of social support feel more confident in their ability to participate in physical activity (McIntyre &

Rhodes). Social support was again the focus of a second study that was also previously described (Verhoef & Love, 1994). Perceived barriers and benefits to physical activity were analyzed through questionnaires in a cross-sectional study involving a large sample of women (Verhoef & Love). Compared to women without children, mothers were more than two times more likely to experience a lack of support from both family or friends and spouse (Verhoef & Love). Mothers had lower levels of social support from friends/family more than having lower levels from their spouse (lack of support: 14% family/friends, 10.5% spouse) (Verhoef & Love). It should be noted that one limitation to both of these studies is that they relied on self-reported questionnaires; however, the information is still beneficial in the sense that the current study aims to increase social support through a group (as opposed to primarily spousal) setting. These studies are helpful to use as a guide for creating a study that has more reliable measures (objective measure such as pedometers instead of primarily questionnaires) and to incorporate a group setting to maximize the projected increase in the social support levels of mothers in an intervention. This shows that there are various aspects of social support that can be utilized to increase physical activity through an intervention.

Social Support and Overall Effect of Health

Social support has been identified as an independent predictor of overall well-being and health (Kaplan et al., 1988; Uchino et al., 1996). Uchino et al. compiled a systematic review of 81 studies and found that social support was consistently associated with providing beneficial effects on the aspects of vital bodily systems such as the cardiovascular, endocrine, and immune system. When looking specifically at clinical populations, low social support was coupled with poor clinical prognosis (Brummett et

al., 2001; Horsten et al., 2000; Murberg & Bru, 2001; Orth-Gomer et al., 1988; Williams et al., 1992). One study in particular focused on women who were admitted for an acute coronary event and were assessed for five years (Horsten et al., 2000). Assessments (standardized questionnaires) occurred every 3-6 months and evaluated lack of social integration and depressive symptoms with association to other cardiac events (Horsten et al.). Women who did not experience lack of social integration and depressive symptoms had the best prognosis (Horsten et al.). To the contrary, the presence of two or more depressive symptoms and lack of social integration independently predicted the reoccurrence of cardiac events in women with coronary heart disease (Horsten et al.). Thus, social support positively affects individuals and is vital for an optimistic quality of life interpretation.

Social Support and Health Outcome Measures

Given that social support has been identified to have a relationship with health and physical activity, the relationship of social support to health outcomes measures (such as depression and satisfaction with life) has also been assessed in the general population (Strine et al., 2009). Using the Behavioral Risk Factor Surveillance System (BRFSS), the associations between depression, life satisfaction, and social and emotional support were assessed in a population based survey (Strine et al., 2009). The Patient Health Questionnaire depression scale was used to classify individuals into five different depression categories: none, mild, moderate, moderately severe, and severe (Strine et al.). Individuals with current depression were 12.3 times more likely to be dissatisfied with life and 3.8 times more likely to report rarely or never receiving social support (Strine et

al.). These results show a strong association among depression, impaired satisfaction with life, and inadequate social support (Strine et al.).

In a study examining older adults (65 and older), the relationships between social support, depressive symptoms, and life satisfaction were assessed (Newsom & Schulz, 1996). Participants were members of a Cardiovascular Health Study and were asked to complete a number of questionnaires that surveyed social support (support networks and helping others and perceived support), depression symptomology, and life satisfaction (Newsom & Schulz, 1996). In a regression analysis for predicting depression and life satisfaction, low social support levels, specifically tangible social support, were associated with higher depression scores ($\beta = -.146$, p = <.001) (Newsom & Schulz). In terms of life satisfaction, perceived support (tangible, belonging, appraisal) was the strongest predictor in association with high life satisfaction (tangible $\beta = .138 p < .001$; belonging $\beta = .132 p < .001$; appraisal $\beta = .146 p < .001$) (Newsom & Schulz). This study again shows the strong relationship between social support, depression, and satisfaction with life. However, given that this study was based off a clinical population that presents a limitation in applying it to the specific population of mothers. Lacking in the current literature is a study that examines this relationship in mothers specifically in a physical activity intervention.

Adherence to Physical Activity

It has been established that social support is important for physical activity, especially in mothers; in addition, social support may have the ability to help mothers adhere to a physical activity intervention and to maintain physical activity changes after the intervention ends. Although determining correlates and barriers to physical activity is

important, evaluating physical activity maintenance is of equal importance. Once adequate levels of physical activity are reached through combatting barriers and facilitating correlates, it is important to continue the lifestyle. Due to an inverse linear relationship between physical activity and all-cause mortality, long-term and continued physical activity is coupled with not only many health benefits, but can also decrease the risk of dying prematurely (Lee & Skerrett, 2001). Although there have been some studies to assess maintenance of physical activity, more research in this field is needed, especially in specific populations such as women and mothers. Adherence to physical activity changes following an intervention has been examined by several studies.

A systematic review was conducted to evaluate studies that focused on maintenance of behavior change following an intervention (Fjeldsoe et al., 2011). The review addressed how frequently trials report on maintenance of behavior change, how frequently behavior change is achieved, and the study characteristics common among studies that had successful maintenance of behavior change (Fjeldsoe et al., 2011). Studies that were included evaluated a physical activity and/or dietary behavior change intervention at a minimum of three time points, with an at least three month post-intervention follow up (Fjeldsoe et al.). The search from four different databases resulted in 349 publications but only 29 trials were included in the review (physical activity N=15, diet N=7, both physical activity and diet N=7) (Fjeldsoe et al.). There were 157 publications that reported on behavioral outcomes of a physical activity and/or diet intervention; however, only 18% of those (29/157) included post-intervention follow up with a comparison group (Fjeldsoe et al.). Of the publications that evaluated maintenance, 90% (26 publications) reported a significant positive, between-groups

difference on at least one behavioral outcome (Fjeldsoe et al.). Among physical activity publications, 12 out of the 15 reported similar findings of significant between-groups differences (Fjeldsoe et al.). When evaluating study characteristics, the review found that women were less likely to achieve maintenance, studies achieving maintenance had a mean intervention length of 21 weeks (SD 17), post-intervention length of 9 months (SD 4.5), used pretrial screening (to exclude individuals who already met behavioral targets), and employed more than 6 intervention strategies (such as relapse prevention, follow-up prompts, and self-monitoring) along with instruction on achieving behavior change (Fjeldsoe et al.). The findings from this review highlight the lack of research presented on adherence to physical activity. It also provides framework for future studies to successfully see maintenance following a physical activity intervention.

The maintenance of physical activity was again assessed in a study by Aliabad et al., 2014. The study used coronary heart disease patients, who had completed a rehabilitation program, to assess the effects of a health action based intervention on the maintenance of physical activity (Aliabad et al., 2014). The health action plan used is known as the Health Action Process Approach (HAPA) which consisted of focusing on intention/motivation and self-efficacy (Aliabad et al.). When compared to a control group receiving no post rehabilitation intervention, the participants who received the post rehabilitation health based intervention showed higher levels of physical activity (assessed using Godin Leisure-Time Exercise Questionnaire) after the health action based intervention (Physical activity: Interventional group pre-70.1 and post-182.86; Control group pre-81.25 and post-147.39) (Aliabad et al.). The interventional group also either increased or maintained outcome expectancies, self-efficacy, behavioral intention, coping

planning, and social support whereas the control group only slightly increased their physical activity (Aliabad et al.). These data represent that individuals (such as the control participants) are less likely to sustain physical activity behaviors once an intervention has ended and they are left to independently maintain. In terms of social support, the intervention group increased whereas the control group decreased (Aliabad et al.). This study represents that to better maintain physical activity an initial behavioral change model is needed during an intervention. Further, social support as a primary factor to facilitate in the adherence and maintenance of physical activity needs further research. Given that this particular demographic is specific, generalization to mothers and other populations is questionable. The current study aims to focus on mothers and also specifically social support to examine whether a health behavior intervention paired with social support will not only increase physical activity but increase adherence to an intervention and maintenance.

In the Mailey and McAuley (2014) intervention study that evaluated group informational sessions, a 5-month post intervention follow-up was conducted and all information collected at baseline was collected again. Compared to the post intervention data, physical activity, barriers to self-efficacy, planning/scheduling, and perceived stress all decreased slightly across the follow-up period (Mailey & McAuley, 2014).

Participants in the intervention group reported a decrease in physical activity from 35.51(18.5) to 33.75(22.5), decrease in barriers self-efficacy from 48.1(19.0) to 41.8(18.4), decrease in planning and scheduling from 24.5(7.69) to 22.1(7.79), and an increase in perceived stress from 14.9(6.74) to 15.6(7.06) (Mailey & McAuley).

However, from initial baseline values to follow-up values, interventional participants

increased their values for physical activity and planning/scheduling at a higher caliber than the control participants (physical activity effect size = .74 (intervention) and .45 (control), planning/scheduling effect size = .88 (intervention) and .25 (control) (Mailey & McAuley). This would suggest that incorporating social cognitive principles similar to the ones in the current study would positively affect physical activity values and the ability to plan/schedule physical activity. However, given that the intervention did not include social support further research regarding participants' ability to sustain previously changed physical activity behaviors is needed. This study will specially evaluate maintaining physical activity in association with incorporating social support.

With previous research showing that individuals are less likely to maintain adequate physical activity levels, more research is called for an intervention that incorporates facilitators to continue physical activity. Social support is a facilitator that has been seen to increase physical activity, but there is a lack of research that examines the relationship between social support and intervention adherence.

Summary

Mothers are a specific section of the population that needs further research in combating low levels of physical activity. By creating an intervention that combats the barriers that mothers have, sessions that educate them on the effects of physical activity, and providing them with a supportive atmosphere, it will aid in learning valuable information that has not yet been studied. The projected study will not only explore the relationships of social support and physical activity but also how it is related to the adherence of physical activity in this population in need.

Chapter III: Methods

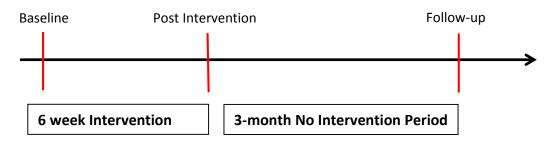
This study was part of a larger study that was designed to compare two approaches for delivering a physical activity intervention to mothers. This study was specifically focused on changes in social support during the physical activity intervention and the relationships between social support, health outcomes, and adherence to the intervention.

The current study aimed to investigate social support in the context of a group-based physical activity intervention for mothers. The three aims of the study were to: a) assess change in social support across three time points of a physical activity, b) explore the relationship between social support and health outcome measures such as BMI, satisfaction with life, and depression, and c) examine the relationship between baseline social support and intervention adherence. It was hypothesized that social support will increase across the intervention, there will be a positive relationship between social support and physical activity and satisfaction with life and a negative relationship between social support and depression and BMI, and social support will be positively associated with adherence to the intervention.

Study Design

An experimental design was used in this study. Inclusion and exclusion criteria were assessed on the phone prior to the informed consent process. Measures of physical activity and health were taken before the intervention (baseline), immediately following the 6-week physical activity intervention (post intervention), and after a 3-month period of no intervention (follow-up) (See Figure 1). All procedures were approved by the University Internal Review Board.

Figure 1



Participants and Recruitment

The study population was mothers (biological, adoptive, or foster) who were 18-64 years old and who had at least one child under the age of 26 residing in the household. A wide age range was selected to include as many mothers as possible for the geographical area. Women who were under the age of 18, pregnant, or within 6 weeks post-partum were excluded from the study. Participants who reported two or more risk factors (e.g., history of heart trouble, pain in chest, feeling faint, high blood pressure, bone or joint problem that worsens with physical activity participation) were excluded from the study. The participants were recruited in several different avenues. Participants from a previous cross-sectional study were contacted and invited to participate in this current study. Flyers were also distributed around the Greenville community to aid in recruiting participants. Some community locations included ECU staff/faulty listsery, Third Street Community Center, Joy's Soup Kitchen, Eppes Recreational Center, Intergenerational Community Center, Boys and Girls Club units, the public library, day care centers, after school programs, and other community establishments. Study recruitment materials and information were also electronically distributed by these organizations and other community members via websites and social media such as Facebook pages.

Enrollment, Randomization, and Testing

Once a mother expressed interest in participation of this study, an informational session was conducted via the phone or email. The session was led by a member of the research team who described the study and answered any questions. Participants still interested completed a short health-screening (Physical Activity Readiness Questionnaire) to ensure that the participant could safely engage in moderate physical activity. Participants reporting two or more conditions on the PAR-Q were disqualified from participation.

Mothers who qualified continued with baseline testing. All mothers signed an informed consent at the beginning of the baseline testing session. A train schedule of all measures is presented in Table 1. Following baseline testing, participants were matched on age and self-reported physical activity. One participant from each pair was randomly assigned to the standard condition and the other participant was assigned to the intervention condition.

Table 1

Measure	Baseline	During	Post-	Follow-
		Intervention	intervention	
				up
International Physical Activity	X		X	X
Questionnaire				
Pedometer	X	X	X	X
MOS Social Support Survey	X		X	X

Participants were then notified via email or phone to inform them of their health education leader along with meeting time/place for the health education/walking sessions.

Pedometers and logs were returned to study staff at the first walking session (approximately one week after baseline testing). Immediately following the 6-week intervention, participants were asked to complete a post-intervention testing session in which all baseline measures were repeated. After a 3-month period of no intervention, participants were again invited back to complete a follow-up testing session which included all baseline measures. After completion of each testing session, participants received a \$25 gift card.

Measures

Anthropometrics

The height of each participant was measured with a portable stadiometer (Seca 213) to the nearest 0.1 centimeter. Weight was measured with a portable scale (Seca 876) to the nearest 0.1 kg. Waist circumference was taken using a standard Gulick tape measure to the nearest millimeter. This information was used to describe the body mass index of the sample.

Physical Activity

The New Lifestyle-1000 pedometer was used during baseline, post-intervention, and follow-up to assess physical activity. The participants were instructed to wear a pedometer for seven days on the non-dominant side between the hip and navel at all times except when sleeping or partaking in water-activities such as showering. The participants noted the time of day the pedometer was put on, any time frames it was taken off, and the time of day it was taken off before bed. Each day participants were asked to record their step counts and activity minutes. These values were stored in the pedometer's

memory for 7-days and were manually inspected by research staff when the pedometer was returned. The pedometer automatically reset every night at 12:00 am.

Physical Activity was also measured through the Interventional Physical Activity Questionnaire (IPAQ) which assessed physical activity over the last seven days. A total score was calculated by creating a continuous score containing the calculation of minutes of physical activity per episode and number of episodes per week for light, moderate, and vigorous physical activity. This measure was only used for randomly assigning participants to an intervention group.

Social Support

Social support was measured in the study through the MOS Social Support Survey (Sherbourne & Stewart, 1991). The survey was originally constructed for the Medical Outcomes Study, a two-year study of patients with chronic conditions (Sherbourne & Stewart, 1991). The multidimensional, self-administering survey is an analysis of four functional social support scales: emotional/informational, tangible, affectionate, and positive social interaction. The 19-item survey was designed to be short, simple, and easy to understand. Each social support scale is calculated with a minimum of 0 and a maximum of 100 with higher scores indicating higher levels of social support. In terms of reliability, the survey exceeded the .50 standard for internal-consistency reliability estimates (emotional: $\alpha = 0.96$, tangible: $\alpha = 0.92$, positive: $\alpha = 0.94$, affection: $\alpha = 0.91$, and overall support index: $\alpha = 0.97$) (Sherbourne & Stewart). In terms of validity, the social support measures (total social support and all four subscales) significantly correlated (p < 0.01) to loneliness, family functioning, martial functioning, mental health, current health, physical functioning, role limitations (physical), role

limitations (emotional), energy/fatigue, effects of pain, pain severity, social activity, and physical symptoms (Sherbourne & Stewart).

Satisfaction with Life

Satisfaction with life was measured by the Satisfaction With Life Scale (SWLS) (Diener, Emmons, Larsen, & Griffin, 1985). The scale is comprised of 5 items with each item scoring 1-7 (1- strongly disagree, 2- disagree, 3- slightly disagree, 4- neither disagree or agree, 5- slightly agree, 6- agree, 7- strongly agree) (Diener et al., 1985). Total possible SWLS score ranges from 5 (least satisfied) to 35 (most satisfied) (Diener et al.). As there are no subscales, total score was used for all analyses.

Depression

Depression was measured by the Depression subscale of the Hospital Anxiety and Depression scale (HDS) created by Zigmond and Snaith (McDowell, 2006). The original scale has 14 items (7 for each anxiety and depression) but for the purpose of this study, only the 7 items pertaining to depression were used. Sample items include "I can enjoy a good book, or radio, or TV program" and "I have lost interest in my appearance" (McDowell, 2006). Total possible score ranges from 0 to 21 with a higher score representing more distress (McDowell).

Intervention

All participants were encouraged to attend 3 weekly sessions of a walking program, lasting for approximately one hour each, for 6 weeks. The standard and intervention groups both received an evidence-based health education program and an evidence-based walking program. Each session began with a brief health education lesson (~10-15 minutes) presented by a graduate student who has experience with the education

content and with teaching. The education lessons were based on strategies from the evidence-based Diabetes Prevention Program manual. The weekly topics included: Move Those Muscles (describing and identifying physical activity guidelines), Being Active: A Way of Life/Take Charge of What's Around You (finding ways to add physical activity in a daily routine and learning how to identify situations where physical activity can be added), Problem Solving (understanding barriers to physical activity and learning how to make an action plan), Talk Back to Negative Thoughts/The Slippery Slope of Lifestyle Change (develop strategies for overcoming negative thoughts and refocusing after a slip in physical activity participation), Jump Start Your Activity Plan/Make Social Cues Work for You (learning how to keep physical activity fun and identifying aspects of social support that can help increase physical activity), and Managing Stress/Ways to Stay Motivated (realizing stressful situations, learning to prevent or deal with stress, and creating a plan to maintain physical activity). During the sessions that focused on social support, participants were asked to identify people in their life who could provide support for their physical activity and how they could use social support to increase physical activity. In addition, participants were asked to identify inactive social situations that could be transformed into physically active social situations (for example, going for a walk with friends instead of watching a movie). Following each health education lesson, the mothers engaged in a group walk. The walking program was based on the evidencebased National Heart, Lung, and Blood Institute walking program. The walk consisted of a 5 minute warm up, progressively longer bouts of "brisk" walking that began at 5 minutes and increased by 2 minutes each week, and a 5 minute cool down (See Table 2). The intensity of the walk was determined through a "talk test". When engaging in

moderate physical activity and using the talk test, participants were encouraged to walk at a pace that allowed them to talk but not sing. The warm-up and cool down was a slow-paced, self-selected walk.

Table 2

	Warm Up	Brisk walk	Cool down	Total Time	Frequency
				per session	
Week 1	5 min	5 min	5 min	15 min	3x/week
Week 2	5 min	7 min	5 min	17 min	3x/week
Week 3	5 min	9 min	5 min	19 min	3x/week
Week 4	5 min	11 min	5 min	21 min	3x/week
Week 5	5 min	13 min	5 min	23 min	3x/week
Week 6	5 min	15 min	5 min	25 min	3x/week

The standard and intervention groups participated in the same health education sessions and walking protocols but differed in the manner that they were delivered. The participants in the standard group were informed that the goal of the intervention was to increase their individual level of physical activity. Participants received a personalized graph at the beginning of each week with the average number of steps and activity minutes taken during the previous week's sessions. The graph allowed each participant to objectively acknowledge measured increases in walking duration and intensity, further reinforcing the individual physical activity goal. Participants in the intervention group were told that the overall goal of the intervention was to increase the group's level of physical activity. To reinforce the goal, participants received a graph at the beginning of

each week showing the group's average number of steps and moderate intensity activity minutes for the previous week and were encouraged to do their best to contribute to the group's overall physical activity.

The intervention group also received supplemental educational messages from the health education leader during the health education sessions and the group walks using messages targeting collective efficacy (the group's confidence in their ability to reach goals). Messages for collective efficacy included working together as a team, having a shared responsibility for health and physical activity, encouraging physical activity in their families and the community, and working toward community change through physical activity change. To further increase collective efficacy for physical activity, participants were encouraged to share and discuss their own experiences and reflections related to the topics covered during the education lessons.

Statistical Analysis

Following all data collection and analysis, statistical analyses was performed to evaluate demographic information and the three different aims. Demographic data was assessed through descriptive statistics such as mean and frequencies along with standard deviations.

Aim 1

Change in social support across the three different time point (baseline, post-intervention, and follow-up) was assessed in both groups of mothers: standard and intervention. It was analyzed by a 2 (Group: Standard; Intervention) x 3 (Time: Baseline; Post-intervention; Follow-up) Repeated Measures ANOVA. The results from this statistical analysis show how social support has changed across time and between the

different groups (standard and intervention) from baseline, post-intervention, and followup.

Aim 2

The relationship between social support and physical activity at baseline, post-intervention, and follow-up was analyzed using a Pearson's correlation at each time point. The relationships between social support and the health outcome measures of BMI, depression, and satisfaction with life were analyzed using a Pearson's correlation at baseline and post-intervention. The results of these correlations will show the relationship between social support, physical activity, BMI, depression, and satisfaction with life before and after the intervention.

<u>Aim 3</u>

Finally, comparing completers and non-completers on levels of social support at baseline was done using an Independent samples *t*-test (comparing baseline level of social support for those who completed the intervention to those who did not complete the intervention). For the completers of the intervention, a Spearman correlation was used between percentage of sessions attended and level of social support at baseline. Results from this will assess if social support at baseline will predict adherence to the intervention.

Chapter IV: Results

Participants

There were 70 mothers who completed baseline testing and were randomized into the standard (N = 35) or intervention (N = 35) group. Of these mothers, 54 (77%) completed post-intervention measures and 38 (54%) completed follow-up testing. An intent-to-treat protocol was used to analyze all data such that all baseline values for mothers who failed to return for future measurements were carried through at equal value. The intent-to-treat protocol was not used for data utilized in Aim 3 as it assessed adherence rates. The mean age of the participants was 39.4 years (SD 9.6) with a mean BMI at baseline of 30.9 (SD 7.4). Participants were mostly married (67.1%), Caucasian (52.9%), and had some form of education higher than a high school diploma (90%). At baseline, the mean score for total social support was 82.0 (19.6). In addition, mothers with a child 5 years old and younger had a mean score of 79.6 (18.0) compared to 83.5(20.7) for mothers with a child older than 5 years. Further detailed characteristics can be seen in Table 3.

Intervention Effects on Social Support

Mean scores for social support across the intervention are displayed in Table 4. The ANOVA revealed no significant main effect of time [F(2,130) = 1.223, p = .298] or time by group interaction [F(2,130) = .963, p = .385] for total social support. There were no significant changes in social support for either group across the three different time points. Each of the four social support subscales showed similar results. There were no statistically significant main effects of time for tangible social support (p = .338), affectionate social support (p = .359), positive social support (p = .226), or emotional

social support (p = .652). There were no statistically significant group by time interactions for tangible social support (p = .09), affectionate social support (p = .760), positive social support (p = .390), or emotional social support (p = .651). Complete results for each ANOVA are displayed in Table 5.

Table 3

TABLE 3 Participant Demographics at Baseline

TABLE 31 articipant Demographics at Ba	Freq(%)				
Variable	Intervention (N=35)	Standard (N=35)			
Age, mean (SD)	39.86(9.21)	39(10.03)			
BMI, mean (SD)	32.21(7.84)	29.68(6.71)			
Normal (>25 kg/ m^2)	6(17.1)	9(25.7)			
Overweight $(25-29.9 \text{ kg/}m^2)$	10(28.6)	15(42.9)			
Obese ($\geq 30 \text{ kg/}m^2$)	19(54.3)	11(31.4)			
Daily Avg Steps, mean (SD)	6716.9(2599.6)	6373.3(3461.3)			
Daily Avg Activity Minutes, mean(SD)	18.7(15)	18.9(18.9)			
Race					
Caucasian	17(48.6)	20(57.1)			
African American	17(48.6)	10(28.6)			
Other	1(2.9)	5(14.4)			
Marital Status					
Married	22(62.9)	25(71.4)			
Never Married	7(20.6)	4(11.4)			
Separated/Divorced	5(14.3)	6(17.1)			
Other	1(2.9)				
Education					
High School Diploma or less	2(5.7)	5(14.3)			
1-3 yrs college	8(22.9)	7(20)			
College/university graduate	18(51.4)	12(34.3)			
Masters	7(20.6)	11(31.4)			
Number of Children					
1	13(37.1)	16(45.7)			
2 or more	22(62.9)	19(54.3)			

The Relationship Between Physical Activity and Social Support

The associations between physical activity (i.e., average daily step count and average daily activity minutes) and social support (total and sub-scales) at each time point (e.g., relationship between step counts at baseline and social support at baseline)

were assessed using Pearson's correlation. All correlations are small in magnitude according to Cohen's guidelines of r=.1, .3, and .5 for small, moderate, and large relationships. The only statistically significant relationship was between average daily step count and average daily activity minutes at baseline and emotional social support at baseline; r=.285, p=.026 and r=.291. p=.030 respectively. Complete results are displayed in Table 6.

Table 4

TABLE 4 Mean (Standard Deviation [SD]) Scores for Social Support Across the Intervention and Follow-Up (SS)

	1. Baseline	2. Post-	3. Follow-up
	Mean (SD)	intervention	Mean (SD)
		Mean (SD)	
Total SS			
Intervention	80.74(19.13)	77.81(20)	79.78(21.77)
Standard	83.23(20.58)	83.28(20.38)	84.41(19.71)
Tangible SS			
Intervention	81.80(20.43)	76.47(22.82)	78.31(24.58)
Standard	80.49(25.38)	81.44(22.99)	82.77(21.43)
Affectionate SS			
Intervention	84.07(20.76)	88.13(19.33)	82.60(22.03)
Standard	90.15(18.34)	88.13(19.33)	89.89(18.96)
Positive SS			
Intervention	78.68(21.62)	75.98(24.26)	80.88(24.83)
Standard	82.07(22.64)	83.33(21.86)	84.09(23.21)
Emotional SS			
Intervention	78.95(19.95)	76.20(22.05)	77.31(23.40)
Standard	80.21(22.12)	80.22(22.05)	80.89(22.79)

Notes: SS = Social Support; Social Support scores range from 0-100

Relationships among Social support, and health outcomes

The relationships between social support (total and subscales), physical (BMI) and psychological (depression) health and overall satisfaction with life at baseline and post-intervention were assessed using Pearson product moment correlations. At baseline, satisfaction with life was significantly associated with total social support (r = .43, p = .43).

.00), tangible (r = .32, p = .01), positive (r = .46, p = .00), affectionate (r = .44, p = .00), and emotional (r = .38, p = .00) social support. Social support was not significantly associated with depression or BMI at baseline. All values at baseline are reported in Table 7. At post-intervention, satisfaction with life was associated with total social support (r = .45, p = .00), tangible (r = .35, p = .00), positive (r = .45, p = .00), affectionate (r = .44, p = .00), emotional (r = .39, p = .00) social support. Social support was not associated with depression or BMI. All values at post-intervention are reported in Table 8.

Table 5

Table 5. ANOVA on Subscales of Social Support

	df	F	<i>p</i> -value
Tangible SS			_
Time	(1.8, 117.9)	1.07	.34
Time by Group	(1.8, 117.9)	2.55	.09
Affectionate SS			
Time	(2, 130)	1.03	.36
Time by Group	(2, 130)	2.75	.76
Positive SS			
Time	(2,130)	1.50	.23
Time by Group	(2, 130)	.95	.39
Emotional SS			
Time	(2, 130)	.43	.65
Time by Group	(2, 130)	.43	.65

Note: SS = Social Support

Relationship between social support and intervention adherence

Completers and non-completers of the intervention were compared on baseline social support levels using an independent samples *t*-test. The purpose of this analysis was to determine whether baseline social support levels were significantly different for completers (i.e., mothers who provided data at post-intervention) compared to non-completers (i.e., mothers who did not provide data at post-intervention). Completers and

non-completers were compared on other baseline variables to identify subgroups of mothers who might be more likely to complete the intervention. Tangible, emotional, and total social support at baseline were all significantly higher among mothers who completed the intervention compared to non-completers (t = 1.141 p = .009, t = 1.597 p = .023, t = 1.388 p = .008, respectively) and approached significance for positive and affectionate social support (t = 1.318 p = .086, t = 1.869 p = .067, respectively). There were no statistically significant differences between completers and non-completers by age, number of children, age of youngest child, or body mass index. The results are displayed in Table 9.

Table 6

TABLE 6 The relationship between physical activity and Social Support

	Steps	Act Min	Steps Post-	Act Min	Steps	Act Min
	Baseline	Baseline	Intervention	Post-	Follow-	Follow-up
				Intervention	up	
	r(p)	<i>r</i> (<i>p</i>)	r(p)	r(p)	r(p)	r(p)
Total SS	.24(.06)	.24(.07)	.09(.49)	.01(.49)	.11(.38)	00(.99)
Tangible SS	.13(.96)	.18(.18)	06(.63)	04(.78)	.06(.64)	07(.57)
Positive SS	.24(.06)	.24(.08)	.09(.47)	.09(.47)	.11(.40)	.02(.91)
Affect. SS	.23(.07)	.18(.18)	.16(.20)	.17(.26)	.12(.36)	.00(.97)
Emot. SS	.29(.03)*	.29(.03)*	.13(.31)	.15(.26)	.13(.31)	.05(.72)

^{*}Note: Time point of social support measures correspond to the physical activity time at same time points. Significance is noted by an asterisk, alpha level was set at p<.05. Affect. SS= Affectionate social support; Emot. SS= Emotional social support.

The strength of the relationship between social support and intervention adherence was analyzed among completers using a Spearman's Correlation between the percent of sessions attended and the level of social support at baseline. Among completers, attendance percentage had a statistically significant relationship with tangible

social support (ρ = .274, p = .049), positive social support (ρ = .315, p = .023), and total social support (ρ = .314, p = .02). These relationships were moderate in magnitude according to Cohen's guidelines (Cohen, 1992). At baseline, tangible, positive, and total social support had a significant correlation with the percentage of sessions attended throughout the intervention. Mothers with higher levels of social support were more likely to have higher attendance during the intervention. All values are presented in Table 10.

Table 7

Table 7. Satisfaction with Life and Depression Relationships at Baseline

Table 7. Dai	ustacu	<i>)</i>	one and bep	CSSIUII	ixciatioi	isinps a	t Dascii	
	BMI	SWL	Depression	Total	Tan.	Pos.	Aff.	Emot.
				SS	SS	SS	SS	SS
BMI	1							
SWL	12	1						
Depression	15	26*	1					
Total SS	.01	.43**	16	1				
Tan. SS	.04	.32**	11	.90**	1			
Pos. SS	.01	.47**	14	.93**	.78**	1		
Aff. SS	05	.44**	17	.90**	.71**	.80**	1	
Emot. SS	.02	.38**	16	.95**	.80**	.86**	.85**	1

Note: Significance is noted by an asterisk; one asterisk notes the alpha level set at p<.05, two asterisks notes the alpha level set at p<.01. SWL: Satisfaction with Life, Tan SS: Tangible social support, Pos: Positive social support, Aff: Affectionate social support, Emot: emotional social support.

Table 8. Satisfaction with Life and Depression Relationships at Post-Intervention

	BMI	SWL	Depression	Total	Tan.	Pos.	Aff.	Emot.
				SS	SS	SS	SS	SS
BMI	1							
SWL	27	1						
Depression	.08	28*	1					
Total SS	09	.45**	14	1				
Tan. SS	.06	.35**	09	.84**	1			
Pos. SS	14	.45**	15	.95**	.68**	1		
Aff. SS	10	.44**	11	.91**	.66**	.86**	1	
Emot. SS	15	.39**	16	.96**	.73**	.93**	.84**	1

Note: Significance is noted by an asterisk; one asterisk notes the alpha level set at p<.05, two asterisks notes the alpha level set at p<.01. SWL: Satisfaction with Life, Tan SS: Tangible social support, Pos: Positive social support, Aff: Affectionate social support, Emot: emotional social support.

Table 9. Independent t-test Comparing Completers and Non-completers on Baseline Variables

v arrabics				
	Mean(SD)	Mean(SD)		
	<u>Completers</u>	Non-completers	<u>t value</u>	<i>p</i> value
Age	40.3(9.4)	36.4(9.7)	1.465	.839
Number of Children	1.2(1)	2(1.2)	571	.336
Age of Youngest Child	10.3(8.1)	8.0(7.3)	1.019	.601
BMI	30.9(7.4)	31.1(7.5)	107	.996
Avg. Daily Steps	6702.6(3160.2)	5832.7(2602.3)	.884	.560
Avg. Daily Act. Min.	19.9(17.5)	14.7(15.6)	.934	.773
Tangible SS	83.6(19.3)	74.2(31.3)	1.141	.009*
Positive SS	82.2(19.5)	74.0(28.7)	1.318	.086
Affectionate SS	89.4(16.8)	79.2(25.8)	1.869	.067
Emotional SS	82.0(17.1)	69.9(28.7)	1.597	.023*
Total SS	84.3(16.1)	74.3(27.4)	1.388	.008*

Note: Significant values are marked with an asterisk, alpha level set at p < .05.

Table 10. Correlation between Social Support at Baseline and Perce

Table 10. Correlation between Social Support at Baseline and Percent of Sessions Attended among Completers of the Intervention

Social Support	Attendance %			
	ρ	<i>p</i> -value		
Tangible SS	.274	.049*		
Positive SS	.315	.023*		
Affectionate SS	.244	.111		
Emotional SS	.249	.075		
Total SS	.314	.024*		

Note: Significant values are marked with an asterisk, alpha level

Chapter V: Discussion

Previous research has identified low physical activity in mothers along with many factors that have been associated with this trend. One of those factors, social support, has been identified has having consistent positive associations with physical activity and might improve physical activity adherence among mothers. Given that there is a current lack of literature examining factors to physical activity adherence, there is a need for a study that investigates the relationship between social support and physical activity in mothers. The purpose of the study was to: determine if social support changes across an intervention, assess the relationships between social support, physical activity, and health measures such as BMI, depression, and satisfaction with life, and examine the relationship between social support and intervention adherence among mothers enrolled in a physical activity intervention.

The purpose of Aim I was to assess change in social support across three time points of a physical activity intervention. It was hypothesized that social support would increase across the intervention. Throughout the intervention, the analyses showed that social support did not change over time. This was true for total social support and also for all subscales (tangible, emotional, affectionate, and positive) of social support. This finding was in contrast to previous research. In an experimental study conducted on mothers with young children, participants in the intervention group that received a print information handout and a discussion meeting had a positive residual increase in partner social support ($\Delta = .08$) (Miller et al., 2002). The change in social support seen in that study could have been due to two factors: the social support scale used and the discussion meetings that were part of the intervention. The partner social support was measured

from a modified version of a social support scale that measured specifically physical activity social support. In terms of the discussion meeting, partner support was a topic that was brought up by the participants and emerged as an issue and therefore created discussions specifically due to the lack of support in the group (Miller et al., 2002). A change in social support was also seen in a separate study with a slightly different population (Aliabad et al., 2014). Coronary heart patients who previously completed a rehabilitation program were enrolled in the intervention (Aliabad et al., 2014). The group receiving the intervention was given a health action plan focusing on intention/motivation and self-efficacy (Aliabad et al.). Throughout the study, there was an increase in social support in the intervention group (Aliabad et al.). The increase that was reported was most likely do with the fact that the spouse or most significant person in the participant's life was invited to attend the last health education discussion meeting where strategies on increasing social support were discussed (Aliabad et al.). Having someone attend the session with them could have made them feel supported in such a way that their social support increased. The measurement of social support was not specified in the study so it is unclear if that could have played an additional role in understanding why there was an increase in social support in that study and not the current.

Given that the results of the current study were not supported by previous research, the following are suspected reasons for a lack of change in social support across the intervention. First, participants in the present study had relatively high levels of social support at baseline and this might have resulted in a ceiling effect. A previous study evaluating social support in postpartum women reported a mean total social support score at baseline of 76.9 (24.9), a difference of +6.33 (standard group) and +3.84 (intervention

group) for the current study (Surkan, Peterson, Hughes, & Gottlieb, 2006). With participants already having high social support, it is possible that it prevented them from further increasing their physical activity throughout the intervention, like most previous research reports. Perhaps if recruitment was aimed toward a population of mothers with low social support levels at baseline, a more pronounced and significant increase in social support would occur during the intervention. A second possible reason for a lack of change in social support could be related to the measurement of social support. The scale created by Sherborne and Stewert was created to assess general social support, not physical activity social support. Given that current available physical activity social support scales do not include specific subscales, the scale created by Sherborne and Stewert was used. However, this scale did not directly ask participants about physical activity and might not have been as sensitive to change as a physical activity social support measure. The scale includes statements related to support levels such as "someone to help you if you were confined to bed" and "someone to prepare your meals if you were unable to do it yourself" (Sherbourne & Stewart, 1991). In addition to high baseline social support levels and the lack of a physical activity social support scale, the characteristics of the intervention could have been a third possible reason for the lack of change in social support. The education lessons, based on the Diabetes Prevention Program Manual, were organized in such a way that social support was only highlighted for one out of the six weeks. This may not have been long enough to elicit a change in their behaviors. In addition to the content of the lessons, they lasted approximately 10 minutes with the intervention lasting 6 weeks. Although previous research has shown that the overall length of the intervention is consistent with what has been seen in successful

behavioral interventions, the educational lessons in successful previous studies were longer than 10 minutes (Cramp & Brawley, 2006; Mailey & McAuley, 2014; Miller et al., 2002). Although no change in social support was seen across the intervention, it is important to highlight that three novel ideas were found from this first aim: the need for a physical activity social support scale with subscales to measure different types of physical activity social support is needed, populations with low social support at baseline should be targeted, and more information and longer health education lessons directed towards developing social support might improve the effectiveness of the intervention.

The purposes of aim II were divided into two parts: to explore the relationships between social support and physical activity across all three time points and to explore the relationships among social support and health outcomes (BMI, satisfaction with life, and depression) at baseline and post-intervention. It was hypothesized that there would be a positive relationship between social support and physical activity at all three time points. It was also hypothesized that there would be a positive relationship at baseline and post-intervention between social support, and satisfaction with life and a negative relationship between social support, BMI, and depression. In general, there were no relationships found between social support and physical activity, BMI, and depression and these findings are not supported by previous research. There was a moderate positive relationship between social support and satisfaction with life and this is consistent with previous research. The relationships between social support and physical activity, depression, and satisfaction with life have all been previously documented (Allender et al., 2006; Eyler et al., 1999; Treiber et al., 1991; Trost et al., 2002; Van der Horst et al., 2007; Wendel-Vos et al., 2007). For example, in a study examining the relationship

between social support and physical activity among a diverse sample of women, a positive relationship was reported (Eyler et al., 1999). Participants reporting medium or high amounts of social support were less likely to be inactive than those reporting no or low social support (OR = 0.57) (Eyler et al.). However, the measurement of social support in the current study differed from Eyler et al. where social support was measured from a scale that specifically measures physical activity social support (Eyler et al.). Numerous reviews have documented the positive effects of social support and physical activity, satisfaction with life, and lack of depressive symptoms. Two studies previously highlighted focused on the positive relationship between social support and satisfaction with life and negative relationship between social support and depression (Newsom & Schulz, 1996; Strine et al., 2009). The lack of relationships related to social support for the current study could relate back to the social support scale used, given that it was designed for general social support assessment, not physical activity social support assessment. Although the participants may have felt they received social support in a general aspect, they may not be able to say the same in a situation related to physical activity. One suspected reason for the lack of relationships found is that the population used in this study could have had relatively high levels of social support, low levels of depression, high levels of satisfaction with life, and a healthy BMI. Thus, low-levels of variability in each of these study variables might have reduced the ability to detect significant relationships among variables that have been found in previous research. Given that this intervention is a walking study, the participants who enrolled could have been biased towards wanting to be healthy or already were healthy with high levels of social support (i.e., self-selection bias). Future studies might consider examining these

variables among a sample of mothers with greater variability in social support and health outcomes.

The purpose of aim III was to compare completers and non-completers on levels of social support at baseline. It was hypothesized that social support would be higher among mothers with greater adherence to the intervention. In comparison of completers and non-completers at baseline, social support (total and all subscales) was higher in completers than non-completers. In addition, intervention session attendance was significantly associated with social support (total, tangible, and positive). This suggests that individuals with higher levels of social support at baseline are more likely to attend and complete the intervention. This is an important finding for future interventions. Participants' social support levels at baseline can allow study investigators to identify them based on their level of social support and target them to have better adherence to the intervention through increasing their social support. Although there is a lack of research evaluating the relationship between adherence to physical activity and social support, previous research has been associated with the engagement of physical activity and social support (Trost et al., 2002). A systematic review examined 9 studies that measured social support and found a positive relationship between social support and physical activity in every single study (Trost et al., 2002). Women with low social support were up to 55% more likely to be insufficiently active (Trost et al.). Although the previous analyses showed that there was no association between physical activity and social support, a significant relationship between social support and adherence to the intervention was found. It is possible that the participants with high general social support were able to utilize that support to prioritize the intervention. For example, the participants might have been able to utilize their social support to delegate other tasks (family, work, personal time) in order to commit to other things, such as the physical activity intervention. In addition, the participants' high levels of social support may be negatively associated with stress. This idea was highlighted by a piece of literature that discusses the stress-buffering effect social support has (Thoits, 2011). Thoits discusses how social support acts as a stress-buffer as a means to improve physical and psychological health through an array of mechanisms including belonging/companionship and perceived support availability (Thoits, 2011). With lower stress levels, it is possible that the participants were more able to prioritize and make a stronger effort in attending the intervention sessions. Future studies using a physical activity specific social support scale that measures different types of social support might help researchers better understand how social support impacts intervention adherence.

Limitations/Future Directions

Although the current study provided important findings, there were some limitations. One limitation that has been highlighted through the discussion is the social support scale used. Since the scale was not focused on specifically measuring physical activity social support, it is possible that general social support measure was not specific enough to show relationships with physical activity or change during a brief physical activity intervention. Second, the intervention was not solely focused on social support and the time frame of each health education lesson was brief. Lastly, the sample of participants recruited for this study is a limitation. Since the participants have generally high levels of social support at baseline, no significant increase was seen across the intervention. In addition to the high social support levels, the wide age range of the sample was a

limitation. It is possible that mothers may have decreased social support levels during a certain age group or stage of motherhood.

Given these limitations, the following are some future directions for the current study. Since most of the mothers in this study had high levels of social support, future studies should consider recruiting a sample of mothers with low social support to better understand the impact of this intervention on social support and the relationships among social support, physical activity, and health outcomes. This could be done through pretrial screening, excluding participants who are already meeting appropriate levels of physical activity and social support. In addition to pre-trial screening for social support and physical activity levels, future researchers should consider adding a measure of social support that includes subscales and is specific to physical activity. Such a scale does not exist and future researchers should be consider creating this type of measure for a more accurate representation of a participant's physical activity social support. Another suggestion for future research would be to include both a physical activity social support scale along with a general social support scale to compare results. Future studies will then have the ability to gain more detailed information about not only participants' general social support, but also their levels of specific types of physical activity social support. Finally, when creating a future intervention aimed at increasing physical activity and social support among mothers, an intervention that has longer education lessons and more lessons focused on social support might result in larger increases in social support. The education lessons could be re-organized so that social support examples are continually provided throughout the entire physical activity intervention. In addition, the educational lessons could be longer in duration to aid in providing added time for social support

discussion. A second suggestion would be to provide more than just group sessions to increase social support, especially among mothers who already have high levels of social support. This could be done through inviting significant others to attend with them, incorporated their children in the walk, or by creating partners within the intervention to hold each other accountable.

There are some notable public health implications of this study. When creating a physical activity program for mothers, a public health practitioner should focus on baseline levels of social support in mothers. Given that social support at baseline was associated with adherence to the intervention, identifying mothers with low social support at the beginning of the program could help to prevent dropout and improve participation in the program. By increasing social support, mothers in a physical activity program will be more likely to attend. Some physical activity is better than none and it is important to identify any aspect of a program that can aid in increasing physical activity.

Summary

The current findings provide novel discoveries within the topic of social support and physical activity of mothers: a new association between baseline social support and intervention adherence and the need for a new physical activity social support scale.

There are physical activity-specific social support scales, however, this study determined that a physical activity scale that includes subscales needs to be created. In addition, social support levels at baseline are positively associated with adherence to an intervention. Given that this study measured general social support, this study suggests that individuals need to focus specifically on social support for physical activity and that should be included in future interventions.

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Appendix A



EAST CAROLINA UNIVERSITY

University & Medical Center Institutional Review Board Office 4N-70 Brody Medical Sciences Building Mail Stop 682 600 Moye Boulevard · Greenville, NC 27834

Office 252-744-2914 · Fax 252-744-2284 · www.ecu.edu/irb

Notification of Initial Approval: Expedited

From: Biomedical IRB
To: Deirdre Dlugonski

CC:

Date: 5/30/2014

Re: UMCIRB 14-000864
Moms UNITE for Health

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 5/29/2014 to 5/28/2015. The research study is eligible for review under expedited category #4,6,7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name Description

Collective Efficacy Surveys and Questionnaires
Data Collection Sheet Surveys and Questionnaires

Debriefing Statement Debriefing Statement

Demographics Surveys and Questionnaires

Flyer Recruitment Documents/Scripts

Focus Group Questions.docx Interview/Focus Group Scripts/Questions

Grit Surveys and Questionnaires
HADS_D Surveys and Questionnaires
Hope Scale Surveys and Questionnaires

ICD Consent Forms

IPAQ Surveys and Questionnaires par-q Surveys and Questionnaires Perceived Stress Scale Surveys and Questionnaires

Protocol Study Protocol or Grant Application

Satisfaction with Life
Surveys and Questionnaires
Self-efficacy
Surveys and Questionnaires
SF 36
Surveys and Questionnaires
Social Support
Surveys and Questionnaires
Surveys and Questionnaires
Recruitment Documents/Scripts

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418 IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418

Appendix B





Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Moms UNITE for Health (Moms <u>U</u>sing <u>N</u>etworks to <u>Increase</u>

<u>T</u>ogetherness and <u>E</u>fficacy for Health) Principal Investigator: Dr. Dee Dlugonski

Institution/Department or Division: East Carolina University

Address: 401 Ficklen Drive, 160 Minges Coliseum, Greenville, NC 27858

Telephone #: 252.328.5266

Study Sponsor/Funding Source: ECU startup funds

Researchers at East Carolina University (ECU) study problems in society, health problems, environmental problems, behavior problems, and the human condition. Our goal is to try to find ways to improve the lives of you and others. To do this, we need the help of volunteers who are willing to take part in research.

Why is this research being done?

The purpose of this research is to compare two different health education and physical activity programs for mothers in the local community. The decision to take part in this research is yours to make. By doing this research, we hope to learn about how to increase your current level of physical activity. We also want to measure changes that occur during this program.

Why am I being invited to take part in this research?

You are being invited to take part in this research because you are a mother between the ages of 18-64 years old with at least one child under 26 years residing in your home and are healthy enough to safely participate in physical activity. If you volunteer to take part in this research, you will be one of about 100 people to do so.

Are there reasons I should not take part in this research?

If you are currently pregnant or under 18 years of age you should not volunteer to participate in this study.

What other choices do I have if I do not take part in this research?

You can choose not to participate.

Where is the research going to take place and how long will it last?

All of the testing sessions will be conducted in a research lab in Minges Coliseum. You will be invited to attend an information session where program staff will describe the study and answer your questions. If you volunteer to participate, we will ask you to complete measurements before the program begins. This information and measurement session will last approximately 1 hour. The walking program will be held at a local park or recreation facility. This program will last for 6 weeks and you will be asked to attend three, one-hour sessions during each week. This is a total of 18 one-hour sessions during the 6-week program. After the 6-week program, we will ask you to attend a one-hour session to measure changes that occurred during the program and a one hour group interview to learn more about your experiences in the intervention. We may also ask you to participate in one additional testing session 3-months after the walking program ends. This final testing session will be identical to the testing sessions that you will participate in before and immediately after the walking program.

What will I be asked to do?

You are being asked to do the following: complete a testing session before the walking program, participate in the walking program, and then complete a testing session and group interview after the 6-week walking program. The group interview will be audio recorded.

The testing sessions before and after the walking program will last approximately 1 hour and will consist of the following measurements:

- Complete a packet of questionnaires. We will ask you to provide information about yourself, your current and previous physical activity, stress, depression, and your overall health.
- Complete the following measurements with one member of the research staff: height, weight, and waist circumference.
- At the end of each of the testing sessions we will ask you to wear an accelerometer for one week. The accelerometer is a small unit, similar to a pedometer. You will wear this unit on a belt around your waist. We will ask you to put this unit around your waist in the morning when you get out of bed and take it off in the evening before you go to sleep. You should take the unit off during any water activities, such as bathing, showering, or swimming. At the end of 7 days, we will ask you to return the accelerometer.

During the 6-week walking program, we will ask you to:

- Attend three, one-hour sessions during each week.
- Listen to brief health education lessons about strategies for increasing your physical activity.
- Participate in group walking sessions with other program participants.

What possible harms or discomforts might I experience if I take part in the research?

There are possible risks (the chance of harm) when taking part in this research. For example, you might feel embarrassed if you are reporting low levels of physical activity. You might also feel uncomfortable when sharing information about your physical activity in a group setting during the educational sessions. Physical activity has many benefits, but there are small risks of muscle soreness, injury, and/or a cardiovascular event when participating in physical activity. These risks are no greater than you would experience walking during your daily life.

What are the possible benefits I may experience from taking part in this research?

This research will help you to learn about how to increase your current level of physical activity. Physical activity has many benefits for your physical and mental health. This research will help us to learn more about how to promote physical activity among mothers. This information may help us to design a community-based physical activity program for other mothers like you. In addition to improving your own health, the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?

We will be able to pay you for the time you volunteer while being in this study. You will receive a \$25 Target gift card after you complete the testing session and return the accelerometer at the beginning of the program. You will receive a second \$25 Target gift card after you complete the testing session and return the accelerometer at the end of the program. You will receive a final \$25 Target gift card when you complete the 3-month follow-up testing session and return the accelerometer.

What will it cost me to take part in this research?

You will be expected to pay for the following costs, which result directly from the following research procedures: any costs related to travelling to/from the research site.

Who will know that I took part in this research and learn personal information about me?

To do this research, ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- Any agency of the federal, state, or local government that regulates human research. This
 includes the Department of Health and Human Services (DHHS), the North Carolina
 Department of Health, and the Office for Human Research Protections.
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff, who have responsibility for overseeing your welfare during this research, and other ECU staff who oversee this research.

How will you keep the information you collect about me secure? How long will you keep it?

The information we collect will be stored in a locked cabinet within a locked office in 160 or 172 Minges Coliseum on the East Carolina University campus. Only research study staff members will have access to this information. An ID code will be used in place of your name on all data collection materials. The link between your name and ID number will be maintained throughout the study for contact purposes and then destroyed after the study has been completed. The information gained from this study will be used to create scientific presentations and publications. Information gathered in this study will be kept for 7 years.

What if I decide I do not want to continue in this research?

If you decide you no longer want to be in this research after it has already started, you may stop at any time. You will not be penalized or criticized for stopping. You will not lose any benefits that you should normally receive.

Who should I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator, Dr. Dee Dlugonski, at 252.328.5266 (Monday through Friday, between 9am and 5pm).

If you have questions about your rights as someone taking part in research, you may call the Office for Human Research Integrity (OHRI) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the OHRI, at 252-744-1971

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

Participant's Name (PRINT)	Signature	Date
Person Obtaining Informed Consent: have orally reviewed the contents of the and answered all of the person's question	consent document with the	
Person Obtaining Consent (PRINT)	Signature	Date
Deirdre Dlugonski Principal Investigator (PRINT)	Signature	Date