

Electronic Thesis and Dissertation Repository

9-29-2014 12:00 AM

Move More Mommy: A Web-Based Physical Activity Intervention for Postnatal Women (Pilot Study)

Sarah Gray
The University of Western Ontario

Supervisor
Anita Cramp
The University of Western Ontario Joint Supervisor
Shauna Burke
The University of Western Ontario

Graduate Program in Health and Rehabilitation Sciences
A thesis submitted in partial fulfillment of the requirements for the degree in Master of Science
© Sarah Gray 2014

Follow this and additional works at: <https://ir.lib.uwo.ca/etd>



Part of the [Maternal and Child Health Commons](#)

Recommended Citation

Gray, Sarah, "Move More Mommy: A Web-Based Physical Activity Intervention for Postnatal Women (Pilot Study)" (2014). *Electronic Thesis and Dissertation Repository*. 2472.
<https://ir.lib.uwo.ca/etd/2472>

This Dissertation/Thesis is brought to you for free and open access by Scholarship@Western. It has been accepted for inclusion in Electronic Thesis and Dissertation Repository by an authorized administrator of Scholarship@Western. For more information, please contact wlsadmin@uwo.ca.

*MOVE MORE MOMMY: A WEB-BASED PHYSICAL ACTIVITY INTERVENTION
FOR POSTNATAL WOMEN (PILOT STUDY)*

(Thesis format: Integrated Article)

by

Sarah Gray

Graduate Program in Health and Rehabilitation Sciences

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science

The School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

© Sarah Gray 2014

Abstract

Despite the many benefits of physical activity, postnatal women are not currently meeting Health Canada Guidelines of 150 minutes per week of moderate-vigorous physical activity. This study, *Move More Mommy*, used a mixed methods design to test the feasibility and acceptability of a web-based intervention combined with a group mediated cognitive behavioural approach, and its effectiveness to increase physical activity, self-efficacy, and group cohesion among postnatal women. Participants received an 8-week intervention delivered through 8 group exercise classes and a purpose built website. From baseline to post-intervention, participants significantly increased self-reported physical activity levels and group cohesion. Objectively measured physical activity levels and self-efficacy showed no significant change. Quantitative and qualitative data on feasibility and acceptability showed that this method of delivery is feasible and acceptable among postnatal women and provides preliminary evidence on the effectiveness of a web-based physical activity intervention for postnatal women.

Keywords

Physical activity, exercise, intervention, postnatal, postpartum, social cognitive theory, pilot study, group mediated cognitive behavioural, online, website, web-based, self-efficacy.

Acknowledgments

First and foremost, I would like to acknowledge my supervisors Dr. Anita Cramp and Dr. Shauna Burke who helped me throughout the research and writing process. Without their guidance and countless hours of editing, this thesis would not be in the hands of the reader today. Thank you so much for all of your time and I value everything I have learned from you over the past two years. I would also like to thank Amy Kossert, who was an essential part of the research team as the qualitative expert. Thank you also for taking the time to read over and make edits to my thesis and help me in the analysis, as well as writing process. I would also like to acknowledge the YMCA of London for welcoming our participants into their facilities.

Table of Contents

Abstract.....	ii
Acknowledgments.....	iii
List of Tables	vi
List of Figures.....	vii
List of Appendices	viii
List of Abbreviations	ix
Chapter 1.....	1
1 Introduction	1
1.1 The Postnatal Period and Physical Activity.....	1
1.2 Physical Activity Participation During the Postnatal Period.....	2
1.3 Benefits of Physical Activity During the Postnatal Period.....	3
1.4 Literature Review: Postnatal Physical Activity Interventions.....	4
1.5 The Importance of Theory to Inform Physical Activity Behaviour Change	8
1.6 Exercising as a Group.....	9
1.7 Group Mediated Cognitive Behavioural Approach.....	10
1.8 Web-based Physical Activity Interventions.....	11
1.9 Present Study	12
1.10 Bibliography	13
Chapter 2.....	23
2 <i>Move More Mommy</i> : Feasibility and Acceptability of a Web-Based Physical Activity Intervention for Postnatal Women	23
2.1 Introduction.....	23
2.2 Method.....	27
2.3 Results.....	36
2.4 Discussion.....	43
2.5 Bibliography	48
Chapter 3.....	54

3	<i>Move More Mommy: Change in Physical Activity, Self-Efficacy, and Group Cohesion from a Web-Based Physical Activity Intervention for Postnatal Women</i>	54
3.1	Introduction.....	54
3.2	Method.....	59
3.3	Results.....	65
3.4	Discussion.....	67
3.5	Bibliography	70
	Chapter 4.....	76
4	Discussion.....	76
4.1	Feasibility	76
4.2	Acceptability.....	78
4.3	Physical Activity.....	79
4.4	Self-Efficacy	80
4.5	Group Cohesion.....	81
4.6	Strengths and Limitations	82
4.7	Future Research.....	83
4.8	Conclusion	84
4.9	Bibliography	85
	Appendices.....	100
	Curriculum Vitae	134

List of Tables

Table 1 Previous Postnatal Physical Activity Interventions, Study Characteristics	88
Table 2 Participant Demographic Information	90
Table 3 Feasibility: Website Usage Statistics	92
Table 4 Item Means: Modified Treatment Evaluation Inventory (Short Form)	93
Table 5 <i>Actical</i> Cutpoints (counts per minute)	94
Table 6 Reliability Values (Cronbach Alpha)	95
Table 7 Results - Self-Report Physical Activity, Self-Efficacy, and Group Cohesion Measures	96
Table 8 Website Features	97
Table 9 Social Cognitive Theory (SCT) Constructs	98
Table 10 Accelerometer data	99

List of Figures

Figure 1: Identification of studies in literature review.....	5
Figure 2: Participant Flow	37
Figure 3: Participant Flow (2).....	63

List of Appendices

Appendix A: Recruitment Materials.....	100
Appendix B: Measures.....	102
Appendix C: Letter of Information and Informed Consent	114
Appendix D: Website.....	122
Appendix E: Weekly Video Session Summary	124
Appendix F: Weekly PDF Summaries.....	126

List of Abbreviations

MVPA: Moderate-vigorous physical activity

CHMS: Canadian Health Measures Survey

RCT: Randomized controlled trial

SMS: Short Messaging Service

SCT: Social Cognitive Theory

GMCB: Group-mediated cognitive behavioural

TTM: Transtheoretical Model

TPB: Theory of Planned Behaviour

PA: Physical activity

SE: Self-efficacy

PAGEQ: Physical activity group environment questionnaire

IPAQ-SF: International Physical Activity Questionnaire – Short Form

TEI-SF: Treatment Evaluation Inventory – Short Form

Chapter 1

1 Introduction

Canadian physical activity guidelines recommend that healthy adults should accumulate at least 150 minutes of moderate to vigorous intensity aerobic activity (MVPA) each week, in bouts of 10 minutes or more (Haskell, Lee, Pate, Powell, & Blair, 2007; Tremblay et al., 2011). Regular physical activity is associated with a number of health benefits, including reduced risk of cardiovascular disease and other chronic diseases such as diabetes, increased mood and mental health, and increased cardiovascular endurance and muscle mass (Centers for Disease Control and Prevention, 2011). Despite the many well-known benefits, recent estimates suggest that only 30% of Canadian's waking hours are spent engaging in four hours of light physical activity (Colley et al., 2011). Furthermore it is estimated that only 15% of Canadian adults are currently accumulating 150 minutes per week of MVPA as recommended to gain health benefits (Colley et al., 2011).

1.1 The Postnatal Period and Physical Activity

Data from the Canadian Health Measures Survey (CHMS; Colley et al., 2011) demonstrates that activity levels are low in the population as a whole, however postnatal women have been identified among the least likely to exercise and are commonly found to be less active than women of the same age without young children (Brown, Heesch, & Miller, 2009; Brown, Mishra, Lee, & Bauman, 2000; Brown & Trost, 2003; Drago, 2001; Nomaguchi & Bianchi, 2004; Verhoef, Love, & Rose, 1992). The postnatal period is defined as the period from childbirth through to one year following delivery (Mottola, 2002). While the term postnatal has traditionally been defined as the time period immediately following birth, women continue to face mental and physical health issues, as well as lifestyle and parenting concerns up to one year post delivery (Gennaro & Fehder, 2000; Mottola, 2002). With respect to physical activity, healthy postnatal women are encouraged to follow current guidelines for healthy adults of 150 minutes per week of

MVPA. Many women can resume physical activity as soon as it is medically safe to do so; typically within a few weeks of giving birth (American College of Obstetricians and Gynecologist Committee Opinion 2002:2009, Davies, Wolfe, Mottola & Mackinnon, 2003).

1.2 Physical Activity Participation During the Postnatal Period

Unfortunately, engaging in regular physical activity following the birth of a child has been identified as a challenge for many women (Cramp & Bray, 2011). For example, Brown and Trost (2003) conducted a follow-up study on a four-year longitudinal women's health study ($n = 7281$) and found that women who had babies during this period were significantly more likely to be insufficiently active at follow-up in comparison to women who did not have children during this same period. Similarly, Brown, Heesch, and Miller (2009) surveyed 22535 women from the same longitudinal study. Among this sample, 15.9% identified starting a family over the study period. The birth of a first child was significantly associated with a decrease in physical activity levels ($p < .001$), as was the birth of a second child ($p = .027$; Brown et al., 2009). Furthermore, postpartum women tend to shift from MVPA to light physical activity once their child is born (Mottola & Campbell, 2003; Pereira, et al., 2007). Consequently, women fail to meet physical activity recommendations. For example, in a longitudinal study from pre-pregnancy to 6 months postpartum ($n = 1442$), physical activity levels declined from 9.6 hours per week before becoming pregnant to 8.0 hours per week at 6 months postpartum (Pereira et al., 2007). Participants in this study decreased their moderate and vigorous physical activity; however walking remained consistent. At 6 months postpartum, 78.3% of participants were meeting physical activity recommendations (i.e., 150 minutes of leisure-time physical activity per week; however this included walking and light physical activity as well as MVPA) in comparison to 87.4% prior to pregnancy (Pereira et al., 2007).

1.3 Benefits of Physical Activity During the Postnatal Period

Benefits of physical activity during the postnatal period include reduced risk of chronic disease, less weight retention from pregnancy (O'Toole, Sawicki & Artal, 2003; Rooney & Schauburger, 2002; Sampsel, Seng, Yeo, Killion, & Oakley, 1999), decreased risk of postpartum depression (Daley, MacArthur & Winter, 2007), and improved mood (Brown, Mishra, Lee, & Bauman, 2000; Cramp & Bray, 2010; Daley et al., 2007; Norman, Sherburn, Osborne, & Galea, 2010; Whatley-Blum, Beaudoin, & Caton-Lemos, 2004). Specifically, excess weight gain (O'Toole et al., 2003) and postpartum depression (Armstrong & Edwards, 2004) are two major health concerns following childbirth that can both be mitigated with exercise. For example, O'Toole and colleagues (2003) conducted a randomized control trial in which intervention participants received a diet and physical activity intervention including a weekly educational component for 12 weeks ($n = 21$). Control group participants received a one-hour diet and physical activity session with a dietitian and exercise physiologist ($n = 19$). This intervention led to a significant change in body weight for the intervention group, and weight loss did not change in the control group. Furthermore, there was no significant difference in caloric intake between groups; however, exercise expenditure and vigorous activity had both increased for the intervention group at 12 weeks and 1 year postpartum (O'Toole et al., 2003). Thus, excess weight gain in the postpartum period can be mitigated with increased physical activity. Furthermore, a randomized control trial by Armstrong and Edwards (2004) demonstrates the impact of physical activity on postpartum depression. In this intervention, participants were randomized to either an exercise intervention group, or a control group who received only a social support intervention ($n = 24$). The exercise group saw a significant increase in aerobic fitness levels, and moreover, a significant decrease in depression scores over the 12-week intervention. The social support group did not show significant differences on aerobic fitness level or depression scores (Armstrong & Edwards, 2004).

The known benefits of regular physical activity during the postnatal period and the documented low rates of physical activity following childbirth have prompted the

creation and implementation of a number of studies and interventions specifically seeking to increase physical activity levels among postnatal women.

1.4 Literature Review: Postnatal Physical Activity Interventions

A literature search revealed 18 previous published postnatal physical activity interventions from the earliest date until 2013. Databases Scopus, PubMed, MEDLINE, and PsycINFO were searched using keywords such as “postnatal”, “postpartum”, “new mother”, AND “exercise” OR “physical activity” in combination with “intervention”. Nine hundred and fifty one studies were initially found through the search. In order to be included in the review, studies had to meet the following eligibility criteria: a) be a randomized controlled trial (RCT), pilot study including only an intervention condition, or quasi-experimental study; b) include a physical activity intervention; c) target postnatal women; d) report physical activity levels prior to and after the intervention; and e) be published in an English peer-reviewed journal. Studies were excluded if the outcome data did not consist of leisure time or planned physical activity data. After reviewing titles and some abstracts, there were 82 articles that fit inclusion criteria. Each of the 82 articles were reviewed by two researchers to determine eligibility for inclusion in the review. Nineteen studies were found to fit inclusion criteria, however two were later excluded as one was a duplicate and the other was not specific to postnatal women. A manual search then yielded one additional study and thus, 18 studies were reviewed (as displayed in Figure 1). A summary of each study is displayed in Table 1.

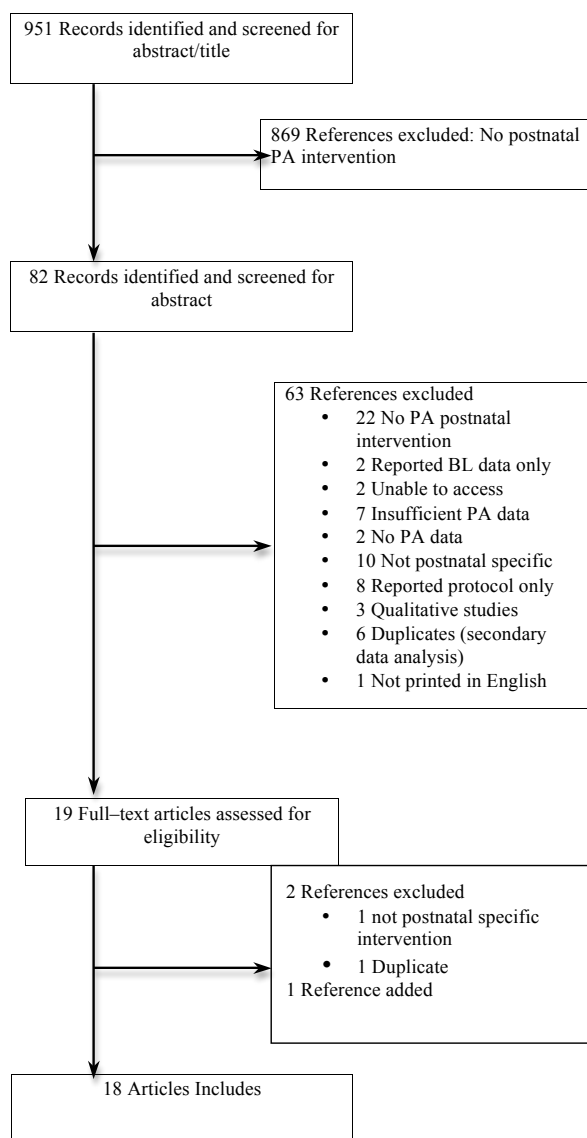


Figure 1: Identification of studies in literature review

Of the 18 intervention studies identified, 12 of these were RCTs; two were pilot studies with no control group and four were quasi-experimental. Ten studies targeted changes in physical activity only; six studies targeted both changes in physical activity and diet/nutrition and two studies targeted changes in physical activity levels and overall health education. Of the included studies, most ($n = 15$) were delivered face-to-face, whereas others were delivered over the phone, and even through short messaging service (SMS) text messaging. Despite many of these intervention studies having strong methodology, including randomized control trials and many based in theory, results have been inconsistent. For example, Chang and colleagues (2010) found no difference in physical activity levels following a 10-week randomized control trial based in Social Cognitive Theory (SCT; Bandura, 1986) delivered primarily through a DVD. A nine-month RCT also based in SCT where intervention participants received healthy eating classes, physical activity classes, and telephone counseling also showed no difference in physical activity levels (Ostbye et al., 2009). Several promising interventions (mostly theory-based), however, guided the development of the current intervention. A brief overview of these interventions follows.

Maturi, Afshary, and Abedi (2011) conducted a RCT delivered using a combination of face-to-face, telephone, and SMS text messaging to 66 participants over a 12-week period. This intervention implemented a walking program using a pedometer in order to increase physical activity and energy expenditure among participants. Participants in the intervention group had an initial face-to-face consultation with a researcher, and subsequently received text message and phone calls as a reminder to increase their pedometer steps until they met their goal. Although this intervention was not specifically based in theory, Maturi and colleagues used techniques such as goal setting and self-regulation (monitoring pedometer steps on a calendar) to successfully increase physical activity levels among the intervention group. Using telephone and SMS text messaging was one strength of this intervention as it was a convenient method of delivery for various lifestyles (Maturi et al., 2011).

Cramp and Brawley (2006) also employed self-regulatory skills based on SCT combined with group dynamic principles, and were effective at increasing physical activity as well as barrier efficacy and outcome expectations among new mothers. In this randomized intervention ($n = 57$), participants were randomized to receive standard exercise, or standard exercise combined with a group mediated cognitive behavioural (GMCB) intervention delivered through six face-to-face sessions. These sessions focused on the development of self-regulatory skills and the ability to overcome barriers specific to postnatal women (Cramp & Brawley, 2006). The GMCB intervention group showed increased confidence to overcome barriers to physical activity and there was a significant difference between groups on physical activity outcomes at post intervention. Unlike Maturi and colleagues (2011), a limitation of this study was the face-to-face delivery method commonly used for GMCB interventions, as it requires a large amount of time from both researchers and participants.

Fjeldsoe, Miller, and Marshall (2010) reduced this previous limitation of face-to-face intervention delivery when they delivered a RCT based in SCT using principally SMS text-messaging ($n = 88$). This 12-week intervention involved only one to two face-to-face goal setting consultations, which were followed by three to five personally tailored SMS text messages each week for the intervention group, based on SCT. Furthermore, each participant had a support person who would also receive SMS text messages each week. By utilizing goal setting techniques, self-monitoring of physical activity goals and rewards, social support, and providing behavioural and cognitive strategies for behaviour change; Fjeldsoe and colleagues significantly increased physical activity levels in the intervention group by post intervention.

Albright, Maddock, and Nigg (2009) conducted a pilot study similar to that of the present study. Albright and colleagues focused on enhancing self-efficacy through techniques such as self-monitoring, goal setting, and including barriers. Social support from family, friends, and peers were also important to the success of this study. Participants ($n = 20$) had one face-to-face session in which they set goals and identified

barriers to physical activity. Subsequently, participants received individualized counseling over the phone and set goals / monitored physical activity behaviours using a pedometer and self-monitoring calendar. Over this 8-week intervention, participants significantly increased their MVPA by over 80 minutes per week.

Collectively, these studies (e.g., Albright et al., 2009; Cramp & Brawley, 2006; Fjeldsoe et al., 2010; Maturi et al., 2010) provide evidence that interventions that include social support or group-based exercise and delivery-methods other than face-to-face intervention approach are promising. Furthermore, theory-based interventions also appear to be promising.

1.5 The Importance of Theory to Inform Physical Activity Behaviour Change

Within the physical activity domain, theory-based interventions have been found to be effective for increasing exercise among a variety of populations (e.g., Marcus et al., 2007; Napolitano et al., 2003; Phillips & McAuley, 2013; Rejeski et al., 2003), including postnatal women (e.g., Aittalso et al., 2008; Albright et al., 2009; Chang, Nitzke, & Brown, 2010; Cramp & Brawley, 2006; Ferrara et al., 2011; Fjeldsoe et al., 2010; Kinnunen et al., 2007; Lewis, Martinson, Sherwood, & Avery, 2011). In designing interventions to increase physical activity behaviour, it is important to examine theories or models to guide the intervention (Glanz, Rimer, & Viswanath, 2008). For example, theories can help to influence people's choices on how to act; also known as mediators or determinants to behaviour change (Brug, Oenema, & Ferreira, 2005). Selecting the appropriate theory and identifying effective interventions strategies to successfully change behaviour is an important part of the study design process (Glanz et al., 2008; Hochbaum, Sorenson, & Lorig, 1992). Evidence from studies and systematic reviews, demonstrate that theory-based health behaviour interventions are more effective than atheoretical interventions (Ammerman, Lindquist, Lohr, & Hersey, 2002; Brawley, Rejeski, & King, 2003; Legler et al., 2002; Noar, Benac, & Harris, 2007).

Many theory-based physical activity studies have consistently identified self-efficacy as the strongest psychosocial correlate of physical activity initiation and maintenance (Bauman et al., 2012; Dawson & Brawley, 2000, Dawson, Brawley, & Maddux, 2000, Dishman et al., 2004; Phillips & McAuley, 2013). According to SCT, self-efficacy is defined as a person's "belief about their capabilities to exercise control over events that affect their lives" (Bandura, 1989, p1175) and represents an instrumental psychological construct linked to behaviour change (Bandura, 1989). Two key dimensions of self-efficacy that have been linked to exercise initiation and maintenance include task self-efficacy and self-regulatory self-efficacy (Bandura, 1991; Rodgers & Sullivan, 2001). Task self-efficacy refers to an individual's confidence in the ability to perform the elemental aspects of a task (Rodgers & Sullivan, 2001). For example, task self-efficacy relates to one's level of confidence in their ability to complete exercise bouts that are defined in terms of frequency per week, duration and intensity (e.g., 3 times a week at a moderate intensity for 30 minutes).

Self-regulation is defined as the "exercise of influence over one's own motivation, thought processes, emotional states and patterns of behaviour" (Bandura, 1994). According to Bandura (1991), one's ability to set goals and self-monitor are fundamental to self-regulation. By learning and practicing components related to self-regulation, individuals can regulate their behaviour, cognitions, and affect in the pursuit of behaviour change, as is demanded by increased adherence to physical activity (Barone, Maddux, & Snyder, 1997; Brawley et al., 2003). Positive behaviour change research can thus be achieved through strategies targeting changes in task and self-regulatory self-efficacy.

1.6 Exercising as a Group

SCT further extends to group dynamics. The performance of the group results from interactive and coordinative dynamics of the group members. The efficacy of the group affects how each group member uses their resources and how much effort they put into achieving the group's goal (Bandura, 1999). The perceived collective efficacy of the group is directly proportional to the group's investment in their undertakings and their

willingness to push through in the face of any setbacks. Higher collective efficacy leads to greater performance accomplishments for the group (Bandura, 2006).

In addition to self-efficacy, another consistent predictor of exercise adherence is social support, or exercising in a group. Dishman and Buckworth (1996) synthesized results from 127 studies targeting physical activity interventions, looking at individual versus group approach, and found that interventions delivered to groups had much larger effects than those delivered to individuals. Standard group-based exercise classes represent a different psychological environment than an exercise class where group dynamic principles are used to enhance cohesion among participants (“true group”; Burke, Carron, Eys, Ntoumanis, & Estabrooks, 2006). According to Burke and colleagues (2006), exercising with others opposed to alone was better for adherence, and participation in classes was characterized by high task cohesiveness, the primary outcome of group dynamic strategies. Burke et al. (2006) similarly found that exercising in a “true group” was superior to exercising in all other contexts. Additionally, as groups become more integrated socially and increase perceptions of similar social values, return rates to subsequent physical activity programs increase (Beauchamp, Dunlop, Downey, & Estabrooks, 2011). Thus, group dynamics principles can be used to enhance the feeling of groupness among intervention participants to increase exercise adherence and participation.

1.7 Group Mediated Cognitive Behavioural Approach

GMCB is an approach developed by Brawley, Rejeski, and Lutes (2000) that incorporates the constructs of SCT, combined with group dynamics. GMCB has been identified in previous physical activity reviews as one possible strategy that can be used to increase physical activity behaviours among adults (Brawley et al., 2003), and has been used to successfully change physical activity behaviours in a number of populations (Brawley et al., 2000; Cramp & Brawley, 2006; Kabaroff, Eys, Schinke, & Eger, 2013; Rejeski et al., 2003; Rejeski, Tian, Liao, & McDermott, 2008; Rejeski et al., 2014). This approach focuses on teaching participants evidence-based self-regulatory skills necessary for

physical activity initiation and maintenance. For example, participants are commonly taught how to set goals by creating specific plans for physical activity; to self-monitor physical activity behaviour; and how to identify and overcome barriers to physical activity. The GMCB approach uses the group as an agent of change based on group dynamics literature where group-based exercise is known to be superior to exercising alone (Burke et al., 2006; Cartwright & Zander, 1953). However, this approach has only previously been delivered using face-to-face methodologies.

1.8 Web-based Physical Activity Interventions

Combining face-to-face, group-based physical activity interventions with new methods of intervention content delivery may be an area of opportunity. The Internet has previously been used to deliver behaviour change interventions to postnatal women who experience postpartum depression (Danaher et al., 2013; Jones et al., 2013; Maher, Ziviani, Miller, Olds, & Parkyn, 2012) and gestational diabetes (Kim, Draska, Hess, Wilson, & Richardson, 2012). For example, Danaher and colleagues conducted a feasibility study of an interactive guided web-based intervention for postnatal women to evaluate the efficacy on changes in postpartum depression levels. This intervention included three websites; a personal coach page where coaches can review the progress of participants; a support website for participants; and an administrative website for researchers. Participants received six sequential sessions in a video format, with interactions and animations as well. At baseline, 55% of these participants met criteria for minor or major depression. Following this web-based intervention, 90% no longer met this criteria. However, no interventions have been delivered over the Internet for postnatal women to date that target physical activity. The increasing popularity of the Internet as a resource for health information (Pew Research, 2013) make this an interesting method of delivery to explore. The Internet has been successfully employed in the past to increase physical activity in various populations including older adults, people in the workplace (Napolitano et al., 2003; Plotnikoff, McCargar, Wilson, & Loucaides, 2005), patients with rheumatoid arthritis (Van den Berg et al., 2006), and patients with diabetes (McKay, Feil, Glasgow, & Brown, 1998). Van den Berg, Schoones, and Vlieland (2007) reviewed

internet-based randomized controlled trials to describe the effectiveness of physical activity interventions. This review resulted in 10 studies, most of which were theory-based and used self-monitoring and feedback tools. Van den Berg and colleagues concluded that internet-based physical activity interventions were more effective than a waiting list group (similar to usual care control). A meta-analysis by Davies, Spence, Vandelanotte, Caperchione, and Mummery (2012) included 34 interventions seeking to increase physical activity in adult populations. From these 34 studies, Davies and colleagues found that the Internet was in fact effective in producing small, significant changes in physical activity behaviours. Using this method of intervention delivery was not only effective, but has also been shown to reduce cost and time required to reach large populations (Davies et al., 2012). More importantly, specifically for populations who state lack of time as a common barrier to exercise (i.e., postnatal women; Cramp & Bray, 2011), web-based delivery allows the participant to access the intervention when it is most convenient to them (Davies et al., 2012).

1.9 Present Study

The overarching purpose of the current study was to test the feasibility, acceptability, and effectiveness of an 8-week web-based physical activity intervention for postnatal women, combined with standard group-based exercise.

The purpose of study 1 was to examine the feasibility and acceptability of the web-based intervention. Using a mixed methods, non-randomized within-subjects design, feasibility and acceptability were examined through measuring and/or tracking data related to exercise class attendance, web usage, and overall intervention acceptability using a modified Treatment Evaluation Inventory (TEI-SF; Kelley, Heffer, Gresham, & Elliott, 1989). Focus groups were also conducted at post intervention to collect participant feedback on intervention design and delivery methods. It was hypothesized that participants would view the intervention as feasible; attending approximately 75% of group exercise classes. Secondly, it was hypothesized that scores on the TEI-SF (Kelley

et al., 1989) would be positive. There were no a priori hypotheses with regard to web usage.

The purpose of study 2 was to evaluate the effectiveness of this intervention at increasing physical activity, self-efficacy levels, and group cohesion. It was hypothesized that physical activity levels (including self-report and objectively measured volume of mild, moderate and vigorous physical activity per week), task and self-regulatory self-efficacy, and group cohesion would increase from pre to post intervention.

1.10 Bibliography

Aittasalo, M., Pasanen, M., Fogelholm, M., Kinnunen, T.I., Ojala, K., & Luoto, R. (2008). Physical activity counseling in maternity and child health care – A controlled trial. *BMC Women's Health*, 8(14). doi:10.1186/1472-6874-8-14.

Albright, C.L., Maddock, J.E., & Nigg, C.R. (2009). Increasing physical activity in postpartum multiethnic women in Hawaii: Results from a pilot study. *BMC Women's Health*, 9(4). 1-7. doi:10.1186/1472-6874-9-4

American College of Obstetricians and Gynecologist Committee Opinion No. 267 (2002:2009). Exercise during pregnancy and the postpartum period. *Obstetric Gynecology*, 99, 171-173.

Ammerman, A.S., Lindquist, C.H., Lohr, K.N., & Hersey, J (2002). The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: A review of the evidence. *Preventive Medicine*, 35, 25-41.

Armstrong, K. & Edwards, H. (2004). The effectiveness of a pram-walking exercise programme in reducing depressive symptomatology for postnatal women. *International Journal of Nursing Practice*, 10(4), 177-194.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, New Jersey: Prentice-Hall. Bandura, A. (1998).

Bandura, A. (1989). A social cognitive theory of action. In J.P. Forgas & M.J. Innes (Eds.), *Recent advances in social psychology: An international perspective*, pp.127-138. North Holland: Elsevier.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50, 248-287.

Bandura, A. (1994). Self-efficacy. In R.J. Corsini (Ed.), *Encyclopedia of psychology* (2nd ed., Vol 3, pp.368-369). New York: Wiley.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian Journal of Social Psychology*, 2, 21-41.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents*, 307-337.

Barone, D.F., Maddux, J.E., & Snyder C.R. (1997). *Social cognitive psychology: History and current domains*. New York: Plenum Press.

Bauman, A.E., Reis, R.S., Sallis, J.F., Wells, J.C., Loos, J.F., & Martin B.W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet*, 380(9838), 258-271. doi:10.1016/S0140-6736(12)60735-1

Beauchamp, M., Dunlop, W.L., Downey, S.M., & Estabrooks, P.A. (2011). First impressions count: Perceptions of surface-level and deep-level similarity within postnatal exercise classes and implications for program adherence. *Journal of Health Psychology*, 17(1), 68-76.

Brawley, L.R., Rejeski, W.J., & King A. (2003). Promoting physical activity for older adults: The challenges for changing behavior. *American Journal of Preventive Medicine*, 25, 172-183.

Brawley, L.R., Rejeski, J.W., & Lutes, L. (2000). A group-mediated cognitive-behavioral intervention for increasing adherence to physical activity in older adults. *Journal of Applied Biobehavioral Research*, 5(1), 47-65.

Brown, W.J., Heesch, K.C., & Miller, Y.D. (2009). Life events and changing physical activity patterns in women at different life stages. *Annals of Behavioral Medicine*, 37(3), 294-305. doi: 10.1007/s12160-009-9099-2.

Brown, W.J., Mishra, G., Lee, C., & Bauman, A. (2000). Leisure-time physical activity in Australian women: Relationship with well-being and symptoms. *Research Quarterly for Exercise and Sport*, 71(3), 206-216.

Brown, W. & Trost, S. (2003). Life transitions and changing physical activity patterns in young women. *American Journal of Preventive Medicine*, 25(2), 140-143.

Brug, J., Oenema, A., & Ferreira, I. (2005). Theory, evidence, and intervention mapping to improve behavior nutrition and physical activity interventions. *International Journal of Behavioral Nutrition and Physical Activity*, 2(2). doi:10.1186/1479-5868-2-2

Burke, S.M., Carron, A.V., Eys, M.A., Ntoumanis, N., & Estabrooks P.A. (2006). Group versus individual approach? A meta-analysis of the effectiveness of interventions to promote physical activity. *Sport and Exercise Psychology Review*, 2, 13-29.

Cartwright, D., & Zander, A. (1953). *Group dynamics research and theory*. Oxford, England: Row, Peterson.

Centers for Disease Control and Prevention (2011). *Physical Activity and Health. The benefits of physical activity*. Retrieved from <http://www.cdc.gov/physicalactivity/everyone/health/>

Chang, M.W., Nitzke, S., & Brown, R. (2010). Design and outcomes of a Mothers in Motion behavioural intervention pilot study. *Journal of Nutrition Education Behaviour*, 42(3), s11-s21. doi:10.1016/j.jneb.2010.01.010.

Colley, R.C., Garriguet, D., Janssen, I., Craig, C.L., Clarke, J., & Tremblay, M.S. (2011). Physical activity of Canadian adults: Accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Statistics Canada Catalogue no. 82-003-XPE. Health Reports, 22(1)*, 7-14.

Cramp, A.G., & Brawley, L.R. (2006). Moms in motion: a group-mediated cognitive-behavioral physical activity intervention. *International Journal of Behavioral Nutrition and Physical Activity, 3(1)*, 23-29.

Cramp, A.G., & Bray, S.R. (2010). Postnatal women's feeling state responses to exercise with and without baby. *Maternal and Child Health Journal, 14*, 343-349. doi: 10.1007/s10995-009-0462-5.

Cramp, A.G., & Bray, S.R. (2011). Understanding exercise self-efficacy and barriers to leisure-time physical activity among postnatal women. *Maternal and Child Health Journal, 15*, 642-651.

Daley, A.J., MacArthur, C., & Winter, H. (2007). The role of exercise in treating postpartum depression: a review of the literature. *Journal of Midwifery and Women's Health, 52(1)*, 56-62.

Danaher, B.G., Milgrom, J., Seeley, J.R., Stuart, S., Schembri, C., Tyler, M.S... & Lewinsohn, P. (2013). MomMoodBooster Web-Based Intervention for Postpartum Depression: Feasibility Trial Results. *Journal of Medical Internet Research, 15, 11*, e242.

Davies, C.A., Spence, J.C., Vandelanotte, C., Caperchione, C.M. & Mummery, K. (2012). Meta-analysis of internet-delivered interventions to increase physical activity levels. *International Journal of Behavioral Nutrition and Physical Activity, 9(52)*. doi:10.1186/1479-5868-9-52

Davies, G.A.L., Wolfe, L.A., Mottola, M.F., & MacKinnon, C. (2003). Exercise in pregnancy and the postpartum period. *Journal of obstetrics and gynaecology Canada, 25(6)*, 516-529.

Dawson, K.A., & Brawley, L.R. (2000). Examining the relationship between exercise goals, self-efficacy, and overt behavior. *Journal of Applied Social Psychology, 30*, 315-329.

Dawson, K.A., Brawley, L.R., & Maddux, J.E. (2000). Examining the relationship among concepts of control and exercise attendance. *Journal of Sport & Exercise Psychology, 22*, 1-14.

Dishman, R.K., & Buckworth, J. (1996). Increasing physical activity: A quantitative synthesis. *Medical Science of Sport and Exercise, 28(6)*, 706-719.

Dishman, R.K., Motl, R.W., Saunders, R., Felton, G., Ward, D.S., Dowda, M., et al. (2004). Self-efficacy partially mediates the effect of a school-based physical-activity intervention among adolescent girls. *Preventive Medicine, 38*, 628-636.

Drago, R. (2001). Time on the job and time with their kids: Cultures of teaching and parenthood in the US. *Feminist Economics, 7(3)*, 1-31.

Ferrara, A., Hedderson, M.M., Albright, C.L., Ehrlich, S.F., Quesenberry, C.P., Peng, T., Feng, J., Ching, J., & Crites, Y (2011). A pregnancy and postpartum lifestyle intervention in women with gestational diabetes mellitus reduces diabetes risk factors. *Diabetes Care, 34(7)*, 1519-1525.

Fjeldsoe, B., Miller, Y.D., & Marshall, A.L (2010). Mobile mums: A randomized controlled trial of an SMS-based physical activity intervention. *Annual Behavioural Medicine, 39*, 101-111.

Gennaro, S., & Fehder, W. (2000). Health behaviors in postpartum women. *Family Community Health, 22*, 16-26.

Glanz, K., Rimer, B.K., & Viswanath, K. (2008). *Health Behaviour and Health Education: Theory, Research, and Practice*. San Francisco: Jossey-Bass. 4th ed.

Haskell, W.L., Lee, I.M., Pate, R.R., Powell, K.E., & Blair, S.N. (2007). Physical Activity and Public Health: Updated Recommendation for Adults From the American College of Sports Medicine and the American Heart Association. *Circulation, 116*(9), 1081-1093.

Hochbaum, G.M., Sorenson, J.R., & Lorig, K. (1992). Theory in health education practice. *Health Education Quarterly, 19*, 295-313.

Jones, B.A., Griffiths, K.M., Christensen, H., Ellwood, D., Bennett, K., & Bennett, A. (2013). Online cognitive behaviour training for the prevention of postnatal depression in at-risk mothers: A randomized controlled trial protocol. *BMC Psychiatry, 13*, 265.

Kabaroff, J.L., Eys, M.A., Schinke, R.J., & Eger, T. (2013). The analysis of a group-mediated cognitive-behavioral corporate physical activity intervention. *Work, 44*(4), 423-433. doi: 10.3233/WOR-2012-1379.

Kelley, M.L., Heffer, R.W., Gresham, F.M., & Elliott, S.N. (1989). Development of a modified treatment evaluation inventory. *Journal of Psychopathology and Behavioral Assessment, 11*(3), 235-247.

Kim, C., Draska, M., Hess, M.L., Wilson, E.J., & Richardson, C.R. (2012). A web-based pedometer programme in women with a recent history of gestational diabetes. *Diabetic Medicine, 29*, 2, 278-283.

Kinnunen, T.I., Pasanen, M., Aittasalo, M., Fogelholm, M., Weiderpass, E., & Luoto, R. (2007). Reducing postpartum weight retention – A pilot trial in primary health care. *European Journal of Clinical Nutrition, 16*(7), 884-891.

Legler, J., Meissner, H.I., Coyne, C., Breen, N., Chollette, V., & Rimer, B.K. (2002). The effectiveness of interventions to promote mammography among women with historically lower rates of screening. *Cancer Epidemiology Biomark Preventative, 11*, 59-71.

Lewis, B.A., Martinson, B.C., Sherwood, N.E., & Avery, M.D. (2011). A pilot study evaluating a telephone-based exercise intervention for pregnant and postpartum women. *Journal of Midwifery and Women's Health, 56*(2), 127-131.

Maher, C., Ziviani, J., Miller, Y., Olds, T., & Parkyn, H. (2012). The internet and postpartum women: Roles, patterns of usage and opportunities for intervention delivery. *Journal of Science and Medicine in Sport, 15, 1*, S284-S285.

Marcus, B.H., Napolitano, M.A., King, A.C., Lewis, B.A., Whiteley, J.A., Albrecht, A.,...Papandonatos, G.D. (2007). Telephone versus print delivery of an individualized motivationally tailored physical activity intervention: Project STRIDE. *Health Psychology, 26*(4), 401-409.

Maturi, M.S., Afshary, P., & Abedi, P. (2011). Effect of physical activity intervention based on a pedometer on physical activity level and anthropometric measures after childbirth: a randomized control trial. *Pregnancy and Childbirth, 11*(103).

McKay, H.G., Feil, E.G., Glasgow, R.E., & Brown, J.E. (1998). Feasibility and use of an Internet support service for diabetes self-management. *Diabetes Education, 24*(2), 174-179.

Mottola, M.F. (2002). Exercise in the postpartum period: Practical Applications. *Current Sports Medicine Reports, 1*(6), 362-368.

Mottola, M.F. & Campbell, M.L. (2003). Activity patterns during pregnancy. *Canadian Journal of Applied Physiology, 28*(4), 642-653.

Napolitano, M.A., Fotheringham, M., Tate, D., Sciamanna, C., Leslie, E., Owen, N...Marcus, B. (2003). Evaluation of an internet-based physical activity intervention: A preliminary investigation. *Annual Behavioural Medicine, 25*, 92-99.

Noar, S.M., Benac, C.N., & Harris, M.S. (2007). Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychology Bulletin, 133*, 673-693.

Nomaguchi, K. & Bianchi, S. (2004). Exercise time: gender differences in the effects of marriage, parenthood and employment. *Journal of Marriage and Family*, 66(2), 413-430.

Norman, E., Sherburn, M., Osborne, R.H., & Galea, M.P. (2010). An exercise and education program improves well-being of new mothers: A randomized controlled trial. *Journal of the American Physical Therapy Association*, 90, 348-355.

O'Toole, M.L., Sawicki, M.A., & Artal, R. (2003). Structured diet and physical activity prevent postpartum weight retention. *Journal of Women's Health*, 12(10), 991-998.

Ostbye, T., Krause, K.M., Lovelady, C.A., Morey, M.C., Bastian, L.A., Peterson, B.L.,...McBride, C.M. (2009). Active mothers postpartum: A randomized controlled weight-loss intervention trial. *American Journal of Preventive Medicine*, 37(3), 173-180.

Pereira, M.A., Rifas-Shiman, S.L., Kleinman, K.P., Rich-Edwards, J.W., Peterson, K.E., & Gillman, M.W. (2007). *American Journal of Preventive Medicine*, 32(4), 312-319. doi: 10.1016/j.amepre.2006.12.017

Pew Research (2013). *Health Online*. Retrieved from: http://www.pewinternet.org/files/old-media/Files/Reports/PIP_HealthOnline.pdf.

Phillips, S.M. & McAuley, E. (2013). Social cognitive influences on physical activity participation in long-term breast cancer survivors. *Psycho Oncology*, 22(4), 783-791.

Plotnikoff, R., McCargar, L., Wilson, P.M., & Loucaides, C.A. (2005). Efficacy of an e-mail intervention for the promotion of physical activity and nutrition behavior in the workplace context. *American Journal of Health Promotion*, 19, 422-429.

Rejeski, J.W., Brawley, L.R., Ambrosius, W., Brubaker, P.H., Focht, B.C., Foy, C.G. et al. (2003). Older adults with chronic disease: The benefits of group mediated

counseling in the promotion of physically active lifestyles. *Health Psychology*, *22*, 414-423.

Rejeski, J.W., Tian, L., Liao, Y., & McDermott, M.M. (2008). Social cognitive constructs and the promotion of physical activity in patients with peripheral artery disease. *Journal of Cardiopulmonary Rehabilitation & Prevention*, *28*(1), 65-72.

Rejeski, J.W., Spring, B., Domanchuk, K., Tao, H., Tian, L., Zhao, L., & McDermott, M.M. (2014). A group-mediated, home-based physical activity intervention for patients with peripheral artery disease: effects on social and psychological function. *Journal of Translational Medicine*, *12*(29). doi:10.1186/1479-5876-12-29

Rodgers, W.M. & Sullivan, M.J. (2001). Task, coping, and scheduling self-efficacy in relation to frequency of physical activity. *Journal of Applied Social Psychology*, *31*, 741-753.

Rooney, B.L., & Schauburger, C.W. (2002). Excess pregnancy weight gain and long-term obesity: one decade later. *Obstetric Gynecology*, *100*(2), 245-252.

Sampsel, C., Seng, J., Yeo, S., Killion, C., & Oakley, D. (1999). Physical activity and postpartum well-being. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, *28*(1), 41-49.

Taveras, E.M., Blackburn, K., Gillman, M.W., Haines, J., McDonald, J., Price, S., & Oken, E. (2011). First steps for mommy and me: A pilot intervention to improve nutrition and physical activity behaviors of postpartum mothers and their infants. *Maternal and Child Health Journal*, *15*, 1217-1227.

Tremblay, M.S., Warburton, D.E.R., Janssen, I., Paterson, D.H., Rhodes, R.E., Kho, M.E.,...Duggan, M. (2011). New Canadian physical activity guidelines. *Applied Physiology, Nutrition, and Metabolism*, *36*(1), 36-46. doi: 10.1139/H11-009

Van den berg, M.H., Runday, H.K., Peeters, A.J., van der Giesen, F.J., Breedveld, F.C., & Vliet Vlieland, T.P. (2006). Using internet technology to deliver a home-based physical activity intervention for patients with rheumatoid arthritis: A randomized controlled trial. *Arthritis & Rheumatism*, 55, 935-945. doi: 10.1002/art.22339

Van den berg, M.H., Schoones, J.W., & Vliet Vlieland, T.P. (2007). Internet-based physical activity interventions: A systematic review of the literature. *Journal of Medical Internet Research*, 9(3), e26.

Verhoef, M.J., Love, E.J., & Rose, M.S. (1992). Women's social roles and their exercise participation. *Women Health*, 19, 15-29.

Whatley Blum, J., Christina, M., & Caton-Lemos, L (2004). Physical activity patterns and maternal well-being in postpartum women. *Maternal and Child Health Journal*, 8(3), 163-169.

Chapter 2

2 *Move More Mommy: Feasibility and Acceptability of a Web-Based Physical Activity Intervention for Postnatal Women*

2.1 Introduction

The postnatal period, defined as the time from childbirth through to one year postpartum, is characterized by many new and altered behavioural patterns and physical changes for the mother (Mottola, 2002). Examples include lack of sleep, unregimented feeding patterns, increased demands of time, and weight retention (Mottola, 2002). Engaging in regular physical activity during the postnatal period is associated with many physical and mental health benefits for new mothers, such as less anxiety and improvements in mood (Cramp & Bray, 2009; Koltyn & Schultes, 1997; Lewis, 2011), increased cardiovascular fitness and energy, as well as facilitated weight loss (Mottola, 2002). Furthermore, being physically active during this time can set a positive example for children and provide a brief break from the demands of early parenthood (when exercising without the baby), which has been associated with a more positive maternal-infant relationship (Dell, Pruett & Caputo, 2011). Although many benefits exist, physical activity levels of women during the postnatal period are generally low (Cramp & Bray, 2009; Gennaro & Fehder, 2000; Symons Downs & Hausenblas, 2004). Furthermore, approximately two-thirds of women do not meet physical activity guidelines during this time in their lives (American College of Obstetricians and Gynecologists, 2002; Brown, Brown, Miller, & Hansen, 2001; Sampsel, Seng, Yeo, Killion, & Oakley, 1999). Commonly reported barriers to engaging in physical activity during the postnatal period include fatigue, lack of time, childcare duties, and lack of social support (Bellows-Riecken & Rhodes, 2007; Cramp & Bray, 2010). Childcare responsibilities and having other young children in the home have also been cited by women as major barriers to an active lifestyle during this time (Nicklas et al., 2011; Symons Downs & Hausenblas, 2004; Whatley Blum, Beaudoin, & Caton-Lemos, 2004). These self-reported barriers to physical activity across the postnatal period

are shown to be consistent over time, suggesting that these barriers are persistent and therefore difficult for many to overcome (Cramp & Bray, 2010).

Currently, there are no population-specific physical activity guidelines for postnatal women, although they are (generally) encouraged to follow current physical activity guidelines for healthy adults (i.e., accumulate at least 150 minutes of moderate- to vigorous-intensity [MVPA] aerobic physical activity per week; Haskell et al., 2007; Tremblay et al., 2011). The type of birth determines the timing, in terms of safety, to start or resume physical activity following the birth of a child. In the case of uncomplicated births, the Society of Obstetricians and Gynecologists of Canada and Canadian Society for Exercise Physiologists (2003) state that women can initiate or resume physical activity within the first few weeks of giving birth. In cases where complications have occurred or the baby was delivered by cesarean section, women are advised to consult with their health care provider prior to engaging in physical activity (Davies, Wolfe, Mottola, & Mackinnon, 2003).

In order to improve postnatal women's physical activity levels, researchers have designed and implemented a wide array of interventions. For example, Albright, Maddock, and Nigg (2009) conducted a telephone-based pilot study using constructs from Social Cognitive Theory (SCT; Bandura, 1986) and the Transtheoretical Model (TTM; Prochaska & Velicer, 1997). The intervention was designed to enhance physical activity self-efficacy through the promotion of positive experiences in meeting physical activity goals. Over this 2-month intervention period, participants ($n = 20$) self-identified barriers to physical activity and set physical activity goals weekly over the phone with a health educator. Results of the study revealed a significant increase in leisure-time MVPA levels ($p < .001$) from pre to post intervention.

Lewis, Martinson, Sherwood, and Avery (2011) also conducted a telephone-based pilot intervention using TTM and SCT to increase the amount and duration of physical activity among postnatal women ($n = 18$). This 3-month, non-randomized pilot study included health educator led telephone counseling sessions delivered weekly during the

first month and biweekly during the second and third months. Participants were asked to engage in behaviour change techniques known to improve physical activity such as goal setting and self-monitoring the duration and intensity of their physical activity (Michie et al., 2013). This intervention led to significant increases in physical activity from baseline to three months ($p < .05$).

Cramp and Brawley (2006) have also demonstrated significant improvements in physical activity among women in the postnatal period in a randomized control trial ($n = 57$). In this study, the effects of a theory-based group-mediated cognitive behavioural (GMCB) intervention, grounded in the tenets of SCT (Bandura, 1986) and group dynamics (e.g., Burke, Carron, Eys, Ntoumanis, & Estabrooks, 2006), were examined. In this 8-week intervention study, physical activity levels of the women exposed to the SCT-based group-mediated intervention were compared to participants who were randomly assigned to an exercise-only group (i.e., standard care). All participants were asked to attend eight group exercise classes at a large fitness facility, as well as record their physical activity for self-monitoring purposes. The intervention group also received six GMCB educational sessions in which information about SCT-based skills (e.g., self-monitoring, setting goals, and overcoming barriers to physical activity) was delivered to enhance physical activity participation and adherence. Results showed a significant difference in the frequency and volume of physical activity at the post intervention assessment; women in the GMCB group reported significantly more physical activity than did participants in the standard care group ($p < 0.01$).

Published postnatal physical activity interventions have demonstrated promising findings for theory-based physical activity interventions. However, no study to date has used the Internet as the primary mode of delivery for a theory-based postnatal physical activity intervention. Given the extensive use of the Internet for access to health information (Pew Research, 2013), the web-based delivery of cognitive behavioural skills training may be an effective and convenient method of intervention delivery for postnatal women who are facing unregimented daily schedules.

A meta-analysis conducted by Davies, Spence, Vandelanotte, Caperchione, and Mummery (2012) on web-based physical activity interventions evaluated 34 studies targeting physical activity in adult populations. Inclusion criteria required that a comparison group was included containing participants who were not exposed to web-based intervention materials. Davies et al. found that the Internet as a mode of delivery was effective in producing small yet significant changes in physical activity, and concluded that this method of delivery may be most effective with physically inactive populations. As noted above, using the Internet to deliver a physical activity intervention has several key benefits. Not only are web-based interventions a cost-effective way to reach a large population (Davies et al., 2012), this mode of delivery requires less time than face-to-face interventions from both researchers and participants (Davies et al., 2012). Furthermore, online intervention delivery allows participants to access information at a time that is convenient for them.

The need for flexible modes of intervention delivery with minimal face-to-face contact was highlighted in a recent study in which SMS-messaging (i.e., mobile phone short messaging service) was used to deliver a 13-week community-based intervention to women in the postnatal period (Fjeldsoe, Miller, & Marshall, 2010, $n = 88$). Although this was not a web-based intervention, this randomized control mobile health intervention promoted cognitive and behavioural strategies based on SCT, with an emphasis on mediators previously found to promote behaviour change in this population (e.g., self-efficacy and social support; Cramp & Brawley, 2006; Miller, Trost, & Brown, 2002). The results showed that there was a significant difference in physical activity frequency from baseline to 6 weeks, and baseline to 13 weeks ($p = .038$). Furthermore, physical activity goals were achieved by 84% of intervention study participants at weeks 6 and 13.

With increased usage of technology such as mobile phones, wireless devices, and social media among women who are pregnant and in the postnatal period, the Internet is a promising way in which interventions can be delivered to this population (Choi, Fukuoka, & Hyeon Lee, 2013). Therefore, the purpose of this pilot study was to examine the

feasibility and acceptability of *Move More Mommy*; a theory-and web-based GMCB intervention combined with a group-based physical activity program. Feasibility and acceptability of this intervention were examined through measuring and/or tracking data related to exercise class attendance, web usage, and overall intervention acceptability using a modified Treatment Evaluation Inventory – Short Form (TEI-SF; Kelley, Heffer, Gresham, & Elliott, 1989). In addition, focus groups were conducted to collect qualitative data in the form of participant feedback on intervention design and delivery methods, and barriers to participating in the classes. Based on previous research, it was hypothesized that participants would attend approximately 75% of group exercise classes (cf Cramp & Brawley, 2006). Furthermore, it was hypothesized that TEI-SF (Kelley et al., 1989) scores would be positive, however we expected that participants would provide insights into areas for intervention improvement. There were no a priori hypotheses advanced with regard to website usage.

2.2 Method

A multi-site, mixed methods, non-randomized within-subjects design was used for this pilot intervention study. The 8-week intervention was delivered in two separate, subsequent, and identical waves at two different community-based locations.

Participants and Recruitment. Women were recruited through the use of posters at community pregnancy and postnatal events and clinics, the YMCA, and local municipal libraries, and via paid advertising through an online resource for new mothers. Advertisements were also placed in a local parent and caregiver magazine and a free local newspaper. Furthermore, recruitment posters were posted on the social media websites Facebook and Twitter, targeting postnatal women in London, Ontario. See Appendix A for a copy of the recruitment materials. The YMCA also included study information and eligibility criteria in their monthly newsletter circulated to all existing members. Finally, some participants heard about the intervention through word of mouth. To participate in the study, women had to meet the following inclusion criteria: a) be between 6 and 52 weeks postnatal prior to commencement of the intervention; b) be physically inactive

(i.e., not engaging in moderate-to-vigorous intensity physical activity for more than 150 minutes per week for the previous six months; Godin & Shephard, 1985); c) have daily access to Internet; d) be English speaking; e) be medically able to exercise according to the Physical Activity Readiness Questionnaire (Canadian Society for Exercise Physiology, 2002); and f) be over the age of 18.

Measures. All measures and a measurement timeline can be found in Appendix B. All self-report measures were administered online via Survey Monkey (www.surveymonkey.com), a secure website designed for questionnaire completion. Questionnaires could be accessed only through use of a specific link (e-mailed to participants at each data collection point) and required a study-specific identification code and password. Therefore, questionnaires were only accessible to study participants and the research team, and individual responses were privacy protected and accessed only by the Principal Investigators.

At baseline, participants were asked to complete a demographic questionnaire. At post intervention (week 8), a modified version of the TEI-SF (Kelley et al., 1989) was administered to study participants. Website usage data were collected throughout the 8-week intervention using analytics from the website developer. Following the 8-week intervention, focus groups were held at the YMCA to elicit rich feedback from participants on their collective experiences of the intervention.

Demographics. An investigator-developed form was used to collect demographic information from participants including age, number of weeks postnatal, number of children, age of eldest child, marital status, ethnicity, level of education, and income.

Feasibility. Feasibility determines whether the intervention is appropriate for further testing, and typically addresses one or more of eight areas commonly addressed by feasibility studies (Bowen et al., 2009). These eight areas include: acceptability, demand, implementation, practicality, adaptation, integration, expansion, and limited efficacy. This study focused on acceptability, demand, and practicality. Demand and

practicality were measured via participant attendance at the group exercise classes, and how frequently participants' used the website during the intervention.

Attendance. As noted above, adherence to the group-based physical activity aspect of the intervention was measured as an indicator of feasibility. Exercise class attendance was recorded by the instructor at the end of each class. An attendance percentage score was calculated for each participant by dividing the number of classes they attended by the total number of classes offered (i.e., 8).

Barriers to Attendance. Specific questions from the focus groups held at post intervention (discussed below) were used to examine the barriers to attendance that participants faced throughout the intervention. For example, participants were prompted with the question, "What things prevented you from attending the class?"

Website Data. Website analytic data were recorded and saved each time a participant logged on to the intervention website (www.movemoremommy.com) and were accessed by the researchers only. Data collected included the frequency and timing of participant logins, number of video sessions viewed, the frequency of the goal setting and journal calendar entries, and the frequency of discussion board posts. Participants were asked to log in a minimum of one time each week. Website data were analyzed by dividing the number of times the participant logged in, posted on the discussion board, and used the goal setting and self-monitoring calendars, divided by the number of times they were expected to do so. Such outcomes are reported as percentages.

Acceptability. Acceptability is a dimension of feasibility that refers to how well an intervention is received by the target population and the extent to which the intervention meets the needs of the given population (Ayala & Elder, 2011). Acceptability measures the satisfaction of participants, intent to continue use, and perceived appropriateness (Bowen et al., 2009). Acceptability was measured using a modified version of the TEI-SF (Kelley et al., 1989) and qualitative responses from focus groups.

Treatment Evaluation Inventory – Short Form. As noted above, a modified version of the TEI-SF (Kelley et al., 1989) was used to measure the acceptability of the pilot study. The inventory included 11 items and response options ranged from -2 (*strongly disagree*) to +2 (*strongly agree*). Example items included, “*The program was effective in improving my levels of activity/exercise*”; “*I am happy with the behavioural changes this program has created in my management of exercise*”; and, “*I like the weekly online session approach used in this education program to manage exercise*”. Each participant’s mean inventory value was used to calculate an overall mean for the inventory.

Focus Groups. In order to gain insight into participants’ subjective experiences of the intervention, focus group sessions were conducted post-intervention at both study sites. Specifically, the purpose of conducting the focus groups was to ascertain information about intervention acceptability (e.g., satisfaction with individual intervention components) and barriers to exercise participation. Qualitative responses from the focus group sessions were intended to complement the quantitative acceptability data and allow for a deeper understanding of the acceptability of the intervention from the participants’ perspective. The semi-structured focus group interview guide was created by the research team and included questions designed to elicit discussion about the experience of the intervention and its components. First, general questions were posed about the participants’ experience of the intervention to promote a synergistic discussion among participants. Following the general discussion, participants were asked to provide feedback specific to the intervention components. Examples included: “*What aspects of the weekly fitness class did you enjoy or not like?*” and “*What were the most helpful aspects of the weekly video sessions for you in understanding the actions that you could take to increase your physical activity?*” The focus group sessions concluded with an invitation for participants to share feedback or experiences that had not been addressed. Focus group sessions were audio-recorded and transcribed verbatim by a member of the research team.

Two focus groups were conducted, one at each intervention site; a setting that was familiar to participants. Participants sat in circle formation atop exercise equipment that had been used in the intervention sessions. One member of the research team acted as the moderator and another as the assistant moderator who was responsible for audio-recording the session and recording field notes. Focus groups were held at the same time as the weekly exercise classes one week following the last class. All participants attended the focus groups (i.e., $n = 9$, $n = 8$).

Procedure. Western University's institutional health research ethics board approved the study protocol. Upon hearing about the study, participants contacted the principal investigator by phone or e-mail, indicating their interest. Interested participants were then asked to complete the eligibility screening questionnaire online via a secure website. Individuals who did not meet study eligibility criteria were informed via e-mail and thanked for their interest. Eligible individuals were given the opportunity to select the preferred YMCA location (i.e., most convenient location) and were subsequently assigned to that study site.

One week prior to the study start date, eligible women were invited to an orientation session at their study-specific YMCA location with the other participants from their site. At the orientation session, women engaged in the informed consent process with a member of the research team (see Appendix C for the Letter of Information and Informed Consent). Following written, informed consent to participate in the study, participants were given a tour of the facility. Participants also received an introduction to the website on laptops and were provided with their respective login information (refer to Appendix D to view website login page, session page, goal setting calendar, and self-monitoring calendar). Finally, participants viewed a short video about the intervention and were asked to introduce themselves to the other study participants from their site through a discussion board post; this represented their first weekly study-related task.

The group-based physical activity program consisted of one 45-minute group exercise class offered each week at both YMCA locations for eight weeks. Each exercise class was led by a certified instructor at the YMCA and was conducted in an interval-style format that included a cardiovascular warm-up, strength training components, and a cool down period. The instructors were trained in evidence-based group dynamics principles (Burke et al., 2006) by a member of the research team to foster cohesion during the exercise classes. Both instructors were also mothers themselves. The sessions were designed to be progressive in terms of difficulty (i.e., start easier and become increasingly difficult over the course of the intervention) as the exercise classes were designed for physically inactive postnatal women. Childcare was provided by the YMCA's Child Minding program for all participants at no cost. In addition, participants were given a free membership to access the YMCA at any time within operating hours during the intervention. Participants had access to all areas of the YMCA including group exercise classes, cardiovascular and weight training machines, the track, swimming pool, and childcare. The group-based physical activity program was paired with a SCT-based behavioural skills training program delivered via an online platform.

The *Move More Mommy* website included: (1) a home page with a weekly motivational quote; (2) a weekly motivational and behavioural skills training video; (3) a goal setting calendar; (4) a self-monitoring calendar; and (5) a discussion board. Participants were asked to log on to the website each week a minimum of one time. Participants were asked to watch the weekly video, record a thought related to the video topic on the discussion board, and plan and track their physical activity for the week using the online calendar.

Weekly online video sessions were accessible to participants on the Sunday of each week. Brief videos (i.e., 3 - 5 minutes) were posted on the website and included education related to evidence-based behaviour change techniques known to motivate postnatal women to initiate and maintain a physical activity program (e.g., SCT; Bandura, 1986, GMCB; Brawley, Rejeski, & Lutes, 2000, Group dynamics; Burke et al., 2006). A

member of the research team created these videos as PowerPoint slideshows with a voiceover. The purpose of these sessions was to have participants learn and practice one cognitive-behavioural technique, such as “goal setting” or “overcoming barriers”, each week. The weekly video: a) described the technique in detail; and, b) instructed participants on how they could practice the technique in the upcoming week. As mentioned, participants watched the pre-intervention video at the orientation session where they were introduced to the intervention and asked to introduce themselves to other participants on the discussion board.

Video session 1 introduced the concept of *goal setting* and making action plans. The goal setting calendar was a feature of the website that the participants were asked to use on a weekly basis. The topic for video session 2 was *self-monitoring* (keeping track) and introduced participants to the physical activity journal feature of the website where they were asked to log their physical activity behaviours each week. The website also provided visual feedback to participants by displaying a figure that represented discrepancies between planned and actual physical activity behaviour each week. This figure was updated each time the participant entered a new activity into the goal setting or self-monitoring calendars. Video session 3 introduced the concept of *the group*, in which it was emphasized that group efforts towards a common goal is an effective means of meeting and maintaining individual physical activity goals (Burke et al., 2006). Participants were asked to set a group goal for total physical activity minutes for the week. This was done using the online discussion board. A group total was calculated by an algorithm on the website and displayed on the home page. The topic of video session 4 was *reinforcement and rewards*. This session demonstrated the importance of acknowledging individual successes and rewarding oneself for goal attainment. Participants were also rewarded with a *Move More Mommy* water bottle during the week 4 group exercise class. The emphasis of video session 5 was placed on *overcoming obstacles*; barriers that could prevent participants from reaching their physical activity-related goals. In this session, participants were provided with common solutions to overcoming prevalent obstacles encountered by postnatal women. For example, ideas for

coping with barriers such as a sick or fussy baby were highlighted as a means of planning for and meeting physical activity intentions. In video session 6, *social support* was introduced as a facilitator for meeting physical activity goals. Participants were asked to identify individuals in their lives who exerted positive and negative influences over their physical activity behaviours. The focus of video session 7 was the development and implementation of *strategies to prevent relapse* back to a physically inactive lifestyle. The purpose of video session 8 was to introduce participants to strategies that would facilitate the *maintenance* of this new physically active lifestyle as the intervention came to an end. A detailed description of the objectives and content of each online video session can be found in Appendix E.

The goal setting component of the intervention was integrated into an online scheduling calendar. Participants could log onto the website and enter planned physical activity as often as they wanted to, but were asked to do so once each week. Participants selected the intensity of physical activity (i.e., light, moderate, vigorous), type of physical activity (i.e. walk, interval training, etc.), and the day and time (duration) that they would do this activity for. Participants were able to refer to the goal setting calendar throughout the various pages of the website for their reference.

The self-monitoring component of the intervention was designed such that participants could enter completed physical activity sessions into a calendar. Similar to the goal setting calendar, participants selected the intensity, type, and duration of physical activity. Participants could only plan exercise sessions in the future, and track exercise sessions on dates/times that had already passed. Participants were able to log this information as often as they desired. Physical activity logs were saved on the website and a number was generated to indicate the attainment or discrepancy between planned and actual physical activity behaviour each week.

Each video session included a *discussion board task* related to a technique that participants were asked to post about on the website discussion board. The discussion board was site-specific and could only be seen by other group members of the respective

study site. Participants could log on and post on the discussion board in relation to the weekly video or for any other reason. For example, one participant posted that she planned to attend a yoga class with another participant, displaying the use of social support and goal setting techniques for physical activity behaviour change.

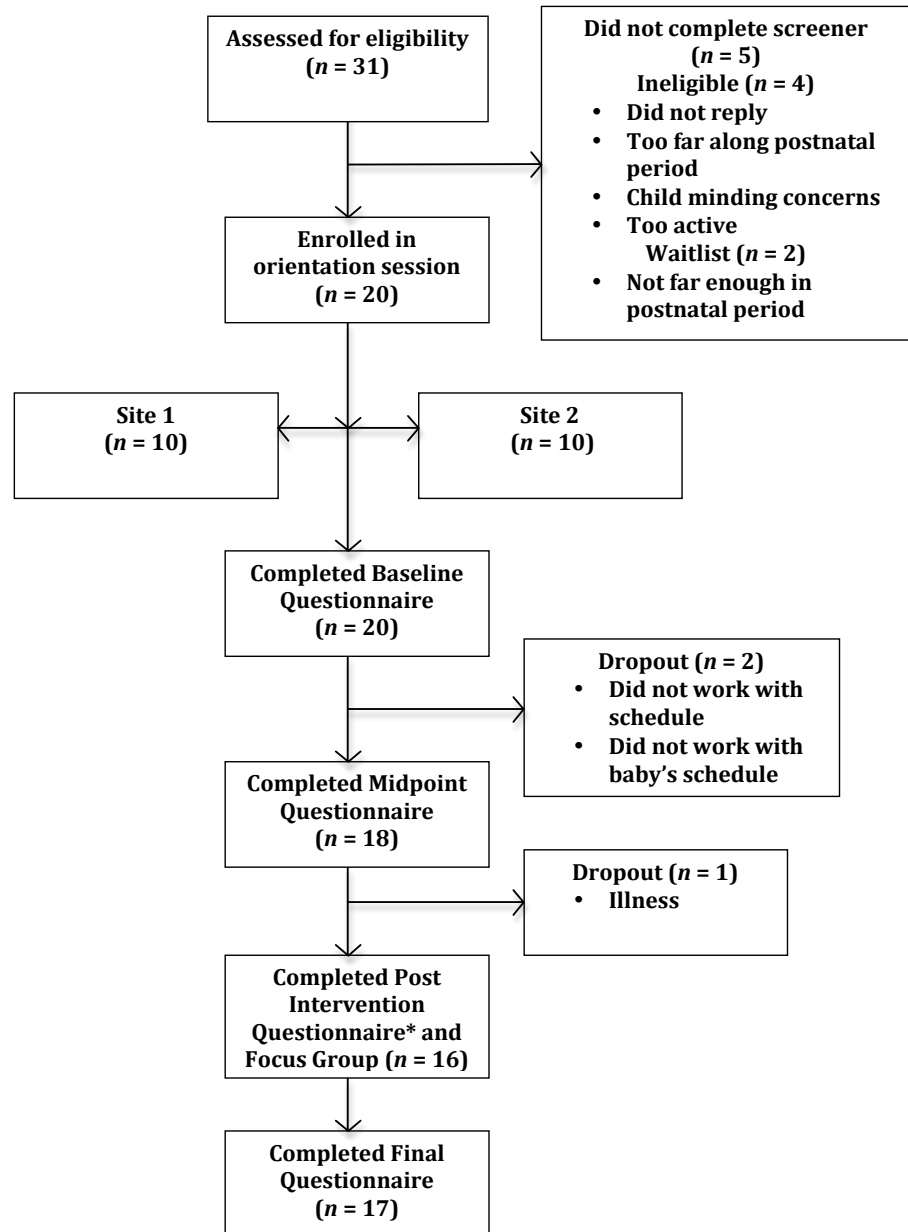
Participants received a *summary* of the weekly session via e-mail every Sunday night of the 8-week intervention. The summary included an overview of the weekly video session that served as a reminder to log onto the website and engage in the session.

Data Analysis. All quantitative data were imported into SPSS Statistics (version 21, SPSS Inc., Chicago) from the secure online survey website and the *Move More Mommy* website. The data set was explored for any missing values. Descriptive statistics including frequencies and/or means were calculated, as appropriate. To determine if there were any significant participant differences at baseline by intervention site, demographic data were compared using a one-way analysis of variance (AVOVA). Descriptive results were reported for attendance, website usage, and intervention acceptability.

Content analysis was conducted on all qualitative focus group data (Miles & Huberman, 1994; Patton, 2002) using both deductive and inductive approaches to inform intervention feasibility and acceptability. Firstly, two researchers independently reviewed focus group transcripts for ideas relating to overall intervention acceptability (e.g., deductive; satisfaction with each specific intervention component). Qualitative responses addressing acceptability were first coded using a deductive approach according to predetermined categories specific to the intervention components. The researchers discussed their independent coding of the data and resolved discrepancies of preliminary categories through discussion. Following this deductive analysis, an inductive approach was employed by a third researcher to identify emergent themes that were not captured with the deductive framework. Recurrent themes were discussed and agreed upon by all three researchers. Selected quotes from the transcripts are presented to illustrate the themes and categories that emerged from this qualitative content analysis.

2.3 Results

Participants. Thirty-one women expressed interest in participating in *Move More Mommy* and were invited to complete the online eligibility-screening questionnaire. Five participants did not complete the screening tool and four did not meet eligibility criteria. Reasons for ineligibility included being too far along in the postnatal period, child minding concerns, and being too physically active. Two participants were added to the waitlist for a subsequent randomized controlled trial (RCT), as they were not yet far enough into the postnatal period to safely engage in a physical activity program (i.e., less than 6 weeks). Thus, a total of twenty participants enrolled in the intervention and completed baseline measures ($n = 10$ per YMCA site). Two participants withdrew from the study prior to midpoint testing due to scheduling conflicts, and a third participant withdrew before completing the intervention due to illness. Therefore, a total of 17 participants completed the 8-week intervention. An illustration of participant flow can be seen in Figure 2.



*includes Treatment Evaluation Inventory (Short Form)

Figure 2: Participant Flow

Table 2 contains the demographic characteristics of the sample. Participants were 17 postnatal women between the ages of 26 and 39 years ($M = 31.88$, $SD = 3.3$). The participants were, on average, 22.41 weeks postnatal at baseline. For 59% of the sample, this postnatal period followed the birth of their first child (i.e., primiparous), whereas the remainder of the sample had at least one other child (i.e., multiparous). The majority of participants were married (94%), Caucasian (94%), and well educated (94% with more than a high school diploma). There were no significant differences between women in the two intervention site groups at baseline on all demographic variables.

Results. Missing data occurred when a participant did not complete questions from a particular scale, and were dealt with based on recommendations from Tabachnik and Fidell (2013). Between-scale means were used to replace entire scales that were not completed by individual participants; a mean score from each question was calculated based on other participant responses and was used to replace the missing value. There was one missing scale in the data set (i.e., 6% of cases), as one participant did not complete the TEI-SF (Kelley et al., 1989) at post intervention. Aside from this, there were no missing values throughout.

Feasibility. Participants were asked to attend 8 weekly group exercise classes at the YMCA. On average, participants ($n = 17$) attended 6.85 classes over the 8-week intervention ($SD = 1.07$), or 86% of the entire face-to-face intervention. A one-way ANOVA revealed a significant difference in attendance between sites [$F(1, 15) = 11.57$, $p = 0.04$]. Attendance was slightly higher at site 1, where participants attended a mean of 7.5 classes ($SD = 0.43$) over the 8-week period. At site 2, participants attended a mean of 6.12 classes ($SD = 1.12$) over the study period.

As noted above, participants were asked in the focus group sessions about their perceived barriers to participating in the group-based exercise classes. The most commonly identified barriers were external; things participants could not control such as weather and illness (of both mother and baby). Additionally, participants felt that their baby's schedule was often a priority; if the baby was napping they would stay home.

Lastly, the accessibility of the location was considered to be a barrier to attendance to some participants, as illustrated by the following quote:

“Two weeks ago I came and there was no parking, and it was raining, so I wasn’t going to get [baby’s name] out in the carrier in the rain, so I just went home. I had all intentions of coming, but it was just too much for me to wait around when there’s five cars in front of me and a baby crying in the back.”

A number of participants specifically identified that motivation was not a barrier to attendance.

On average, participants ($n = 17$) posted on the discussion board 6.53 out of the eight times they were prompted to ($SD = 2.76$; 81.6%). Participants used the goal setting calendar 6.29 times out of the eight weeks of the intervention ($SD = 1.49$, 78.6%; introduced in week two). The self-monitoring calendar was used 5.53 times out of the eight week intervention ($SD = 1.91$, 69.1%; introduced in week three). Participants logged into the website 35.58 ($SD = 23.73$) times on average, and clicked on the ‘session’ tab to view a video an average of 13.71 ($SD=9.33$) times over the course of the 8-week intervention. Refer to Table 3 for additional website usage statistics.

Acceptability. Overall, feedback on the acceptability of the intervention elicited from the modified TEI-SF (Kelley et al., 1989) was favourable. Specifically, on the Likert scale ranging from -2 (“strongly disagree”) to +2 (“strongly agree”), the overall mean value was 1.35 ($SD = 0.35$). Refer to Table 4 for detailed means for each scale item.

Overall, the narrative comments elicited from the focus group sessions suggested that participants enjoyed the intervention. Participants discussed the components of the intervention with which they were satisfied and dissatisfied. These results are presented below, according to predetermined categories aligned with the specific intervention components: weekly video sessions; goal setting and journal calendars; group-based physical activity program; and the impact of the intervention on physical activity

engagement. Two emergent themes surrounding intervention acceptability were then identified using an inductive approach: *motivation* and *social support*. Two focus groups were held and were 44 and 38 minutes in duration.

Participants found that the video sessions served as a weekly reminder of their physical activity intentions and techniques to achieve physical activity goals. One participant said, *“I think they were really well done, all the videos, it was slow, and everything was explained really well, and because they were short you had a whole week to think about it.”* However, some participants experienced technological challenges (e.g., viewing the videos on a tablet). Participants described the *weekly summary* (distributed in a widely supported portable document format [PDF]) as an important tool to review the sessions when faced with compatibility issues, in addition to offering the opportunity to reflect upon the overall objectives of the weekly session at a later time. For example, one participant noted, *“I had a hard time viewing the videos so I would just read the PDFs, and that was really helpful. I couldn’t view it on my iPad, but the PDF was really helpful.”* Weekly summary PDFs can be viewed in Appendix F.

In general, participants described the self-monitoring technique, *journal*, as a valuable tool, while many agreed that the goal setting technique, *action plan*, was not as useful. One participant said,

“For me keeping track was the most valuable, the journal part, not so much the plan, the plan didn’t have a lot of meaning because with four kids and two twins its unrealistic for me to say oh I am going to exercise Monday at nine, with the naps, anytime during the day unless it’s an evening class it was just a shot in the dark.”

Participants discussed aspects of the goal setting calendar that impeded the objectives of this intervention component, describing the process as unrealistic (i.e., planning specific times each week dedicated to physical activity). One participant

discussed her experience with goal setting and self-monitoring in the *Move More Mommy* intervention:

“I found that I used the journal, even though goal setting has always been a part of my life, it was almost demotivating to put the goals in because I would never make them, there was always something coming up, so towards the end I was kind of going more generic, but journaling it and writing down what I did do those days was awesome, total motivation.”

Another participant described the negative emotions she experienced in response to not attaining her physical activity goals:

“I tracked, but I didn’t plan anything. When I start my week, I’m always planning out my activities and when it’s going to happen but I was like I’m going to workout Monday and Wednesday and then it wouldn’t happen and I was really angry about the whole thing and felt really bad about it. So I started journaling everything instead.”

Overall, participants described the discussion board feature of the website as favourable. The women discussed the social aspect of the discussion as a positive addition to the intervention and an opportunity to engage in social interactions with other postnatal women. One recommendation for the discussion board that participants raised in the focus group discussion was the addition of a notification feature, such that women would be notified if one of their posts had received a response from another participant. The discussion board was also described as a venue in which women felt comforted and reassured in reading about experiences from other women that described similar struggles. One participant said, *“I got to see what everyone else was doing in terms of exercise, so it did motivate me. It’s good to see you’re kind of all going through the same thing.”* Another said, *“I found it reassuring just to see that everyone else was having the same struggles.”*

Participants at both locations stated that the exercise class time worked for their schedules and that the classes were challenging enough. Participants mentioned that they

liked the variety in the classes and that it was a different type of workout than they would typically do on their own. One participant said, *“I really liked the way that she could adapt things, if you weren’t there yet she said, this is how you change it so you are still doing it. I really liked that.”* Participants also indicated that the instructor made a difference in their exercise class experience. One participant reflected, *“She worked all different muscles. Her personality made me want to be here. She had such a great personality and I felt like she knew where we were coming from because she also has children.”*

Participants agreed that the intervention was helpful in increasing their physical activity levels. One participant said, *“I did way more than I would have otherwise! I wasn’t exercising at all like structured, planned exercise; I was walking my kids to and from school but wasn’t doing any exercise.”* Another woman described the impact of the intervention on her personal expectations, *“I wasn’t really working out at all until now. I didn’t even know I could do half these things. I’m really surprised by what I can do.”*

Among the qualitative responses, some of the focus group discussions were specific to the study site. Participants at site 2 discussed the importance of the complimentary YMCA membership and childcare in increasing their physical activity levels throughout the intervention. One woman said, *“That it was free. For me, that’s number one.”* Both study sites were provided with complimentary memberships and childcare.

Overall, participants expressed that certain features of the intervention were motivating, whereas others were demotivating. For example, participants expressed that the self-monitoring tool acted as a source of motivation. The exercise group as well as the discussion board, were also identified as motivators. As mentioned previously, the goal setting feature of the website was considered to be demotivating to some.

In terms of postnatal concerns, participants expressed a desire for additional exercise modifications related to issues specific to pregnancy, such as torn abdominal

muscles. There was discussion about the consequences of a group physical activity program without modifications, as illustrated by the following quote, *“I had a hard time with a lot of the abs from having a c-section so, I felt kind of discouraged.”*

Participants collectively discussed enjoyment of certain aspects of the intervention, such as exercising with a consistent group of postnatal women, and having a scheduled class each week. One participant said, *“I liked that it was the same people all the time. You felt accountable because the other women were counting on you to go to class.”* Another participant noted, *“We were with the same women every week, it wasn’t like a class you come to where you don’t know anyone, so you felt comfortable which really motivated you to go.”*

Participants discussed several areas for improvement with regard to increasing social support throughout the intervention. In particular, participants voiced that it would have been useful to have contact information of other participants upon study enrollment in order to plan together more easily over the course of the intervention. To illustrate, one woman said, *“there were so many times I wondered if I could get a hold of everyone, to contact them to meet up for a class or mommy bonding.”* Similarly, another participant expressed the potential contribution of shared contact information for improved social support throughout the intervention:

“It would have been better if we had more of our contacts during these eight weeks, right, cause now we are done and we are going to get together and do stuff but it would have been great if we could have planned, and that would have probably made me go more often if another participant was going.”

2.4 Discussion

This study examined the feasibility and acceptability of a theory-based cognitive behavioural skills training web-based intervention, combined with group-based physical activity among postnatal women in London, Ontario. *Move More Mommy* participants were satisfied with the intervention overall. Participant attendance rates were excellent;

participants attended 86% of group exercise classes, which was slightly higher than hypothesized based on previous research (Cramp & Brawley, 2006). Participants also used all features of the website frequently. Quantitative data collected to assess participant acceptability (TEI-SF; Kelley et al., 1989) was positive. Furthermore, as hypothesized focus group discussions elicited rich data about the participant experience of the intervention and feedback for modifications to the intervention for a future postnatal physical activity interventions.

To our knowledge, this is the first study to have combined face-to-face intervention delivery with a web-based intervention to increase physical activity levels among postnatal women. Results of the present study provide preliminary evidence that a combined face-to-face and Internet intervention to increase physical activity among postnatal women may be a feasible and acceptable mode of delivery.

The purpose-built website was used extensively by participants over the course of the intervention. Website analytics indicated that participant logins to the intervention website exceeded the conventional once weekly contact time of face-to-face interventions. Increased intervention exposure has been shown previously to increase behaviour change with a dose-response relationship (Draper, Jennings, Baron, Erdur, & Shankar, 2000; van den Berg, Schoones, Vliet, & Vlieland, 2007). Furthermore, the frequency of logins per week in this intervention exceeded the average number of weekly logins for online physical activity interventions reported in a recent meta-analysis (Davies et al., 2012). This suggests that the acceptability of the *Move More Mommy* online intervention was high.

Participants used the discussion board, goal setting calendar, and journal feature often over the course of the 8-week intervention. Focus group discussions revealed that generally speaking, participants did not feel that the action plan calendar was useful, which could have been reflected in their usage of this feature. However, participants were also introduced to the self-monitoring (i.e., journal) feature in the second week of the intervention, and therefore had less time overall to engage in this technique.

Data from the focus groups and TEI-SF (Kelley et al., 1989) demonstrated that participants were satisfied with the intervention. During the focus groups, participants revealed that they enjoyed being a part of a group of women in a similar life stage. Furthermore, they mentioned that exercising in a group facilitated their attendance. This highlighted the importance of combining the web-based intervention with a face-to-face group based exercise class.

Participants were extremely receptive to the website delivery aspect of the intervention and found it to be useful. Over the 8-week intervention, adherence to the weekly exercise classes was higher than that documented in similar studies (e.g., Cramp & Brawley, 2006). There was a significant difference in attendance by study site; the women in site 1 attended significantly more classes than participants at site 2. The focus group discussions highlighted pragmatic concerns such as accessibility and parking availability as potential reasons for this discrepancy. Parking and accessibility were much more limited at site 2 and as such, these concerns were warranted. Selecting an appropriate site for participants, especially when they are postnatal women with young babies, should be given much consideration when planning future interventions.

Participant discussions in the post intervention focus groups shed light on the acceptability and impact of the intervention. Participants described the intervention as integral to their self-reported increases in physical activity over the 8-week study period. Qualitative responses elicited from the focus group discussions suggested that the goal setting technique embedded into the *goal setting* component of the website was not perceived as useful among the women in this sample. Women described the fluctuating schedules related to child rearing as an important barrier to effective use of the goal setting feature. Participants offered suggestions to improve the utility of this feature, highlighting the specificity regarding time of day as the primary concern. Participants suggested that a more general action plan could decrease the personal consequences (e.g., feelings of “defeat”) experienced when schedule changes precluded these women from attaining their physical activity goals.

One strength of the research methodology used was the strong connection between the theory and intervention strategies employed. Previous physical activity interventions that have been successful have targeted various aspects of SCT, similar to the web-based behavioural skills training program delivered in the current intervention (e.g., Cramp & Bray, 2006; Fjeldsoe et al., 2010). A theory-based GMCB intervention methodology that has been successfully used in this population in the past (Cramp & Brawley, 2006) was implemented using a new, convenient delivery method. Another strength of this intervention was the mixed methods design whereby qualitative and quantitative methodologies were used to conduct an in-depth investigation into the feasibility of this mode of intervention delivery among postnatal women.

There are limitations with this study that should be acknowledged. In particular, this study had a small sample size, with only 20 participants enrolled and 17 who completed post intervention measures. However, previous pilot studies have used similarly sized samples to explore the efficacy (Albright et al., 2009; Fjeldsoe et al., 2010) and feasibility (Fjeldsoe et al., 2010) of physical activity interventions targeting women in the postnatal period. Furthermore, due to the small number of women in the study, their demographic characteristics (primarily white, well educated, married women), this sample may not be representative of the greater population and therefore, these results not generalizable.

The intervention website also had a number of limitations. Unfortunately, the video sessions were not compatible with tablet devices, precluding some participants from viewing the video sessions. Although participants were provided with another venue to view the sessions (i.e., <http://www.youtube.com>), this alternative did not allow for analytics to be calculated through the study website; one participant was limited by this. In addition, website analytics did not track how often or for how long the video sessions were viewed (dose exposure) by participants in this pilot study, which was a limitation of this method. Additional challenges with the website analytics included the inability to monitor the duration of participant engagement with the website per login.

These findings contribute to current knowledge as this was the first known study to assess the feasibility and acceptability of delivering a physical activity intervention to women in the postnatal period using a website intervention. This early research in web-based interventions indicates that this type of delivery method—when combined with group-based ‘in person’ exercise classes—is an acceptable and feasible method of intervention delivery and has the potential to increase physical activity behaviours among postnatal women.

2.5 Bibliography

Albright, C.L., Maddock, J.E., & Nigg, C.R. (2009). Increasing physical activity in postpartum multiethnic women in Hawaii: Results from a pilot study. *BMC Women's Health, 9*(4), 1-7. doi:10.1186/1472-6874-9-4

American College of Obstetricians and Gynecologists (2002). Committee Opinion #267: Exercise during pregnancy and the postpartum period. *ACOG Committee on Obstetric Practice, 99*(1), 171-173.

Ayala, G.X., & Elder, J.P. (2011). Qualitative methods to ensure acceptability of behavioral and social interventions to the target population. *Journal of public health dentistry, 71*(01), S69-S79.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. New Jersey: Prentice-Hall. Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology and Health, 13*, 623-649.

Bandura, A. (1995). On rectifying conceptual ecumenism. In: J.E. Maddaux (Ed.), *Self-efficacy, Adaption, and Adjustment: Theory Research and Application*. (pp.247-375). New York: Plenum Press.

Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York, NY: Freeman.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian Journal of Social Psychology, 2*, 21-41.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31*(2) 143-164.

Bandura, A. (2005). The primacy of self-regulation in health promotion. *International Association for Applied Psychology, 54*(2), 245-254.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents, 14*, 307-337.

Bellows-Riecken, K.H. & Rhodes, R.E. (2007). A birth of inactivity? A review of physical activity and parenthood. *Preventive Medicine, 46*, 99-110.
doi:10.1016/j.ypmed.2007.08.003

Bowen, D.J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weinder, D.,...Fernandez, M. (2009). How we design feasibility studies. *American journal of preventive medicine, 36(5)*, 452-457.

Brown, P.R., Brown, W.J., Miller, Y.M. & Hansen, V. (2001). Perceived constraints and social support for active leisure among mothers with young children. *Leisure Sciences, 23*, 131-144.

Burke, S.M., Carron, A.V., Eys, M.A., Ntoumanis, N., & Estabrooks P.A. (2006). Group versus individual approach? A meta-analysis of the effectiveness of interventions to promote physical activity. *Sport and Exercise Psychology Review, 2*, 13-29.

Canadian Society for Exercise Physiology (2002). Physical Activity Readiness Questionnaire (PAR-Q). Retrieved from: <http://www.csep.ca/cmfiles/publications/parq/par-q.pdf>

Choi, J., Fukuoka, Y., & Hyeon Lee, J. (2013). The effects of physical activity and physical activity plus diet interventions on body weight in overweight or obese women who are pregnant or in postpartum: A systematic review and meta-analysis of randomized controlled trials. *Preventive Medicine, 56*, 351-364.

Colley, R.C., Garriguet, D., Janssen, I., Craig, C.L., Clarke, J., & Tremblay, M.S. (2011). Physical activity of Canadian adults: Accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Statistics Canada Catalogue no. 82-003-XPE. Health Reports, 22(1)*, 7-14.

Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E.,...Oja, P. (2003). International Physical Activity Questionnaire: 12-country reliability and validity. *Medicine and Science in Sports Exercise*, 35(8), 1381-1395.

Cramp, A.G., & Brawley, L.R. (2006). Moms in motion: a group-mediated cognitive-behavioral physical activity intervention. *International Journal of Behavioral Nutrition and Physical Activity*, 3(1), 23-29.

Cramp, A.G., & Bray, S.R. (2010). Postnatal women's feeling state responses to exercise with and without baby. *Maternal and Child Health Journal*, 14(3), 343-349.

Cramp, A.G., & Bray, S.R. (2011). Understanding exercise self-efficacy and barriers to leisure-time physical activity among postnatal women. *Maternal and Child Health Journal*, 15, 642-651.

Davies, C.A., Spence, J.C., Vandelanotte, C., Caperchione, C.M. & Mummery, K. (2012). Meta-analysis of internet-delivered interventions to increase physical activity levels. *International Journal of Behavioral Nutrition and Physical Activity*, 9(52). doi:10.1186/1479-5868-9-52

Davies, G.A.L., Wolfe, L.A., Mottola, M.F., & MacKinnon, C. (2003). Exercise in pregnancy and the postpartum period. *Journal of obstetrics and gynaecology Canada*, 25(6), 516-529.

Dell Pruett, M & Caputo, J.L. (2011). Exercise guidelines for pregnant and postpartum women. *Strength and Conditioning Journal*, 33(3), 100-103.

Draper, M., Jennings, J., Barón, A., Erdur, O., Shankar, L. (2000). Dose-effect relationships in brief therapy based on a nationwide college counseling center sample. In: Dose-effect relationships in brief therapy based on a nationwide college counseling center sample, vol. 1. *The Counseling & Mental Health Center*, The University of Texas at Austin.

Estabrooks, P. A., & Carron, A. V. (2000). The Physical Activity Group Environment

Questionnaire: An instrument for the assessment of cohesion in exercise classes for older adults. *Group Dynamics*, 4, 230-243.

Fjeldsoe, B., Miller, Y.D., & Marshall, A.L (2010). Mobile mums: A randomized controlled trial of an SMS-based physical activity intervention. *Annual Behavioural Medicine*, 39, 101-111.

Gennaro, S., & Fehder, W. (2000). Health behaviors in postpartum women. *Family Community Health*, 22, 16-26.

Godin G., & Shephard R. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10, 141-146

Haskell, W.L., Lee, I.M., Pate, R.R., Powell, K.E., Blair, S.N., Franklin, B.A...American Heart Association (2007). Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*, 116, 1081-1093. doi: 10.1161/CIRCULATIONAHA.107.185649

Kelley, M.L., Heffer, R.W., Gresham, F.M., & Elliott, S.N. (1989). Development of a modified treatment evaluation inventory. *Journal of Psychopathology and Behavioral Assessment*, 11(3), 235-247.

Koltyn, K., & Schultes, S. (1997). Psychological effects of an aerobic exercise session and a rest session following pregnancy. *Journal of Sports Medicine and Physical Fitness*, 37, 287-291.

Lewis, B.A. (2011). Effects of Exercise on Depression During Pregnancy and Postpartum: A Review. *American Journal of Lifestyle Medicine*, 5, 370-378.

Lewis, B.A., Martinson, B.C., Sherwood, N.E., & Avery, M.D. (2011). A pilot study evaluating a telephone-based exercise intervention for pregnant and postpartum women. *Journal of Midwifery and Women's Health*, 56(2), 127-131.

McAuley, E., Mihalko, S. (1998). Measuring exercise-related self-efficacy. In: J. Duda (Ed.). *Advances in sport and exercise psychology measurement* (pp.371-381). USA: Fitness Information, Inc.

Mckay, H.G., Feil, E.G., Glasgow, R.E., & Brown, J.E. (1998). Feasibility and use of an Internet support service for diabetes self-management. *Diabetes Education*, 24(2), 174-179.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W...Wood, C.E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine*, 46(1), 81-95. doi: 10.1007/s12160-013-9486-6

Miles M. B., Huberman A.M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Thousand Oaks, CA: Sage.

Miller, Y.D., Trost, S.G., & Brown, W.J. (2002). Mediators of physical activity behavior change among women with young children. *American Journal of Preventive Medicine*, 23(2), 98-103.

Mottola, M.F. (2002). Exercise in the postpartum period: Practical Applications. *Current Sports Medicine Reports*, 1(6), 362-368.

Nicklas, J.M., Zera, C.A., Seely, E.W., Abdul-Rahim, Z.S., Rudloff, N.D. & Levkoff, S.E. (2011). Identifying postpartum intervention approaches to prevent type 2 diabetes in women with a history of gestational diabetes. *BMC Pregnancy and Childbirth*, 11(23).

Patton, M.Q. (2002). *Qualitative research and evaluation methods*. Sage Publications, Thousand Oaks, CA.

Pew Research (2013). *Health Online*. Retrieved from: http://www.pewinternet.org/files/old-media/Files/Reports/PIP_HealthOnline.pdf.

Sampselle, C., Seng, J., Yeo, S., Killion, C., & Oakley, D. (1999). Physical activity and postpartum well-being. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 28(1), 41-49.

Symons Downs, D., & Hausenblas, H. (2004). Women's exercise beliefs and behaviours during their pregnancy and postpartum. *Journal of Midwifery & Women's Health*, 49(2), 138-144. doi:10.1016/S1526-9523(03)00495-1.

Tabachnik, B.G., & Fidell, L.S. (2013). *Using Multivariate Statistics (6th Ed.)*. Boston: Pearson.

Tremblay, M.S., Warburton, D.E.R., Janssen, I., Paterson, D.H., Rhodes, R.E., Kho, M.E.,...Duggan, M. (2011). New Canadian physical activity guidelines. *Applied Physiology, Nutrition, and Metabolism*, 36(1), 36-46. doi: 10.1139/H11-009

Van den berg, M.H., Schoones, J.W., & Vliet Vlieland, T.P. (2007). Internet-based physical activity interventions: a systematic review of the literature. *Journal of Medical Internet Research*, 9(3), e26.

Whatley Blum, J., Christina, M., & Caton-Lemos, L (2004). Physical activity patterns and maternal well-being in postpartum women. *Maternal and Child Health Journal*, 8(3) 163-169.

Chapter 3

3 *Move More Mommy: Change in Physical Activity, Self-Efficacy, and Group Cohesion from a Web-Based Physical Activity Intervention for Postnatal Women*

3.1 Introduction

Current physical activity guidelines recommend that healthy adults, including women who have recently given birth, accumulate a minimum of 150 minutes of moderate to vigorous physical activity (MVPA) per week (Tremblay et al., 2011). According to the American College of Obstetricians and Gynecologists and Society of Obstetricians and Gynaecologists of Canada (ACOG and SCOG; ACOG Committee Opinion, 2009; Artal & O'Toole, 2003; Davies et al., 2003), generally, with uncomplicated births, postnatal women are encouraged to resume physical activity within the first few weeks of giving birth. However, women who have given birth via Cesarean section or experienced any birthing complications are advised to consult with their health care provider(s) before initiating or resuming physical activity (ACOG Committee Opinion, 2009; Kochan-Vintinner, 1999).

Engaging in regular physical activity during the postpartum period (i.e., up to one year following childbirth; Mottola, 2002) is associated with many evidence-based benefits, including improved cardiovascular fitness and psychological well-being (e.g., Mottola, 2002), weight loss (e.g., Mottola, 2002), increased energy (e.g., Mottola, 2002), decreased fatigue and depression (e.g., Ko, Yang, Fang, Lee, & Lin, 2012), urinary incontinence (e.g., Mottola, 2002) and lactation-induced bone loss (e.g., Mottola, 2002). Despite these known benefits, researchers have found that postnatal women are not meeting recommended physical activity guidelines (Albright, Maddock, & Nigg, 2005; Cramp & Bray, 2009; Gennaro & Fehder, 2000; Pereira et al., 2007; Symons Downs & Hausenblas, 2004).

A systematic review of studies examining physical activity and parenthood (i.e., parents vs. non-parents) found a negative relationship between parenthood and physical activity involvement (Bellows-Riecken & Rhodes, 2007). In fact, mothers were found to be 37% less physically active than women of similar ages without children (Bellows-Riecken & Rhodes, 2007). These low rates of physical activity are concerning and thus, interventions have been designed and implemented to increase physical activity engagement in postnatal women.

In recent years, a number of interventions have been designed to increase the physical activity levels of postnatal women. Many of these interventions have been delivered face-to-face or over the telephone and are theory-driven (e.g., Albright, Maddock, & Nigg, 2009; Cramp & Brawley, 2006; Kinnunen et al, 2007; Lewis, Martinson, Sherwood, & Avery, 2011; McIntyre, Peacock, Miller Koh, & Marshall, 2012; Ostbye et al., 2009). Commonly employed theories used include Social Cognitive Theory (SCT; Bandura, 1986), Transtheoretical Model of Behaviour Change (TTM; Prochaska & Velicer, 1997), and Theory of Planned Behaviour (TPB; Ajzen, 1991). For example, Albright and colleagues (2009) conducted a pilot study in accordance with the tenets of SCT and TTM to increase MVPA engagement among sedentary postnatal women. This telephone based intervention targeted social cognitions such as readiness for change, outcome expectations, goal setting, self-efficacy, and self-monitoring. The results revealed significant increases in leisure time MVPA (in minutes) per week, offering support for the use of theory-based technology interventions in promoting physical activity among postnatal women.

Furthermore, Cramp and Brawley (2006) randomized women in the postnatal period to either a face-to-face intervention, which combined physical activity and group mediated cognitive behavioural (GMCB) counseling, or to a standard physical activity group that were not offered GMCB counseling. The GMCB approach (Brawley, Rejeski, & Lutes, 2000) integrates principles of group dynamics (e.g., Cartwright, 1951; Spink & Carron, 1993; Zander, 1983) and behaviour change techniques derived from SCT. There

is evidence to support the use of this combined approach for the modification of physical activity behaviours among a variety of populations (e.g., peripheral artery disease [McDermott et al., 2014]; older adults; [Brawley et al., 2000]). Results from the study conducted by Cramp and Brawley (2006) demonstrated that a GMCB-style approach produced significantly greater effects in improving physical activity levels of postnatal women compared to a standard physical activity group. Utilizing principles from SCT, combined with principles of group dynamics to increase “groupness” among a group of postnatal women, may therefore lead to greater increases in physical activity behaviour change.

Although most interventions targeting the physical activity levels of women in the postnatal period have been delivered face-to-face or via telephone, a few studies have used electronic technologies as a modality for intervention delivery. For example Chang, Nitzke, & Brown (2010) combined peer support group teleconferences with interactive educational DVDs to deliver the theory-based intervention. This 10-week SCT-based intervention included the randomization of 129 postnatal women to either an intervention or usual care group. In addition to the peer support group teleconferences, participants viewed a series of DVDs that featured peers from the target audience talking about their positive and negative experiences. Each DVD chapter included interactive information (to promote healthful lifestyle norms), culturally sensitive narratives (mothers talking about their own positive and negative experiences to increase self efficacy), and goal setting (providing concrete examples of short and long term goals and plans to achieve them). Women in the intervention group increased their weekly physical activity (in METs) more than the control group from baseline to post-intervention, however this difference was not significant. In another study, Fjeldsoe, Miller, and Marshall (2010) used short message service (SMS) to deliver intervention content via text messages. The researchers randomized 88 participants to either a 12-week intervention or a minimal contact control condition. The intervention group received 3 to 5 SMS text messages each week. Intervention-specific text messages targeted SCT constructs (e.g., outcome expectancy, self-efficacy, goal setting). Findings from this study demonstrated a

significant increase in frequency of physical activity and walking for exercise among those in the intervention group compared to the control condition from baseline to post-intervention.

Although postnatal physical activity interventions have demonstrated promising results, several gaps exist in the literature. Firstly, few interventions have assessed physical activity using an objective measure (e.g., accelerometry, pedometer, etc.). In our review of the literature, we identified two interventions targeting increases in physical activity among postnatal women that used objective measures. Clarke and colleagues (2007) conducted an 8-week face-to-face RCT that measured physical activity using pedometers. Results demonstrated a significant increase in steps per day and energy expenditure from pre to post intervention for intervention participants ($n = 93$). Participants randomized to the control arm were not provided with pedometers to assess their step counts, precluding a comparison across conditions. More recently, Craigie, Macleod, Barton, Treweek, and Anderson (2011) used a physical activity monitor to measure changes in activity among a sample of postnatal women randomized to either an intervention or usual care group. In the 12-week intervention, participants received three face-to-face consultations using motivational interviewing techniques, combined with three telephone calls to identify progress and offer support. The control group received usual care and no further contact throughout the intervention. Physical activity monitors were worn for 7 days prior to each assessment time point; at baseline and 12 weeks. There were no significant differences in physical activity over time between participants in the two study arms over the course of the intervention. A summary of previous postnatal interventions can be found in Table 1.

The second gap in the literature pertains to the use of the Internet as a means of intervention delivery. Our literature search revealed no studies that have utilized the Internet to deliver intervention content targeting women in the postnatal period. The use of web-based interventions to increase physical activity among the general population has demonstrated promising results. In fact, a recent meta-analysis evaluated the

effectiveness of 34 web-based physical activity interventions that included control groups (Davies, Spence, Vandelanotte, Caperchione, & Mummery, 2012). Findings showed that this method of intervention delivery was effective, especially in sedentary populations, and produced small yet significant changes in physical activity ($d = 0.14$, $p < .001$). Furthermore, Davies and colleagues (2012) found that delivering interventions via the Internet reduced cost and time required to deliver the intervention, and also increased convenience for participants as they could access the intervention at any point in time.

A third gap in the literature is the lack of literature examining the cognitions known to influence physical activity, such as self-efficacy. Despite many studies being based in theory and targeting these variables, most do not examine how the intervention affects these theoretical variables. For example, Fjeldsoe and colleagues (2010) targeted constructs of SCT including self-efficacy in the SMS messages delivered to the intervention group, however, did not measure the changes in self-efficacy that may have occurred throughout the intervention.

To address the limitations of current postnatal physical activity intervention research, the current study involves the use of the Internet as a modality to deliver intervention content. Furthermore, physical activity was measured using both objective (i.e., accelerometer) and subjective (i.e., self-report) measures. Specifically, the purpose of this study was to examine the effectiveness of the 8-week Move More Mommy pilot intervention at increasing total physical activity (minutes per week) among sedentary postnatal women. We hypothesized that participants would increase the frequency of physical activity over the course of the intervention on both subjective and objective measures of physical activity. A secondary purpose was to examine changes in participants' perceptions of group cohesion and self-efficacy throughout the intervention. We hypothesized that both group cohesion and self-efficacy would increase over time.

3.2 Method

This study was a multi-site, non-randomized, within-subjects pilot intervention. The face-to-face portion of the 8-week intervention was delivered at two YMCA locations in London, Ontario. Study protocol was identical at both intervention sites.

Participants and Recruitment. Recruitment posters were displayed at community postnatal events and clinics, the YMCA (only at study sites), local municipal libraries, as well as on social media websites including Facebook and Twitter. Study information appeared in a free local newspaper, paid advertising through an online resource for new mothers, and a local parenting magazine. To be eligible to participate in the study, women had to meet the following inclusion criteria: a) be over the age of 18; b) be between 6 and 52 weeks postnatal; c) be physically inactive (i.e., not meeting current recommendations of 150 minutes per week of MVPA for the past six months); d) have daily access to the Internet; e) be English speaking; and f) be medically able to exercise according to the Physical Activity Readiness Questionnaire (Canadian Society for Exercise Physiology, 2002).

Measures. All measures can be found in Appendix B. Questionnaires were administered through a secure website: <http://www.surveymonkey.com>. Participants accessed questionnaires by following a direct link (e-mailed to participants) that was password protected and required their unique study identification.

Demographics. An investigator-developed demographic questionnaire ascertained personal characteristics including participant age, number of weeks postnatal, parity, age of eldest child, level of education, income, ethnicity, and marital status.

Physical Activity. Self-reported physical activity was measured using the International Physical Activity Questionnaire – Short Form (IPAQ-SF; Craig et al., 2003) which assessed time spent engaging in walking and MVPA each week. Participants were asked to recall the frequency and duration of walking, moderate, and vigorous physical activity in the past seven days in bouts of ten minutes or more. The IPAQ-SF has been

shown to be valid and reliable in measuring physical activity among 18 to 65 year old adults in diverse settings (Spearman's correlation = 0.76, Craig et al., 2003). For the purpose of the current study, total physical activity volume is reported (i.e., minutes per week of walking, moderate, and vigorous intensity physical activity).

Participants were asked to wear an *Actical*® activity monitor using an elasticized belt on their right hip for 7 days prior to the beginning of the intervention and for one week post-intervention. Participants were asked to put the *Actical*® on when they woke up in the morning, and to take it off at night when they went to bed. Each day the *Actical*® was worn, participants were asked to log what time they put the device on in the morning, took it off at night, and any additional pertinent information (e.g., when they took it off to bathe or reasons for irregular levels of physical activity). *Actical*® accelerometers were programmed to record data at a one-minute epoch length, as has been shown to be effective in adult populations (e.g., Colley et al., 2011). The *Actical*® has been validated to measure physical activity in adults (Heil, 2006).

All *Actical*® devices were programmed with participant information (age, weight, and height). Kinesoft software was used for analyses, and produced a series of standardized outcome variables (Esliger, Copeland, Barnes, & Tremblay, 2005; Esliger & Tremblay, 2007). Data were considered valid and included in the analysis if there were four or more valid days of data. A valid day was defined as 10 or more hours of wear time (Colley et al., 2011; Troiano et al., 2008). Non-wear time was defined as 60 minutes or more of inactivity (no movement data recorded by the accelerometer). Variables of interest were total minutes of light, moderate, and vigorous physical activity each day, and total minutes of physical activity per valid day. Cut points were used to distinguish different levels of intensity among the data (sedentary, light, moderate, or vigorous, according to Colley & Tremblay, 2011). These cut points used are listed in Table 5.

Self-Efficacy. Construction of self-efficacy scales were based on recommendations by Bandura (1995) and McAuley and Mihalko (1998). Exercise self-efficacy was assessed based on the participant's degree of confidence in their ability to

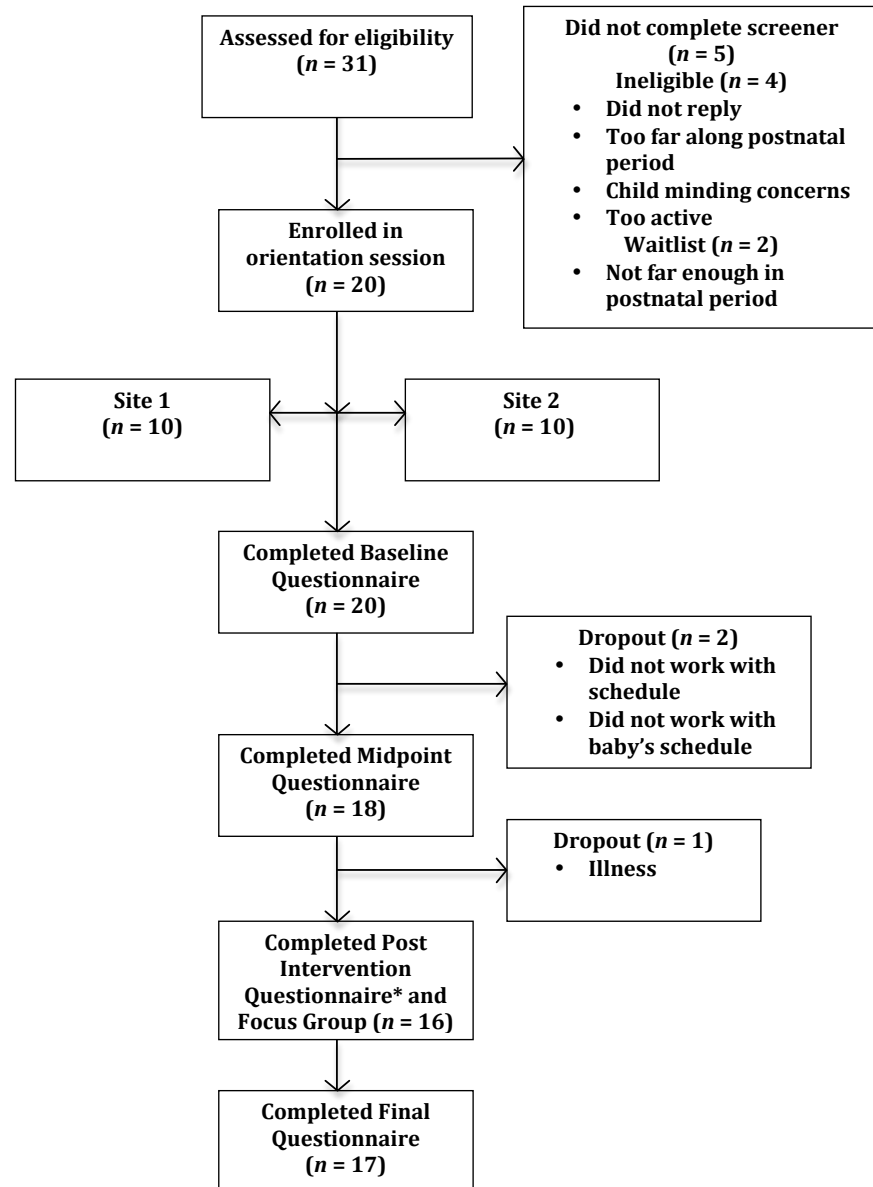
complete 30 minutes or more of moderate and vigorous intensity physical activity one, two, three, four, and five times per week in the subsequent four weeks (e.g., “Over the next 4 weeks, I am confident that I can complete 30 minutes or more of moderate exercise once a week”). The frequency and duration values selected were based on Canadian physical activity recommendations for adults (Tremblay et al., 2011). Participants rated their perceived self-efficacy on a scale ranging from zero to 100 percent, increasing in 10 percent increments. A score of zero indicated they had no confidence in their ability to complete the task, whereas a score of 100 indicated full confidence in their ability to complete the task. Exercise self-efficacy was assessed at baseline and post intervention. Mean scores for both moderate and vigorous physical activity were calculated.

Self-regulatory efficacy was measured using 6 to 21 items across four different subscales that assessed confidence in one’s ability to: 1) self-monitor completed bouts of physical activity; 2) set goals; 3) overcome barriers, and 4) recover from a relapse. An example item from the self-monitoring subscale is “Over the next 4 weeks I am confident that I can record the time of day I engage in exercise.” Participants rated their perceived self-efficacy on a scale ranging from 0 to 100 percent, increasing in 10 percent increments. Again, a score of zero indicated they had no confidence in completing this task, whereas a score of 100 indicated full confidence that they would complete this task. Mean scores were calculated for each subscale. Reliability values for these subscales were deemed acceptable (Tabachnik & Fidell, 2013) and are presented in Table 6.

Group Cohesion. The Physical Activity Group Environment Questionnaire (PAGEQ; Estabrooks & Carron, 2000) is a 21-item instrument used to assess perceptions of group cohesion in exercise classes in adult populations. The first subscale includes 12 items that assess feelings about one’s personal involvement with the exercise group, including both task and social attractions to the group (Estabrooks & Carron, 2000). The second subscale includes 9 items that assess one’s feelings about the exercise group as a whole, known as group integration (Estabrooks & Carron, 2000). Participants were asked

to rate each item on a scale from 1 (very strongly disagree) to 9 (very strongly agree). The PAGEQ was administered in Week 2 of the intervention after participants had met the group at the first exercise class, and again at post intervention. The PAGEQ has demonstrated acceptable content and concurrent validity and is a reliable measure of exercise class cohesion among adults (Estabrooks & Carron, 2000). Sample items include “I enjoy my social interactions within this exercise group” and “We encourage each other in order to get the most out of the program”. Mean values were calculated for both subscales and are included in Table 7.

Procedure. The study protocol was approved by the Health Sciences Research Ethics Board at Western University. Interested participants contacted a member of the research team via e-mail or telephone and were asked to complete a screening questionnaire online. Participants who did not meet study eligibility criteria (i.e., screen fails) were contacted via e-mail and thanked for their interest in the study. All eligible participants were contacted via e-mail and selected the most convenient study location. Participant flow throughout the intervention is illustrated in Figure 3.



*includes Treatment Evaluation Inventory (Short Form)

Figure 3: Participant Flow

Participants were invited to an orientation session at the YMCA one week before the beginning of the intervention. During the orientation session, participants engaged in informed consent (Appendix C). After providing written informed consent, participants received a tour of the facility and were given their unique website access information (e.g., login and password) and a guided tour of the intervention website (www.movemoremommy.com; Appendix D). Finally, participants had the opportunity to view a brief introductory video for an overview of the 8-week intervention and the website discussion board. In this video; participants were prompted to post a comment on the discussion board introducing themselves to the group and sharing a reason for which they joined Move More Mommy.

All participants were given a free membership pass for the YMCA, allowing them access to all areas of the facility for the duration of the intervention. The 8-week intervention included a weekly 45-minute Move More Mommy group exercise class. Classes were led by certified instructors hired specifically for this study (one per site). Instructors were middle-aged females, who were also mothers. The instructor conducted an interval-style class; including a cardiovascular warm-up, strength training portion, and a cool-down period. Classes were designed specifically for physically inactive postnatal women and became increasingly more difficult over the 8-week intervention.

The weekly exercise classes were coupled with a SCT-based behavioural skills training intervention delivered via a website (www.movemoremommy.com) created specifically for the intervention. This website was available to study participants only and required a study specific login and password. The website features are listed in Table 8. Participants were asked to log on to the website a minimum of one time each week to view the weekly video session, schedule their activity for the coming week, log their activity from the previous week, and post on the discussion board in response to the weekly video session. Table 9 lists specific SCT constructs and describes the ways in which these constructs were targeted through the web-based intervention.

Data Analysis. Data were analyzed using SPSS Statistics (version 21, SPSS Inc., Chicago). Descriptive statistics including frequencies and means were calculated where appropriate.

An analysis of variance (ANOVA) was conducted to determine if there were significant differences in demographic variables at baseline between participants at the two intervention sites. Paired sample *t*-tests were conducted to determine if there were significant differences between baseline and post intervention outcome measures. Effect sizes were reported as Cohen's *d*. Effect sizes were interpreted based on general guidelines of small ($d < 0.2$), medium ($0.2 < d < 0.8$), and large ($d > 0.8$; Cohen, 1988).

Objectively measured *Actical*® data were entered into *KineSoft* (version 3.3.62) for analysis. Weekly exercise volume was calculated using the daily average reported duration of light, moderate, and vigorous intensity physical activity (Colley et al., 2011). Differences between these data at baseline and post intervention were calculated using paired sample *t*-tests.

3.3 Results

Participants. Thirty-one potential participants were recruited and screened for the current study. Of these, five did not complete the initial screening questionnaire. Four others were ineligible for various reasons including too far in the postnatal period, unsure about childcare, and already meeting physical activity guidelines. Interested volunteers who were not far enough along in the postnatal period ($n = 2$) were added to a waitlist. Thus, a total of 20 participants enrolled in the intervention and completed baseline measures ($n = 10$ per YMCA site). Three participants withdrew from the intervention prior to completion due to scheduling conflicts and illness. Seventeen participants completed the 8-week intervention and follow up measures. Figure 2 shows the process of participant inclusion and data collection.

Table 2 lists the sociodemographic characteristics of the sample. Participants included 17 postnatal women between the ages of 26 and 39 years ($M = 31.88$, $SD = 3.3$).

The participants were on average 22.41 weeks postnatal at baseline. Fifty-nine percent of mothers were first time mothers (i.e., primiparous). Most were married (94%), Caucasian (94%), and well educated (94% with more than a high school diploma). There were no statistical differences between participants in the two intervention sites at baseline on any of the demographic or screening (i.e., self-report physical activity) variables.

Results. Missing data were identified and treated based on recommendations from Tabachnik and Fidell (2013). Missing scales occurred in 6% of cases (three participants were missing entire scales at baseline, and one participant had a missing scale at post intervention). There were seven instances where missing data points occurred within the scales throughout all measures. One participant had missing data for physical activity measured by the *Actical*® at baseline; as such, 16 participants are included in baseline *Actical*® measures and all are included in post intervention measures.

A summary of the descriptive statistics from each subjective measure can be found in Table 7. Total self-reported physical activity volume from baseline to post intervention increased by 126.39 minutes per week ($SD = 108.52$). The results of a paired sample *t*-test revealed a significant effect over time $t(1, 16) = 4.80, p < .001, d = 1.16$. Valid *Actical*® data were obtained for all participants except one where a technical error occurred at baseline. Table 10 contains data pertinent to the *Actical*® accelerometers. The results of a paired sample *t*-test revealed no significant effect for total objectively measured physical activity over time $t(1, 15) = 0.17, p = .866, d = 0.04$.

Mean values for each self-efficacy scale are reported in Table 7. The results of a paired sample *t*-test revealed no significant effect for exercise self-efficacy, $t(1, 16) = .85, p = .405, d = 0.20$ between baseline and post intervention. As noted, self-regulatory self-efficacy was collected on four different subscales; self-monitoring, goal setting, barriers, and recovery. Self-efficacy on each of these scales decreased over the intervention span. None of these changes were significant, other than self-monitoring where a paired sample *t*-test revealed a significant negative effect over time $t(1, 16) = -2.21, p = .042, d = 0.53$.

The results of a paired sample *t*-test revealed a significant positive effect $t(1, 11) = 10.58, p < .001, d = 3.10$ between baseline and post intervention for subscale A (i.e., individual attractions to the group; personal involvement within the group), and also revealed a significant positive effect $t(1, 8) = 13.88, p < .001, d = 4.71$ between baseline and post intervention for subscale B (i.e., group integration; exercise group as a whole).

3.4 Discussion

This study examined the effectiveness of a web-delivered SCT-based GMCB intervention at increasing physical activity among physically inactive postnatal women in London, Ontario. As hypothesized, *Move More Mommy* participants increased their subjectively measured physical activity levels over the 8-week intervention, as measured by the IPAQ-SF. This finding was not concordant with the physical activity data derived from *Actical*® accelerometers. There were no significant differences in self-efficacy levels over time; however a significant increase in perceptions of group cohesion scores was found over time. This study is one of the few postnatal interventions targeting physical activity levels that has included an objective physical activity measure, and furthermore, to have combined in-person group-based physical activity with web-based delivery of intervention content. Results of the present study provide preliminary evidence that combining face-to-face and web-based intervention methods may be an effective methodology to increase physical activity among postnatal women; however, a larger number of participants are needed as well as a comparison (control) group to support such a claim.

As noted above, self-reported physical activity increased significantly from baseline to post intervention. These findings suggest that this intervention helped participants to increase their levels of overall (reported) physical activity. What is also notable is that at post intervention, according to self-report measures participants were nearing levels recommended for health benefits (150 minutes per week MVPA; Tremblay et al., 2011). Participants increased their total physical activity by 126.39 minutes per week (subjective). Interestingly, this increase in self-reported physical activity levels

were similar to those of Albright et al. (2006), Cramp and Brawley (2006), Fjeldsoe et al. (2010), and McIntyre et al. (2012), among others who conducted similar interventions.

Consistent with previous literature showing that self-reported measures of physical activity are often inflated (Colley et al., 2011), objective measures showed no significant change in physical activity levels from baseline to post intervention. *Actical*® accelerometers showed that participants in this study were meeting recommendations for MVPA at baseline, and this declined by 50 minutes per week at post intervention. One possible explanation is that participants increased their overall physical activity, however, misinterpreted the intensity at which they were exercising. This could explain why self-report measures showed higher levels of MVPA, and *Actical*® accelerometers, a more precise measurement of physical activity intensity, show lower levels. In the future, use of an additional rating scale of perceived exertion could be useful to enhance the accuracy of these results.

Although self-efficacy levels remained relatively consistent, group cohesion changed significantly over the intervention, with a large effect size, as hypothesized. Self-efficacy levels may have been overestimated at baseline; once participants began engaging in practice of these specific activities (i.e., exercising, goal setting, and self-monitoring), they realize how difficult it can be and expectations become more realistic. The large change in group cohesion may be attributed to specific theory-based intervention strategies that were used to increase “groupness”, such as the discussion board and “group goal” features of the website. Furthermore, participants each posted a photo on their profile of the website in order to be more easily identified by other participants. This finding speaks to the importance of not only conducting a web-based intervention, but combining it with a face-to-face group-based intervention to increase group cohesion. In future studies, this increase in group cohesion may result in larger effect sizes in physical activity changes.

One particular limitation of this study is that the sample size was small. Furthermore, this sample was comprised of self-selected volunteers; likely a group of

individuals who had some motivation to engage in physical activity prior to their registration in the intervention. Participants were also similar in terms of demographic characteristics, which may reduce generalizability of results to the larger population. Lastly, there was no control group in this pilot study and therefore, we are unable to compare the results between the intervention group and a similar, standard care group.

This intervention had a number of methodological strengths. To our knowledge, this was the first known physical activity intervention targeting postnatal women that used accelerometers as an objective measure of physical activity. By using this measurement tool, physical activity intensity was measured more precisely than subjective measures allowing researchers to determine unbiased changes in physical activity levels over the course of the intervention. Self-report measures can often act as a source of bias, increasing error in results. Secondly, this intervention was derived from a theory of behaviour change, adding to the number of theoretically driven physical activity interventions among this population. Various constructs of SCT employed in Move More Mommy have previously and consistently been identified to positively impact changes in physical activity behaviours among a variety of populations including postnatal women (references needed).

These results contribute to current research as this was the first web-based physical activity intervention for postnatal women, using an objective measurement of physical activity. This method of delivery used in combination with a theory-based behavioural change approach may be a worthwhile method of intervention delivery to test further in a randomized controlled trial

3.5 Bibliography

Albright C.L., Maddock J.E., Nigg C.R. (2005). Physical activity before pregnancy and following childbirth in a multiethnic sample of healthy women. *Women and Health*, 42, 95–110.

Albright, C.L., Maddock, J.E., & Nigg, C.R. (2009). Increasing physical activity in postpartum multiethnic women in Hawaii: Results from a pilot study. *BMC Women's Health*, 9(4). 1-7. doi:10.1186/1472-6874-9-4

American College of Obstetricians and Gynecologist Committee Opinion No. 267 (2002:2009). Exercise during pregnancy and the postpartum period. *Obstetric Gynecology*, 99, 171-173.

Artal, R., & O'Toole, M. (2003). Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period. *British Journal of Sports Medicine*, 37(1), 6-12.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. New Jersey: Prentice-Hall. Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology and Health*, 13, 623-649.

Bandura, A. (1995). On rectifying conceptual ecumenism. In: J.E. Maddaux (Ed.), *Self-efficacy, Adaption, and Adjustment: Theory Research and Application*. (pp.247-375). New York: Plenum Press.

Bellows-Riecken, K.H. & Rhodes, R.E. (2007). A birth of inactivity? A review of physical activity and parenthood. *Preventive Medicine*, 46, 99-110. doi:10.1016/j.ypmed.2007.08.003

Brawley, L.R., Rejeski, J.W., & Lutes, L. (2000). A group-mediated cognitive-behavioral intervention for increasing adherence to physical activity in older adults. *Journal of Applied Biobehavioral Research*, 5(1), 47-65.

Burke, S.M., Carron, A.V., Eys, M.A., Ntoumanis, N., & Estabrooks P.A. (2006). Group versus individual approach? A meta-analysis of the effectiveness of interventions to promote physical activity. *Sport and Exercise Psychology Review*, 2, 13-29.

Canadian Society for Exercise Physiology (2002). Physical Activity Readiness Questionnaire (PAR-Q). Retrieved from: <http://www.csep.ca/cmfiles/publications/parq/par-q.pdf>

Cartwright, D. (1951). Achieving change in people: Some applications of group dynamics theory. *Human Relations*, 4(4), 381-392.

Chang, M.W., Nitzke, S., & Brown, R. (2010). Design and outcomes of a Mothers in Motion behavioural intervention pilot study. *Journal of Nutrition Education Behaviour*, 42(3), s11-s21. doi:10.1016/j.jneb.2010.01.010.

Clarke, K.K., Freeland-Graves, J., Klohe-Lehman, D.M., Milani, T.J., Nuss, H.J., & Laffrey, S. (2007). Promotion of physical activity in low-income mothers using pedometers. *Journal of the American Dietetic Association*, 107(6), 962-967. doi: 10.1016/j.jada.2007.03.010

Cohen, J. *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum; 1988.

Colley, R.C., Garriguet, D., Janssen, I., Craig, C.L., Clarke, J., & Tremblay, M.S. (2011). Physical activity of Canadian adults: Accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Statistics Canada Catalogue no. 82-003-XPE. Health Reports*, 22(1), 7-14.

Colley, R.C., & Tremblay, M.S. (2011). Moderate and vigorous physical activity intensity cut-points for the Actical accelerometer. *Journal of Sports Sciences*, 29(8), 783-789. DOI: [10.1080/02640414.2011.557744](https://doi.org/10.1080/02640414.2011.557744).

Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E.,...Oja, P. (2003). International Physical Activity Questionnaire: 12-country reliability and validity. *Medicine and Science in Sports Exercise*, 35(8), 1381-1395.

Craigie, A.M., Macleod, M., Barton, K.L., Treweek, S., & Anderson, A.S. (2011). Supporting postpartum weight loss in women living in deprived communities – design implications for a randomized control trial. *European Journal of Clinical Nutrition*, 65(8), 952-958. doi:10.1038/ejcn.2011.56.

Cramp, A.G., & Brawley, L.R. (2006). Moms in motion: a group-mediated cognitive-behavioral physical activity intervention. *International Journal of Behavioral Nutrition and Physical Activity*, 3(1), 23-29.

Cramp, A.G., & Bray, S.R. (2010). Postnatal women's feeling state responses to exercise with and without baby. *Maternal and Child Health Journal*, 14, 343-349. doi: 10.1007/s10995-009-0462-5.

Davies, C.A., Spence, J.C., Vandelanotte, C., Caperchione, C.M. & Mummery, K. (2012). Meta-analysis of internet-delivered interventions to increase physical activity levels. *International Journal of Behavioral Nutrition and Physical Activity*, 9(52). doi:10.1186/1479-5868-9-52

Davies, G.A.L., Wolfe, L.A., Mottola, M.F., & MacKinnon, C. (2003). Exercise in pregnancy and the postpartum period. *Journal of obstetrics and gynaecology Canada*, 25(6), 516-529.

Esliger, D., Copeland, J., Barnes, J. D., & Tremblay, M. S. (2005). Standardizing and optimizing the use of accelerometer data for free-living physical activity monitoring. *Journal of Physical Activity and Health*, 3, 366–383.

Esliger, D.W., & Tremblay, M.S. (2007). Physical activity and inactivity profiling: The next generation. *Canadian Journal of Public Health, 98*, S195-S207.

Estabrooks, P. A., & Carron, A. V. (2000). The Physical Activity Group Environment Questionnaire: An instrument for the assessment of cohesion in exercise classes for older adults. *Group Dynamics, 4*, 230-243.

Fjeldsoe, B., Miller, Y.D., & Marshall, A.L (2010). Mobile mums: A randomized controlled trial of an SMS-based physical activity intervention. *Annals of Behavioral Medicine, 39*, 101-111.

Gennaro, S., & Fehder, W. (2000). Health behaviors in postpartum women. *Family Community Health, 22*, 16-26.

Heil, D.P. (2006). Predicting activity energy expenditure using the Actical activity monitor. *Research Quarterly for Exercise and Sport, 77*, 64-80.

Kinnunen, T.I., Pasanen, M., Aittasalo, M., Fogelholm, M., Weiderpass, E., & Luoto, R. (2007). Reducing postpartum weight retention – A pilot trial in primary health care. *European Journal of Clinical Nutrition, 16(7)*, 884-891

Ko, Y, Yang, C., Fang, A., Lee, M., & Lin, P. (2012). Community-based postpartum exercise program. *Journal of Clinical Nursing, 22*, 2122-2131. doi: 10.1111/jocn.12117

Kochan-Vintinner, A. (1999). *Active living during pregnancy: physical activity guidelines for mother and baby*. Edited by Wolfe, L.A., Mottola, M.F. Ottawa: Canadian Society for Exercise Physiology and Health Canada.

Lewis, B.A., Martinson, B.C., Sherwood, N.E., & Avery, M.D. (2011). A pilot study evaluating a telephone-based exercise intervention for pregnant and postpartum women. *Journal of Midwifery and Women's Health, 56(2)*, 127-131.

McAuley, E., & Mihalko, S. (1998). Measuring exercise-related self-efficacy. In: J. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp.371-381). USA: Fitness Information, Inc.

McDermott, M.M., Guralnik, J.M., Criqui, M.H., Ferrucci, L., Zhao, L., Liu, K...Rejeski, W.J. (2014). Home-based walking exercise in peripheral artery disease: 12-month follow-up of the goals randomized trial. *Journal of the American Heart Association*, 3(3), 1-12. doi: 10.1161/JAHA.113.000711.

McIntyre, H.D., Peacock, A., Miller, Y.D., Koh, D., & Marshall, A.L. (2012). Pilot study of an individualized early postpartum intervention to increase physical activity in women with previous gestational diabetes. *International Journal of Endocrinology*, 2012, 1-5. doi:10.1155/2012/892019

Mottola, M.F. (2002). Exercise in the postpartum period: Practical Applications. *Current Sports Medicine Reports*, 1(6), 362-368.

Ostbye, T., Krause, K.M., Lovelady, C.A., Morey, M.C., Bastian, L.A., Peterson, B.L...McBride, C.M. (2009). Active mothers postpartum: a randomized controlled weight-loss intervention trial. *American Journal of Preventive Medicine*, 37(3), 173-180.

Pereira, M.A., Rifas-Shiman, S.L., Kleinman, K.P., Rich-Edwards, J.W., Peterson, K.E., & Gillman, M.W. (2007). *American Journal of Preventive Medicine*, 32(4), 312-319. doi: 10.1016/j.amepre.2006.12.017

Prochaska, J.O., & Velicer, W.F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12(1), 38-48. doi: <http://dx.doi.org/10.4278/0890-1171-12.1.38>

Spink, K.S., & Carron, A.V. (1993). The effects of team building on the adherence patterns of female exercise participants. *Journal of Sport and Exercise Psychology*, 15, 39-49.

Symons Downs, D., & Hausenblas, H. (2004). Women's exercise beliefs and behaviours during their pregnancy and postpartum. *Journal of Midwifery & Women's Health, 49*(2), 138-144. doi:10.1016/S1526-9523(03)00495-1.

Tabachnik, B.G., & Fidell, L.S. (2013). *Using Multivariate Statistics (6th Ed.)*. Boston: Pearson.

Tremblay, M.S., Warburton, D.E.R., Janssen, I., Paterson, D.H., Rhodes, R.E., Kho, M.E.,...Duggan, M. (2011). New Canadian physical activity guidelines. *Applied Physiology, Nutrition, and Metabolism, 36*(1), 36-46. doi: 10.1139/H11-009

Troiano, R.P., Berrigan, D., Dodd, K., Masse, L.C., Tilert, T., McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports and Exercise, 40*(1), 181-188.

Zander, A. (1983). *Making Groups Effective*. San Francisco: Jossey-Bass.

Chapter 4

4 Discussion

The postnatal period is a time in which many women are confronted with new challenges and lifestyle changes, including low physical activity levels. To facilitate improvement in physical activity among postnatal women, our research team developed an 8-week face-to-face physical activity intervention combined with a web-based group mediated cognitive behavioural self-regulatory skills training intervention. This intervention is the first known study to combine the group mediated cognitive behavioural model with web-based intervention delivery. The purpose of this study was to examine the feasibility and acceptability of a web-based intervention, Move More Mommy, and to evaluate the effectiveness of the intervention at increasing physical activity, self-efficacy, and group cohesion.

Seventeen self-selected postnatal women completed the 8-week intervention. Overall, Move More Mommy was deemed to be a feasible and acceptable intervention; participants reported being satisfied with the intervention overall, the website was used frequently, and physical activity class attendance rates were excellent (86%). Changes in physical activity levels were inconclusive as self-report measures showed an increase; however objective measures showed no significant change. Self-efficacy levels remained similar over the course of the intervention and group cohesion significantly increased. Potential explanations and implications of these results are offered below.

4.1 Feasibility

As hypothesized, the study was deemed to be a feasible intervention overall; attendance at the group-based exercise class was high (86%), as were web-usage statistics.

According to Bowen and colleagues (2009), one key area of focus for feasibility studies is demand: The extent to which a new program is likely to be used. By measuring the use of the intervention through attendance and website usage, the intervention was deemed to

be feasible. Another key area of feasibility is practicality, which includes the ability of participants to carry out intervention activities (Bowen et al., 2009). Participant attendance, usage of each website feature, such as the goal setting calendar, self-monitoring calendar, and discussion board indicated practicality of the intervention. Fjeldsoe, Miller, and Marshall (2010) used similar methods to measure the feasibility of a 12-week short messaging service (SMS) based physical activity intervention in postnatal women. For example, Fjeldsoe et al. (2010) sent participants a “goal check” SMS each week that requested a response from participants on whether or not they had met their weekly physical activity goal, and also asked participant’s to record goal setting, self-monitoring, and planning on a weekly magnet. In the present study, participants used the various website features more frequently (range 69.1% - 81.6%) than did participants in Fjeldsoe et al. (24% at week 10 for “goal check”; 64% at post intervention for magnet use), and logged into the website more than the average number of logins recently found in a meta-analysis of online physical activity interventions (Davies et al., 2012). These high usage rates in the present study are relevant, as behaviour change is known to increase with a dose-response relationship (i.e., increased web-usage provides higher dose of exposure to the intervention; Draper, Jennings, Baron, Erdur, & Shankar, 2000; van den Berg, Schoones, Vilet, & Vileland, 2007).

Attendance at the group-exercise classes was another indication of the feasibility of this study. Attendance rates were higher than hypothesized, and higher than similar intervention studies such as that of Cramp and Brawley (2006). Of note, is that participants at site two considered the study location to be a barrier to their attendance at the group exercise classes. Site one participants, however, did not cite this barrier during the focus groups, and attended slightly more classes than the participants at site two. The location of site one was a new facility, much larger than site two, located on the outside of the city in a residential area. This location has a large parking lot and could potentially hold many more people than site two. Site two is in fact, less accessible and this should be noted for future interventions. Site two was a downtown location, with very limited above ground parking. Underground parking was offered at the site, however,

participants did not all know about this option. Furthermore, for postnatal women with young babies, the underground parking was not ideal as it required climbing a steep, narrow set of stairs to enter the facility. This feedback from participants has implications for future research design where the accessibility of all facilities, especially for women with young children, should be something researchers evaluate prior to the intervention to maximize attendance rates.

4.2 Acceptability

Move More Mommy was also deemed as an acceptable intervention based on results from a modified Treatment Evaluation Inventory – Short Form (Kelley et al., 1989), and qualitative findings from focus groups at post intervention. Acceptability can be defined as the extent to which participants judge the intervention as suitable, satisfying, or attractive measured by things such as the perceived appropriateness or simply, participant satisfaction (Bowen et al., 2009). As hypothesized, scores on the TEI-SF were all positive. Some of the items with the highest scores (closest to anchor “strongly agree”) on the TEI-SF include statements such as “the program was conveyed to me in a way that I could understand”, “I would recommend this program to other postnatal women having difficulty starting and maintaining regular exercise”, and “I believe this program will be beneficial in increasing my exercise/activity levels”. In addition, focus groups furthermore explained the acceptability of the intervention. Participant responses displayed that they found the majority of website features to be suitable (i.e., excluding the goal setting calendar which was too specific for this population). Participants also indicated that the intervention was attractive and satisfying as most wished the intervention was continuing “for another 8 weeks”. It should also be noted that the group played a large role in the attractiveness of the intervention. These results provide preliminary evidence that a group-based intervention combined with web-based intervention delivery is feasible and acceptable among postnatal women in London, ON.

4.3 Physical Activity

In accordance with our hypothesis, physical activity levels increased over the 8-week intervention based on self-report measures. A number of physical activity interventions among postnatal women with similar intervention characteristics such as SCT-based and face-to-face components have shown significant increases in self-reported physical activity levels (i.e., Cheung, Smith, van der Ploeg, Cinnadaio, & Bauman, 2011; Cramp & Brawley, 2006). The self-reported increase in the present study was a very large effect ($d = 1.16, p < .001$).

Although increases in self-reported physical activity were observed, this finding was not replicated with *Actical*® accelerometers. The present study resulted in only a very minute change in objective levels of physical activity. These results are consistent with accelerometer data from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) and the 2007-2009 Canadian Health Measures Survey, which show that often, self-report estimates are much higher than those measured by accelerometer (Colley et al., 2011; Troiano et al., 2008). Accelerometers, however, can also not capture all activities accurately; for example, walking on an incline, and therefore may also underestimate overall physical activity (Heil, 2006). Focus groups held at post intervention shed light on a possible explanation for why self-report results did not align with objective results. Participants expressed that throughout the 8-week intervention, they often recorded workouts at a vigorous level; however, when compared to later, more difficult workouts, realized that they had possibly reported more vigorous intensities than were actually attained. Another possible explanation for why physical activity levels were high at baseline is the Hawthorne effect, which appears to be an increase in human performance when they are aware that their behaviours are being observed (Roethlisburger & Dickson, 1939). A similar effect (i.e., sentinel effect) can also be observed when humans are aware that their behaviours are being evaluated, and could have been a possible reason for which there was a significant effect over time between self-report, yet not objective physical activity measures. Secondly, participants expressed in the focus groups that they felt the intervention had increased their overall levels of

physical activity, yet the intensity at which they were exercising was lower. This finding is consistent with previous literature that shows that postnatal women often tend to shift from MVPA to light physical activity following childbirth and often walk for physical activity (McIntyre, Peacock, Miller, Koh, & Marshall, 2012; O'Toole, Sawicki, & Artal, 2003; Pereira et al., 2007).

4.4 Self-Efficacy

Self-efficacy levels remained consistent over the 8-week intervention, despite intervention strategies such as goal setting and self-monitoring used in an attempt to increase self-efficacy among participants, which has previously been shown to have a significant association with leisure time physical activity levels in postnatal women (Cramp & Bray, 2010). Task self-efficacy, perhaps, did not increase, as it was specific to moderate and vigorous intensities of physical activity. As found by Pereira and colleagues (2007), postnatal women are more likely to exercise at a light intensity following childbirth and as such, may have increased confidence in being active at a light intensity rather than MVPA. Self-regulatory self-efficacy also showed no significant difference. The online goal setting calendar, used to increase self-regulatory skills and hence increase self-efficacy, was specific with 15-minute time intervals in which participants could plan their exercise sessions for the coming week. Focus group conversations shed light on this being difficult and sometimes demotivating for participants to do, and thus, may have inhibited a feeling of success and subsequent increase in self-efficacy. In future studies, a less specific goal setting tool may be more useful to increase self-efficacy for postnatal women. Another possibility is that self-regulatory self-efficacy was overestimated at baseline. Once the intervention, and therefore the practicing of self-regulatory skills such as goal setting and self-monitoring were initiated, it is possible that participants realized that self-regulation can be more difficult than anticipated at baseline. This finding is not unusual and is in accordance with a review by McAuley and Mihalko (1998) on the measurement of efficacy in exercise.

A recent meta-analysis of 27 interventions targeting self-efficacy to change physical activity behaviours in healthy adults found that the various interventions had a small, yet significant effect on self-efficacy levels (Ashford, Edmunds, & French, 2010). Interestingly, identifying barriers to physical activity and encouraging participants to identify ways to overcome these barriers, as we did in the present study, was associated with lower levels of self-efficacy (Ashford et al., 2010). The authors of this particular meta-analysis suggest that identifying barriers as a foundation to behaviour change rather than an explicit exploration of reasons that the participant would not be able to perform the behaviour may be a better technique to increase self-efficacy (Ashford et al., 2010).

4.5 Group Cohesion

Results from the PAGEQ (Estabrooks & Carron, 2000) demonstrate that as hypothesized, group cohesion increased over the 8-week intervention. Specific strategies, such as photos to identify each participant online, the discussion board, and setting “group goals”, were incorporated into the intervention to increase “groupness”. Qualitative findings from the focus groups furthermore emphasized the importance of the group and thus, the importance of combining the web-based intervention with a group component. Participants mentioned that the group, comprised of women in a similar life stage and of similar physical activity levels, acted as a facilitator to attendance at the group-based exercise classes. Furthermore, participants mentioned that the online discussion board added to this feeling of ‘the group’ and gave them an additional outlet to socialize and increase group cohesion. *Move More Mommy* used the GMCB model which has been previously shown to increase physical activity levels in postnatal women (Cramp & Brawley, 2006) and combined the conventional face-to-face delivery method with a more accessible, web-based delivery. Exercising as a group is a well-known predictor of exercise adherence (Burke et al., 2006) and was an important aspect of this intervention.

4.6 Strengths and Limitations

Limitations of this study include the small sample size, the demographics of the sample (majority Caucasian, married, well-educated participants), and that participants self-selected to be a part of the intervention. However, previous pilot studies with postnatal women have used similar sample sizes to test the efficacy and/or feasibility of physical activity interventions (Albright et al., 2009; Fjeldsoe et al., 2009). A small, self-selected, homogeneous sample like that of the present study may lead to overestimation of effect sizes, biases, and may also lessen the generalizability of the findings. Participants who volunteered for the study would likely have been highly motivated individuals who had some level of intention to exercise. The purpose-built website also posed a number of limitations, as expected for any new web page. These limitations included the inability to track how long participants were logged in for each time they logged in, which would have given a better idea of intervention exposure, and whether or not participants actually watched each video session in full. Furthermore, the website was not compatible with tablets and hence, some participants could only watch the video sessions through an external website (www.youtube.com). This also affected the usage data, as it was not possible to know which participants had used the external site as opposed to *Move More Mommy*. Ensuring this website is tablet-friendly for future interventions is an important-step and will increase convenience of a web-based intervention for participants. Additionally, there was no control group used in this study, therefore we are unable to compare the results of the intervention to a similar, standard care group to establish cause and effect. Lastly, no follow-up measures were reported. Follow-up measures would have provided more insight into the effectiveness of the intervention long-term. Despite these limitations, there are several key strengths.

Strengths of this study include the theory-based methodology and the convenient delivery method used with a model known to change physical activity behaviours (GMCB), as well as the group-based component. Previous theory-based strategies known to result in physical activity behaviour change (i.e., exercising as a true group; setting goals; self-monitoring) were used throughout the duration of the intervention.

Furthermore, using web-based intervention delivery methods provides a standardized program, thus all participants receive an identical intervention. Each participants at both sites received the same website and tools where the theory-based GMCB intervention was delivered. Any differences in participant experiences would have been derived only from difference in “the group”, and the site in which their group-based exercise occurred. Secondly, this study used an objective measure of physical activity, which can remove response biases and errors in recalling physical activity (Adamo et al., 2009). A third strength of this intervention was the mixed method design that allowed us to gather not only quantitative data, but also rich feedback on the feasibility of the intervention and delivery method within this population.

4.7 Future Research

In future research, it would be valuable to include participants who were either all primiparous (i.e., first child) or, all multiparous (i.e., more than one child), or to compare the two groups. Previously cited barriers to physical activity among postnatal women include both childcare duties, and, having another child at home. A review on parenthood and physical activity reveals that the total number of children is a key variable; physical activity levels decrease with each subsequent child, and therefore this would be an interesting comparison (Bellows-Riecken & Rhodes, 2007).

Secondly, including both a weaning-phase and a follow-up period in future interventions would potentially increase the behaviour change effects over time. In the present study, participants received an 8-week intervention that included both a web-based component and a group-based component. At the end of this 8-week period, post intervention measures were taken. In the future, it would be beneficial to wean participants from the intervention. For example, following the 8-week intervention participants no longer have the group-based intervention but still have the web-based intervention, or vice versa. Following this first stage of weaning, participants no longer have either phase of the intervention but still have access to the facility (i.e., fitness

center) and childcare. Including follow-up measures is important to understanding whether behaviour changes resulting from the intervention are sustainable.

Lastly, future research should repeat the present study using a randomized control methodology. In this research, the control group should receive the same group-based intervention as the intervention group, however, no access to the *Move More Mommy* website. This would allow researchers to establish preliminary evidence on the effect of the web-based intervention on physical activity behaviours.

4.8 Conclusion

Although the present study found mixed results in physical activity behaviour change (i.e., self-report measures show a significant increase in physical activity, objective measures do not), this web-based intervention was found to be feasible and acceptable among postnatal women. Participants thoroughly enjoyed the intervention and found the group to be one of the most important aspects. This study adds to the current body of literature as it reduces the challenges of effectively delivering a physical activity intervention for postnatal women by using a new method of delivery (web-based). *Move More Mommy* represents a promising finding in postnatal physical activity research.

4.9 Bibliography

Adamo, K., Prince, S., Tricco, A., et al. (2009). A comparison of indirect versus direct measures for assessing physical activity in the pediatric population: A systematic review. *International Journal of Pediatric Obesity*, 4(1), 2-27.

Albright, C.L., Maddock, J.E., & Nigg, C.R. (2009). Increasing physical activity in postpartum multiethnic women in Hawaii: Results from a pilot study. *BMC Women's Health*, 9(4). 1-7. doi:10.1186/1472-6874-9-4

Ashford, S., Edmunds, J., and French, D.P. (2010). What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with meta-analysis. *British Journal of Health Psychology*, 15(2), 265-288.

Bellows-Riecken, K.H. & Rhodes, R.E. (2007). A birth of inactivity? A review of physical activity and parenthood. *Preventive Medicine*, 46, 99-110. doi:10.1016/j.ypmed.2007.08.003

Bowen, D.J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weinder, D.,...Fernandez, M. (2009). How we design feasibility studies. *American journal of preventive medicine*, 36(5), 452-457.

Burke, S.M., Carron, A.V., Eys, M.A., Ntoumanis, N., & Estabrooks P.A. (2006). Group versus individual approach? A meta-analysis of the effectiveness of interventions to promote physical activity. *Sport and Exercise Psychology Review*, 2, 13-29.

Cheung, N.W., Smith, B.J., van der Ploeg, H.P. Cinnadaio, N, & Bauman, A. (2011). A pilot structured behavioural intervention trial to increase physical activity among women with recent gestational diabetes. *Diabetes Research and Clinical Practices*, 92, e27-e29.

Colley, R.C., Garriguet, D., Janssen, I., Craig, C.L., Clarke, J., & Tremblay, M.S. (2011). Physical activity of Canadian adults: Accelerometer results from the 2007 to

2009 Canadian Health Measures Survey. *Statistics Canada Catalogue no. 82-003-XPE. Health Reports, 22(1)*, 7-14.

Cramp, A.G., & Brawley, L.R. (2006). Moms in motion: a group-mediated cognitive-behavioral physical activity intervention. *International Journal of Behavioral Nutrition and Physical Activity, 3(1)*, 23-29.

Cramp, A.G., & Bray, S.R. (2010). Postnatal women's feeling state responses to exercise with and without baby. *Maternal and Child Health Journal, 14*, 343-349. DOI 10.1007/s10995-009-0462-5

Davies, C.A., Spence, J.C., Vandelanotte, C., Caperchione, C.M. & Mummery, K. (2012). Meta-analysis of internet-delivered interventions to increase physical activity levels. *International Journal of Behavioral Nutrition and Physical Activity, 9(52)*. doi:10.1186/1479-5868-9-52

Draper, M., Jennings, J., Barón, A., Erdur, O., Shankar, L. (2000). Dose-effect relationships in brief therapy based on a nationwide college counseling center sample. In: Dose-effect relationships in brief therapy based on a nationwide college counseling center sample, vol. 1. *The Counseling & Mental Health Center*, The University of Texas at Austin.

Estabrooks, P. A., & Carron, A. V. (2000). The Physical Activity Group Environment Questionnaire: An instrument for the assessment of cohesion in exercise classes for older adults. *Group Dynamics, 4*, 230-243.

Fjeldsoe, B., Miller, Y.D., & Marshall, A.L (2010). Mobile mums: A randomized controlled trial of an SMS-based physical activity intervention. *Annals of Behavioural Medicine, 39*, 101-111.

Heil, D.P. (2006). Predicting activity energy expenditure using the Actical activity monitor. *Research Quarterly for Exercise and Sport, 77*, 64-80.

Kelley, M.L., Heffer, R.W., Gresham, F.M., & Elliott, S.N. (1989). Development of a modified treatment evaluation inventory. *Journal of Psychopathology and Behavioral Assessment*, *11*(3), 235-247.

McAuley, E., & Mihalko, S. (1998). Measuring exercise-related self-efficacy. In: J. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp.371-381). USA: Fitness Information, Inc.

McIntyre, H.D., Peacock, A., Miller, Y.D., Koh, D., & Marshall, A.L. (2012). Pilot study of an individualized early postpartum intervention to increase physical activity in women with previous gestational diabetes. *International Journal of Endocrinology*, *2012*, 1-5. doi:10.1155/2012/892019

O'Toole, M.L., Sawicki, M.A., & Artal, R. (2003). Structured diet and physical activity prevent postpartum weight retention. *Journal of Women's Health*, *12*(10), 991-998.

Pereira, M.A., Rifas-Shiman, S.L., Kleinman, K.P., Rich-Edwards, J.W., Peterson, K.E., & Gillman, M.W. (2007). *American Journal of Preventive Medicine*, *32*(4), 312-319. doi: [10.1016/j.amepre.2006.12.017](https://doi.org/10.1016/j.amepre.2006.12.017)

Roethlisburger, F.J., & Dickson, W.J. *Management and the Worker*. Cambridge, MA: Harvard University Press; 1939.

Troiano, R.P., Berrigan, D., Dodd, K., Masse, L.C., Tilert, T., McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine and Science in Sports and Exercise*, *40*(1), 181-188.

Van den berg, M.H., Schoones, J.W., & Vliet Vlieland, T.P. (2007). Internet-based physical activity interventions: A systematic review of the literature. *Journal of Medical Internet Research*, *9*(3), e26.

Table 1

Previous Postnatal Physical Activity Interventions, study characteristics

Year	Authors	Study Design	Type	Theory	N	Duration	Delivery Method
2008	Aittalso, M. et al.	Quasi-Experimental	PA	None	92	32 weeks	Face to face
2009	Albright, C.L., Maddock, J.E., & Nggg, C.R.	Pilot	PA	SCT/TTM	20	8 weeks	Telephone, Email, Newsletters
2010	Chang, M.W., Nitzke, S., & Brown, R.	RCT	PA + diet	SCT	129	10 weeks	DVD, Telephone
2011	Craigie, A.M., Macleod, M., Barton, K.L., Treweek, S., & Anderson, A.S.	RCT	PA + diet	None	60	12 weeks	Face to face, telephone
2006	Cramp, A.G. & Brawley, L.R.	RCT	PA	SCT	67	8 weeks	Face to face
2011	Ferrara, A. et al.	RCT	PA	None	197	Varied	Face to face, Telephone
2010	Fjeldsoe, B.S., Miller, Y.D., & Marshall, A.L.	RCT	PA	SCT	88	12 weeks	SMS
2011	Huang, T., Yeh, C., & Tsai, Y.	RCT	PA + diet	None	189	12 months	Face to face
2007	Kinnunen, T.I. et al.	Quasi-Experimental	PA + diet	None	92	32 weeks	Face to face
2011	Lewis, B.A., Martinson, B.C., Sherwood, N.E., & Avery, M.D.	Pilot	PA	SCT/TTM	18	12 weeks	Telephone
2011	Maturi, M.S., Afshary, P., & Abedi, P.	RCT	PA	None	70	12 weeks	Face to face, telephone, SMS, mail
2012	McIntyre, H.D., Peacock, A. Miller, Y.D., Koh, D. & Marshall, A.L.	RCT	PA	SCT	28	12 weeks	Face to face, telephone
2010	Norman, E., Sherburn, M., Osborne, R.H., & Galea, M.P.	RCT	PA + education	None	135	8 weeks	Mail
2009	Ostbye, T. et al.	RCT	PA + diet	SCT, Stage of Readiness, Motivation Models	450	36 weeks	Face to face, telephone

2003	O'Toole, M.L., Sawicki, M.A., & Artal, R.	RCT	PA + diet	None	40	12 weeks	Face to face
2012	Reinhardt, J.A., Van Der Ploeg, H.P., Grzegulka, R., & Rimperley, J.G.	RCT	PA	Motivatio nal Interviewi ng	34	24 weeks	Telephone
2011	Taveras, E.M. et al.	Quasi- Experimental	PA + education	None	84	24 weeks	Face to face, telephone
2005	Watson, N., Milat, A.J., Thomas, M. & Currie, J.	Quasi- Experimental	PA	None	139	24 weeks	Face to face

Note: RCT = randomized controlled trial. Pilot = single group with no control. PA = physical activity. SCT = social cognitive theory (Bandura, 1986). TTM = transtheoretical model (Prochaska & Velicer, 1997).

Table 2

Participant Demographic Information

Variable	Mean (<i>SD</i>)	<i>N</i>	Percent
Age	31.88 (3.33)	17	-
Weeks Postnatal (baseline)	22.41 (9.80)	17	-
Average Number of Children	1.71 (0.85)	17	-
	Range: 1-4		
Age of Eldest Child	2.13 (2.26)	17	-
Parity			
Primiparous	-	10	59
Multiparous	-	7	41
Marital Status			
Single	-	1	6
Married	-	16	94
Ethnicity			
Caucasian	-	16	94
Multiracial	-	1	6
Education Level			
University/College	-	10	59
Professional Diploma	-	6	35
High School	-	1	6
Household Income			
\$20,000-39,999	-	1	6

\$40,000-59,999	-	1	6
\$60,000-79,999	-	6	35
\$80,000-99,999	-	2	12
\$100,000 or more	-	7	41

Table 3

Feasibility: Website Usage Statistics

Website Feature	Mean (<i>SD</i>)	Range	Percent
Discussion Board Posts	6.53 (2.76)	2-12	81.6
Action Plan Use	6.29 (1.49)	4-8	78.6
Journal Use	5.53 (1.91)	2-8	69.1
Weekly Logins	32.59 (23.73)	7-100	-
Video Session Views*	13.71 (9.33)	3-42	-

Note: Video Session Views reports the number of times participants clicked on the “session” tab of the website. Participants were asked to post on the discussion board 8 times, were asked to implement the action plan 7 times, and the journal 6 times. Each percentage is calculated out of 8 times as these features were available to participants from week one. Participants were asked to login once a week (8 times) and to view each of 8 video sessions.

Table 4

Item Means: Modified Treatment Evaluation Inventory (Short Form)

Question	Mean (SD)
Overall	1.35 (.35)
1. The program was effective in improving my levels of activity/exercise.	1.50 (.61)
2. After participation in the program, I am more skilled at managing exercise in my daily life.	1.19 (.53)
3. I find this treatment approach to be an effective way of teaching skills to managing exercise.	1.13 (.60)
4. I am happy with the behavioural changes this program has created in my management of exercise.	1.13 (.60)
5. I like the weekly online session approach used in this education program to manage exercise.	1.19 (.63)
6. I would recommend this program to other postnatal women having difficulty starting and maintaining regular exercise.	1.69 (.58)
7. I found this program reasonable to use based on my current situation.	1.38 (.48)
8. I believe this program will be beneficial in increasing my exercise/activity levels.	1.56 (.50)
9. The program did not take up too much of my time each day.	1.44 (.79)
10. The program components were all important to help me manage exercise.	1.00 (.71)
11. The program was conveyed to me in a way that I could understand.	1.62 (.60)

Note: TEI-SF (Kelley et al., 1989) was measured on a scale from -2 (strongly disagree) to +2 (strongly agree).

Table 5

Actical Cutpoints (counts per minute)

Intensity	Minimum	Maximum
Sedentary	0	99
Light	100	1535
Moderate	1536	3960
Vigorous	3961	19999
MVPA	1536	19999

Note: (Colley & Tremblay, 2011)

Table 6

Reliability values (Cronbach Alpha)

Subscale	N of Scale Items	Baseline	Post Intervention
Keeping Track	6	.864	.959
Setting Goals	9	.842	.943
Obstacles	21	.947	.944
Motivation and Rewards	6	.879	.854
Recovery	6	.785	.854

Table 7

Results – Self-Report Physical Activity, Self-Efficacy, and Group Cohesion Measures

Variable	<i>N</i>	Baseline Mean (<i>SD</i>)	Post Intervention Mean (<i>SD</i>)	<i>t</i>	<i>p</i>
Light PA	17	80.00 (54.28)	112.72 (107.20)	-1.47	.159
Moderate PA	17	19.11 (31.92)	59.01 (44.35)	-2.83	.012
Vigorous PA	17	1.17 (4.85)	54.93 (37.38)	-5.85	.000
MVPA	17	37.05 (100.61)	113.95 (55.15)	-2.63	.018
Total PA	17	100.29 (56.16)	226.68 (30.72)	-4.80	.000
Self-efficacy Moderate PA	17	66.20 (24.10)	66.12 (23.49)	.028	.978
Self-efficacy Vigorous PA	17	54.00 (25.94)	46.50 (24.15)	1.58	.132
Self-Regulatory Index	17	78.61 (11.16)	73.95 (5.69)	1.16	.364
Recovery Self-efficacy	17	81.50 (7.89)	80.72 (12.82)	.286	.778
PAGEQ-A	17	5.67 (.63)	7.19 (.74)	-10.58	.000
PAGEQ-B	17	4.79 (.54)	6.59 (.39)	-13.88	.000

Note: Physical activity (PA) data measured using IPAQ-SF (Godin & Shepherd, 1985) and reported as average minutes per week. Task and self-regulatory self-efficacy measured on a scale of 1 to 100 (percentages). Physical Activity Group Environment Questionnaire (PAGEQ; Estabrooks & Carron, 2000) is measured on a scale of 1 (very strongly disagree) to 9 (very strongly agree). Bold indicated significance.

Table 8

Website Features

Feature	Description
Home Page	Upon logging in participants came to this page featuring a weekly motivation quote.
Sessions	This feature of the website was where participants could find weekly video sessions. A Short video was posted every Sunday night educating participants on a new behaviour-change technique to help them increase their activity levels. Weekly video sessions: 1) described the skill; and 2) instructed participants to practice the skill. Session summaries can be found in Appendix E.
Action Plan	The action-planning calendar was a scheduling calendar for participants to set their weekly exercise goals on. Participants logged onto this calendar to enter in the type and intensity of exercise that they aimed to complete each day. The calendar appeared week-by-week and included 15-minute time intervals. The action-planning feature only allowed for logging in the future.
Journal	The journaling calendar served as a tracking feature. Participants logged on to the journal to track exercise that they had done. Journals were weekly calendars with 15-minute time intervals where participants selected type and intensity of exercise they had done. The journal feature only allowed for logging of activity in the past.
Discussion Board	Weekly video sessions included a ‘discussion board task’ related to a new skill. Participants were asked to post on the discussion board each week in relation to this topic. Participants could also post on the discussion board in regards to other topics, and could reply directly to other participants’ previous comments. The discussion board was site specific so participants could interact only with those from their YMCA study location.
Summary PDF	On Sunday nights participants received a summary (PDF) of the weekly video session.

Table 9

Social Cognitive Theory (SCT) Constructs

SCT Construct	Intervention Methodology
Goal Setting	Action Planning Calendar: Participant's were asked to log on to website each week to plan their activity for the week on the action planning calendar. Participant's added the day, time, duration, and intensity of physical activity which served as their 'goal' for the week.
Keeping Track	Journal Calendar: Participant's were asked to log on to website each week to log their activity for the previous week on the journal calendar. Participant's added the day, time, duration, and intensity of physical activity and could compare this with their 'goal' for the week which had previously been set. The website also gave participant's a +/- number to show how far from meeting their goal they were that week.

Table 10

Accelerometer data

Variable	<i>N</i>	Baseline mean (<i>SD</i>)	Post Intervention mean (<i>SD</i>)	<i>t</i>	<i>p</i>
Max Sedentary Bout	16	75.08 (28.711)	97.12 (28.00)	-	-
Light PA	16	189.61 (50.41)	198.65 (59.25)	-	-
Moderate PA	16	17.95 (10.28)	11.38 (11.42)	-	-
Vigorous PA	16	3.72 (6.23)	3.35 (5.05)	-	-
MVPA	16	21.68 (14.54)	14.74 (13.11)	-	-
Total PA	16	211.29 (48.53)	213.39 (62.42)	-1.72	.866

Note: *n* = 16. Physical Activity (PA) volumes reported as average minutes per valid day.

Appendices

Appendix A: Recruitment Materials

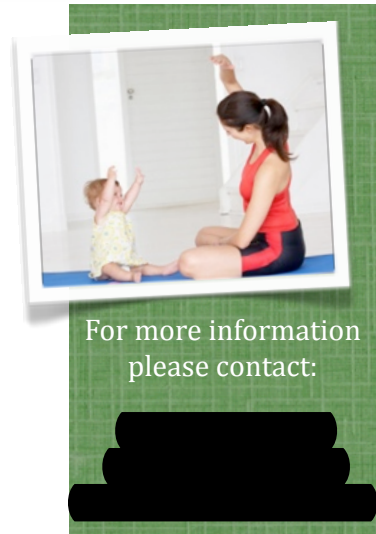
MOVE MORE MOMMY PARTICIPANTS NEEDED FOR POSTNATAL EXERCISE STUDY

We are looking for women between 12 and 52 weeks postnatal to volunteer to take part in a study designed to increase your level of exercise.

Participants will be asked to attend one 45- minute postnatal specific exercise class per week for 8 weeks. Additionally, participation in this study will involve a 75 minute orientation session and several online questionnaires.

For inclusion in the study participants must be over 18 years of age, primarily inactive for the past 6 months, not have any health complications that would limit you from participating in exercise. and have access to the Internet.

Classes will be conducted at the Centre Branch (Thursdays OR Fridays 11am) YMCA.



MOVE MORE MOMMY
PARTICIPANTS NEEDED FOR POSTNATAL EXERCISE STUDY

We are looking for women between 12 and 52 weeks postnatal to volunteer to take part in a study designed to increase your level of exercise.



Participants will be asked to attend one 45- minute postnatal specific exercise class per week for 8 weeks. Additionally, participation in this study will involve a 75 minute orientation session and several online questionnaires.

For inclusion in the study participants must be over 18 years of age, primarily inactive for the past 6 months, not have any health complications that would limit you from participating in exercise and have access to the Internet.

For more information please contact:

Dr. [REDACTED]

Appendix B: Measures

Measurement Timeline

Recruitment	Baseline	Midpoint	Post-Intervention
Screening Questionnaire	Demographics	IPAQ	IPAQ
	IPAQ	SE Scales	Actical
	Actical		SE Scales
	SE Scales		PAGEQ
	PAGEQ		Focus Groups
			TEI-SF

Note: Midpoint was midway through the intervention (week 5). Post-intervention was one week following the last group exercise class (week 9). IPAQ = International Physical Activity Questionnaire. SE = self-efficacy. PAGEQ = Physical Activity Group Environment Questionnaire. TEI-SF = Treatment Evaluation Inventory – Short Form.

Screening Questionnaire.

A. Current Exercise Behaviour

1. During a typical **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number).

STRENUOUS EXERCISE(HEART BEATS RAPIDLY): _____

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

How much time did you usually spend doing vigorous physical activities on one of those days?

_____ minutes per day

_____ Don't know/Not sure

MODERATE EXERCISE (NOT EXHAUSTING): _____

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

How much time did you usually spend doing moderate physical activities on one of those days?

_____ minutes per day

_____ Don't know/Not sure

MILD EXERCISE (MINIMAL EFFORT): _____

(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)

How much time did you usually spend doing moderate physical activities on one of those days?

_____ minutes per day

_____ Don't know/Not sure

2. During a typical 7-Day period (a week), in your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN

SOMETIMES

NEVER/RARELY

B. PAR Q

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
 Yes No
2. Do you feel pain in your chest when you do physical activity?
 Yes No
3. In the past month, have you had chest pain when you were not doing physical activity?
 Yes No
4. Do you lose your balance because of dizziness or do you ever lose consciousness?
 Yes No
5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?
 Yes No
6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
 Yes No
7. Do you know of any other reason why you should not do physical activity?
 Yes No

Note. If a participant answers YES to any one of the questions above they will need to talk with their doctor by phone or in person BEFORE becoming much more physically active.

C. Other Health Questions

1. Have you been clinically diagnosed by a physician with postpartum depression?
 No Yes
2. Are you on any medications?
 No Yes

- a. If yes, do they make your feel dizzy or ill? Yes
No
3. Are you participating in any other research studies?
- No Yes
- a. If yes, please describe the purpose of the study and what is required of you.

D. Location Preference

1. The program will be offered at the Stoney Creek YMCA and the Centre Branch YMCA. Do you have a preference for which centre you attend?

[] Yes, If yes, where: _____

[] No

Demographic Questionnaire

Please answer the following questions to the best of your ability and as truthfully as possible.

1. What is your age: _____

2. How many weeks postnatal are you: _____

3. How many children do you have? _____

4. What are their ages? _____

5. What is your ethnicity:

<input type="checkbox"/> Caucasian	<input type="checkbox"/> Asian/Asian American
<input type="checkbox"/> African/African American	<input type="checkbox"/> Aboriginal Peoples of Canada
<input type="checkbox"/> Hispanic/Hispanic American	<input type="checkbox"/> Other: _____

6. Please indicate your approximate yearly household income:

<input type="checkbox"/> Under \$25,000	<input type="checkbox"/> \$80,000-\$100,000
<input type="checkbox"/> \$25,000-\$40,000	<input type="checkbox"/> \$100,000-\$150,000
<input type="checkbox"/> \$40,000-\$60,000	<input type="checkbox"/> Over \$150,000
<input type="checkbox"/> \$60,000-\$80,000	<input type="checkbox"/> Prefer not to answer

7. What is your marital status:

<input type="checkbox"/> Married/common law partner	<input type="checkbox"/> Single/divorced/separated
---	--

1 2 3 4 5 6 7

6. Did you exercise or play sports after you found out you were pregnancy?
Include waking briskly for ½ hour our more, jogging, aerobics, swimming,
etc.

- a. Yes
b. No

7. If yes, how many times on average per week you exercised or played
sports before you found out you were pregnant.

1 2 3 4 5 6 7

8. How many months of this pregnancy did you exercise or play sports?

1 2 3 4 5 6 7 8 9

9. What kind of exercise or sport did you do most often during your
pregnancy?

10. Has a health professional (i.e., physician) told you recently that you have
any cardiovascular problems?

No

Yes

Treatment Evaluation Inventory Short Form – Revised (Kelley et al., 1989)

TEI-SF

Please tick the relevant column for your answer to each statement about the <i>Move More Mommy</i> program:	-2	-1	0	+1	+2
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The program was effective in improving my levels of activity/exercise.					
2. After participation in the program, I am more skilled at managing exercise in my daily life.					
3. I find this treatment approach (movemoremommy.com) to be an effective way of teaching skills to manage exercise.					
4. I am happy with the behavioural changes this program has created in my management of exercise.					
5. I like the weekly online session approach used in this education program to manage exercise.					
6. I would recommend this program to other postnatal women having difficulty starting and maintaining regular exercise.					
7. I found this program reasonable to use based on my current situation.					
8. I believe this program will be beneficial in increasing my exercise/activity levels.					
9. The program did not take up too much of my time each day.					

10. The program components were all important to help me manage exercise.

11. The program was easy to follow.

12. The program was conveyed to me in a way that I could understand.

Focus Group Guide (Qualitative Interview)

WEEKLY EXERCISE CLASS:

1. What aspects of the weekly fitness class did you enjoy? PROBE: format, time, instructor.
2. What could be improved upon?
3. What things prevented you from attending the classes?

WEEKLY ONLINE VIDEOS:

1. What were the most helpful aspects of the weekly video sessions for you in understand the actions you could take to increase your level of activity / exercise? PROBE: important to include in future, any refinements.
2. Were there aspects of the weekly sessions that you could not understand?
3. Did you apply what was being discussed into your week? If so, what sessions were most helpful?

DISCUSSION BOARD:

1. Did you gain any benefits of using the discussion board? Was the discussion board helpful? If so, how?

WEBSITE:

1. Was there anything missing in the website intervention that you would have liked to be included? PROBE: inclusion in specific sessions?
2. Were any components of the website difficult to use or were not as useful?

CALENDARS:

1. Were there any aspects of the program tools (e.g., calendars) you did not think were helpful or should be changed / refined? What refinements would you suggest?

OVERALL:

1. Do you feel the intervention helped you increase your level of exercise? Why? PROBE: overall impression of MMM website, role/experience of moderator, fitness instructor, information covered in specific sessions, web tools (calendar and action planner), weekly discussion board chats?
2. Did you experience any barriers to implementing what you learned in MMM? Are there any things we can do to improve the program to reduce those barriers?
3. Are there other important questions that should be asked to understand the impact of being a new mom or a program like this on your ability to manage exercise?
4. Are there any other comments you would like to make about MMM that are important for us to know?

Appendix C: Letter of Information and Informed Consent



Letter of Information and Informed Consent

Move More Mommy: A Postnatal Physical Activity eHealth Intervention Pilot Study

Stoneycreek YMCA

Study Investigator:

Anita Cramp, PhD

[Redacted]
[Redacted]
[Redacted]
[Redacted]
[Redacted]

Co-investigators:

Amy Kossert, PhD(c)

[Redacted]
[Redacted]
[Redacted]

Shauna, Burke, PhD

[Redacted]
[Redacted]

Co-investigators:

Sarah Gray, MA(c)

[Redacted]
[Redacted]
[Redacted]

[Redacted]
[Redacted]
[Redacted]

You are being invited to take part in a research study. Before you decide whether to participate, it is important for you to be aware of why the research is being done and what it will involve. Please take time to read the following information

carefully and ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of this study?

The overall purpose of this pilot study is to assess the feasibility of conducting a large study to promote exercise in postnatal women using an Internet-based skills training program and group fitness classes.

A pilot study is a study that tests the methods and procedures that are to be used on a larger scale.

In this pilot study, we are evaluating the process and user satisfaction of a postnatal exercise program that includes an Internet skills training component. The program is designed to increase exercise levels among postnatal women as well as improve psychological health (*e.g.*, energy and mood) and physical health (*i.e.*, body mass index; fitness). Before we test the effectiveness of this program, it is important to collect information about the feasibility and logistics of the program (*e.g.*, assess the content and user friendliness of the website, determine recruitment strategies, best times/days to offer the program and whether women find it enjoyable. That is why we are conducting a pilot study. The information we gather will help guide the development of this Internet-based exercise program for postnatal women.

Who can take part in the study?

We are recruiting 20 women over the age of 18 who are between 12 and 52 weeks postnatal, have not been physically active more than 2 days per week for the past 6 months, are able to participate in moderate intensity exercise, have access to the Internet and are able to read and write in English. If you are unsure about whether it is safe for you to engage in physical activity at this time please consult your family physician or health care provider prior to participating in this study.

What will I be asked to do in this study?

There will be five parts to the study.

1. Orientation and Baseline Assessments (about 1 hour)

If you are eligible and agree to participate in this study, you will be asked to sign the consent form prior to beginning any study procedures. In addition, you will be asked to

attend an orientation session at the YMCA which will take approximately 75 minutes. Upon arrival to the YMCA you will be greeted by a member of our research team and will be taken on a brief tour of the facility so that you are familiar with where the change rooms, child minding centre and exercise rooms are located. Next you will be asked to complete a number of questionnaires using a secure online survey website on a computer at the YMCA meeting room. You will be asked questions pertaining to your exercise habits and intentions, your mood, and a demographic questionnaire which asks about your age, education, marital status, etc. Once you have completed these questionnaires, your weight and height will be measured and you will be asked to perform a brief fitness test using a step.

The step test involves you stepping up and down on the platform for a total of 3 minutes. Immediately after the test you will sit down. Within 5 seconds, of finishing the test, a member of the research team will count the your heart rate for one complete minute. Before leaving, you will be asked to wear an *Actical*®. An *Actical*® is a small (e.g., size of a loonie), waterproof device that is positioned securely on the participant using a waistband. Once the device is on, participants can wear it and forget it and go about their normal daily activities, including rigorous exercise, swimming or bathing. The device measures energy expenditure (e.g., calories burned) through out the day. This device will be provided to you at the orientation session and you will be asked to wear it to your first exercise class the following week to return it.

2. 8-week Exercise Program

You will attend weekly exercise classes at the YMCA with a group of other postnatal women. The classes will be instructed by a certified exercise leader and the classes will be a combination of aerobics and muscle conditioning including a warm-up and cool-down period. The exercise program will start one week after your baseline assessments and orientation and will last for 8 weeks. You will also have access to a website, *Move More Mommy*, that is designed for this study. The website offers psychological skills training that is designed to help you adjust to exercising on a regular basis. In addition to weekly training modules, the website has features to allow you to track your exercise plans and actual exercise. You will also be able to interact with your exercise group using the *Move More Mommy* website. For example, you will have the option of entering the following information into the website:

- Participant profile information (e.g., First Name),
- A profile photo
- Planned Exercise (e.g., minutes per week)
- Actual Exercise (e.g., minutes per week)
- Responses to discussion board

The website will be password protected and housed on a secured server. All the information you enter will be accessible only by other study group participants (e.g., the 9 other women in their exercise group) with the exception of your planned and actual exercise. At the end of your first exercise class, you will be given an overview of the website and instructions for use.

At the end of the first week of the study, you will be asked to complete the following questionnaires online:

- Exercise Intentions
- Exercise-related Self-Efficacy Questionnaires (about 10 minutes), which ask questions about your confidence to engage in regular exercise.
- Physical Activity Group Environment Questionnaire (about 5 minutes), which asks questions about your thoughts regarding exercising with your group.

3. Midpoint Assessments (about 25 minutes)

Halfway through the study (*i.e.*, Week 5), you will be asked to complete questionnaires online assessing self-efficacy, exercise intentions, group environment, satisfaction of outcomes, and physical activity.

4. Post-Program Assessments (about 45 minutes)

At the conclusion of the 8-week exercise program, you will have your height and weight measured and conduct the same fitness test that you did at the orientation session. You will also be asked to wear the physical activity monitoring device again for one week. Finally, you will be sent a link to questionnaires to complete at home. These will include follow-up measures of self-efficacy, exercise intentions, group environment, satisfaction of outcomes, exercise feelings, and physical activity.

5. Follow-up Assessments

1. One week following the last exercise class, you will be asked to return to the YMCA with your exercise group. In a meeting room, you will be asked to discuss topics in a discussion led by the researcher. This discussion will be about your perceptions of being a part of this study. You will be asked for feedback about the website, the exercise classes, and overall perceptions about exercise during the postnatal period. At this focus group session you will be asked to return your physical activity monitoring device. This focus group should take approximately 45 minutes.

2. You will be asked to complete questionnaires four weeks and eight weeks after the exercise program is completed. You will still have access to the *Move More Mommy* website during this time and will be encouraged to use it. The questionnaires will be completed online and will include measures of physical activity, self-efficacy, and group environment. These questionnaires should take approximately 20 minutes to complete.

Do you have to take part in this study?

Your participation in this study is completely voluntary. You may refuse to participate, refuse to answer any questions, or withdraw from the study at any time with no effect on your future care. If you decide to take part, you will be given this Letter of Information to keep and be asked to sign the consent form. If you withdraw from the study, you maintain the right to request that any data collected from you not be used in the study. If you make such a request, all of the data collected from you will be destroyed. If you choose to withdraw from the study you may be approached to identify why you have withdrawn. This information may be valuable for future research and may give the researchers information on ways to improve the study, but you do not have to provide a reason if you do not want to.

Are there any risks involved?

When embarking on any exercise program, there are associated physical risks, such as injury. However, all possible precautions will be taken to ensure a safe exercise environment and there are minimal risks with participation. A knowledgeable exercise professional who is certified in postnatal exercise will be leading the group classes at the YMCA. She will teach you safe exercise practices, such as proper exercise techniques (*i.e.*, warm-up and stretching). These precautions will reduce the potential risks and encourage a safe and comfortable exercise environment. It should be noted that you might experience mild discomfort (*e.g.*, muscle soreness and fatigue) as a result of exercise participation.

What are the benefits of your involvement?

There may be no direct benefit to you associated with your participation in this study. Involvement in this study will help you to increase your levels of physical activity in a safe and supportive setting. You may experience a range of positive health outcomes

including but not limited to: improved fitness; improved physical and psychological health; and improved confidence in your abilities to exercise on a regular basis. Furthermore, your participation will help to inform the development of a larger study of this eHealth intervention for postnatal women.

What are your alternatives?

If you decide not to participate or if you withdraw from the study before it is completed, the alternative procedures or course of treatment will be the usual care provided by your health care provider.

Are there any costs associated with participation?

You will have to pay for your transportation to the YMCA (*e.g.*, gas or bus fare). There is no cost to you for the use of the YMCA or for child minding during the exercise classes.

Will information obtained in the study be confidential?

All of the information you provide to the researcher will be kept in the strictest confidence. You will be assigned an identification number and all data collected from you will be recorded and stored under this number only. All data will be stored in coded form on computers accessible only to research staff. You will not be identified in any documents relating to the research. No information obtained during the study will be discussed with anyone outside of the research team. By participating in this research study, you are agreeing that your results may be used for scientific purposes, including publication in scientific and health journals. The results of the study will be reported without identifying you personally, so your confidentiality will be maintained.

Representatives of the University of Western Ontario Health Sciences Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

You do not waive any legal rights by signing the consent form.

Questions?

If you have any questions about the study, please contact the Principal Investigator,

[REDACTED]

Rights of Subjects and Contact Information:

This letter is for you to keep. If you have any concerns, please feel free to contact one of the researchers below. You may request the general findings of this research study from the researchers after the study is complete. If you have any questions about your rights as a research participant or the conduct of the study you may contact [REDACTED]

[REDACTED]

Move More Mommy: A Pilot Study of a Postnatal Physical Activity eHealth Intervention

Informed Consent

I, _____, have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

Name (please print clearly):

Signature:

Date:

.....

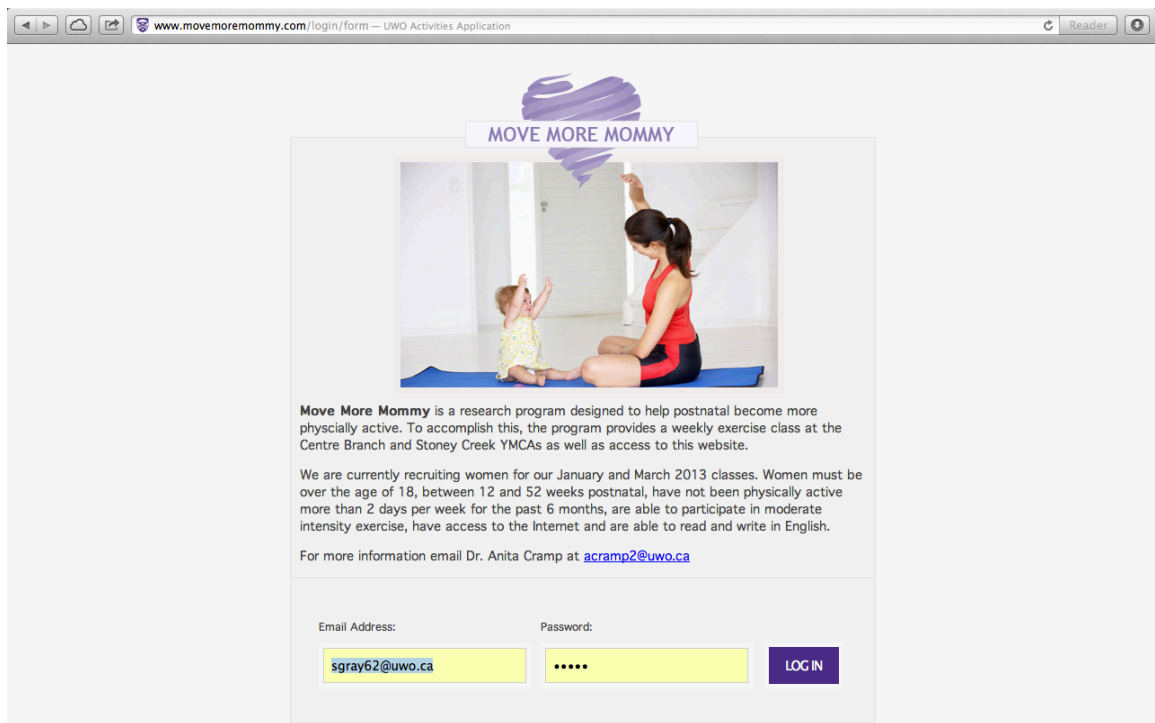
Name of Researcher/Individual Obtaining Consent

Print: _____

Date: _____

Signature: _____

Appendix D: Website



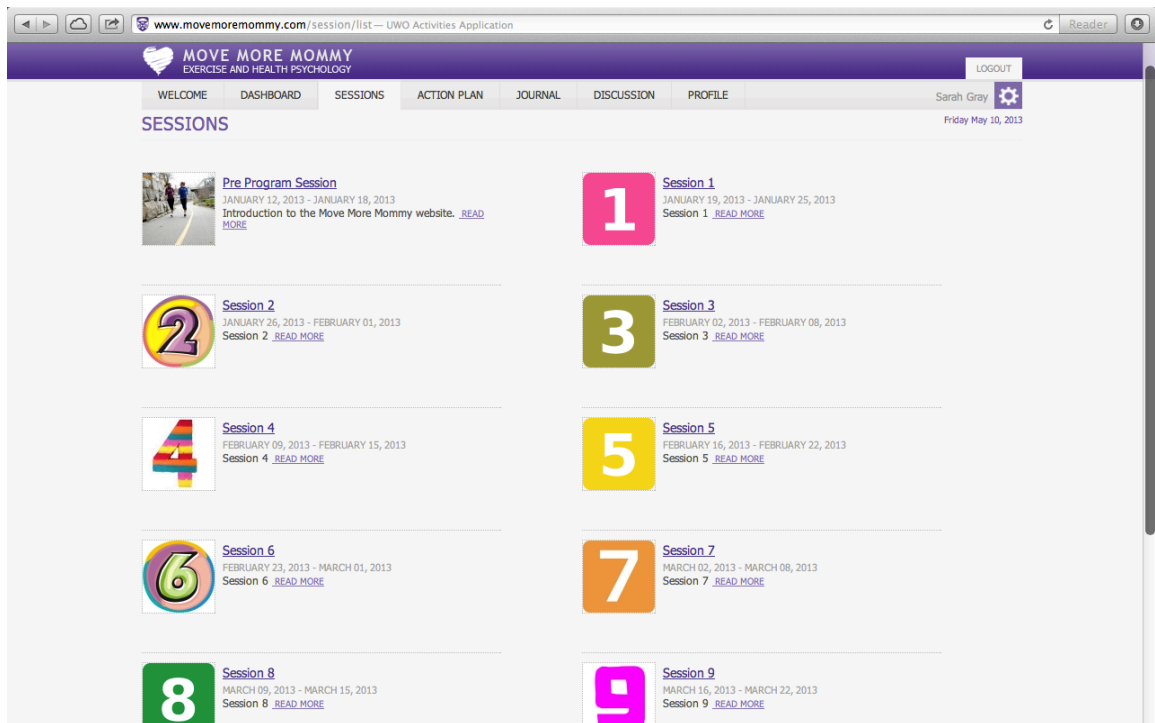
MOVE MORE MOMMY

Move More Mommy is a research program designed to help postnatal become more physically active. To accomplish this, the program provides a weekly exercise class at the Centre Branch and Stoney Creek YMCAs as well as access to this website.

We are currently recruiting women for our January and March 2013 classes. Women must be over the age of 18, between 12 and 52 weeks postnatal, have not been physically active more than 2 days per week for the past 6 months, are able to participate in moderate intensity exercise, have access to the Internet and are able to read and write in English.

For more information email Dr. Anita Cramp at acrap2@uwo.ca

Email Address: Password:













MOVE MORE MOMMY
EXERCISE AND HEALTH PSYCHOLOGY

WELCOME DASHBOARD SESSIONS ACTION PLAN JOURNAL DISCUSSION PROFILE

LOGOUT Sarah Gray Friday May 10, 2013

SESSIONS

	Pre Program Session JANUARY 12, 2013 - JANUARY 18, 2013 Introduction to the Move More Mommy website. READ MORE		Session 1 JANUARY 19, 2013 - JANUARY 25, 2013 Session 1 READ MORE
	Session 2 JANUARY 26, 2013 - FEBRUARY 01, 2013 Session 2 READ MORE		Session 3 FEBRUARY 02, 2013 - FEBRUARY 08, 2013 Session 3 READ MORE
	Session 4 FEBRUARY 09, 2013 - FEBRUARY 15, 2013 Session 4 READ MORE		Session 5 FEBRUARY 16, 2013 - FEBRUARY 22, 2013 Session 5 READ MORE
	Session 6 FEBRUARY 23, 2013 - MARCH 01, 2013 Session 6 READ MORE		Session 7 MARCH 02, 2013 - MARCH 08, 2013 Session 7 READ MORE
	Session 8 MARCH 09, 2013 - MARCH 15, 2013 Session 8 READ MORE		Session 9 MARCH 16, 2013 - MARCH 22, 2013 Session 9 READ MORE

www.movemoremommy.com/plan/form — UWO Activities Application

MOVE MORE MOMMY
EXERCISE AND HEALTH PSYCHOLOGY

WELCOME DASHBOARD SESSIONS ACTION PLAN JOURNAL DISCUSSION PROFILE

LOGOUT Sarah Gray Friday May 10, 2013

SARAH'S ACTION PLAN - HERE'S WHAT I PLAN TO DO

week day today

	Sun 5/5	Mon 5/6	Tue 5/7	Wed 5/8	Thu 5/9	Fri 5/10	Sat 5/11
8am							
9am							
10am							
11am							
12pm							
1pm							
2pm							

View Instructions
View Definitions

Mild

PLANNED THIS WEEK
MAY 5 - MAY 11
0.00

TOTAL PLANNED
1.75

www.movemoremommy.com/journal/form — UWO Activities Application

MOVE MORE MOMMY
EXERCISE AND HEALTH PSYCHOLOGY

WELCOME DASHBOARD SESSIONS ACTION PLAN JOURNAL DISCUSSION PROFILE

LOGOUT Sarah Gray Friday May 10, 2013

SARAH'S JOURNAL - HERE'S WHAT I ACTUALLY DID

week day today

	Sun 5/5	Mon 5/6	Tue 5/7	Wed 5/8	Thu 5/9	Fri 5/10	Sat 5/11
8am							
9am							
10am							
11am							
12pm							
1pm							
2pm							

View Instructions
View Definitions

Mild

THIS WEEK (MAY 5 - MAY 11)

PLANNED	ACTUAL	+/-
0.00	0.00	0.00
TOTAL		
1.75	0.00	-1.75

Appendix E: Weekly Video Session Summary

GMCB Online Training Session Overview

Content	Discussion Board Post	Learning Objective
Session 1: Getting Started		
Discuss the purpose of the intervention. Discuss the groups role in helping group members reach their goals	Introduce yourself to the group using the Discussion Board: Name, how many kids, hobby. Why did you join the program?	To learn about the importance of the group as part of the overall interven
Session 2: Putting Goals Into Action		
Discuss motivation and outcome expectations of increased exercise. Discuss goal setting and action plans.	Let other group members know what exercises you will be doing. Be specific (e.g., when and where). Maybe someone will join you!	To learn about making goals into action plans.
Session 3: Keeping Track		
Discuss self-monitoring as a self-regulatory strategy. Introduce participants to the Journal feature of the website and teach them how to use it.	What you like about keeping track and what don't you like about keeping track.	To learn how to keep track of your exercise using the website's journal feature.
Session 4: Rewards		
Introduce progress-based rewards as a motivator for physical activity. Develop strategies to identify relevant rewards to acknowledge success.	Post your ideas for how you and other group members can reward yourselves.	To learn that rewards can be intrinsic or extrinsic. To learn that rewards can be a source of motivation. Learn to implement rewards that work for you.
Session 5: Overcoming Obstacles		
Introduce notion of obstacles to exercise. Elicit suggestions of strategies to overcome barriers or obstacles.	Post an obstacle you have faced and describe how you overcame it.	To learn that obstacles are common and that the best way to overcome obstacles is to think about them in advance and have solutions ready to implement when they arise.
Session 6: Someone to Lean On		

Describe the importance of social support. Have participants identify both positive and negative social support persons in their life.	Who is your support person(s)? Looking for someone to exercise with outside of class time? Let your group members know this.	To learn that having a support person might be an important strategy for keeping you active. To learn that support can come in many different forms and the you need to determine what kind of support you need in helping you stay active.
--	--	---

Session 7: Setbacks

Discuss what setbacks are and how to get back on track when you experience a set back.	Tell the group about a time when you experienced a setback. Let us know what you did to get back on track. Recall what motivated you to start exercising. Let the group know if these still motivate you today. Or do you have any new motivators?	To learn how to identify and deal with setbacks.
--	--	--

Session 8: Maintaining What You Started

Elicit realization and sense of pride developed for being a physically active individual. Acknowledge conclusion of scheduled classes. Discuss strategies for maintaining a physically active lifestyle as a new Mom now that the exercise classes are coming to an end. Create an exercise plan that to determine your satisfaction with outcomes as a result of exercising more. Create a plan for moving forward in order to maintain what you started. is flexibly and able to accommodate the multiple barriers.	Tell the group what your overall exercise goal is. Give an outline of your 4-week plan for achieving this goal.	To determine your satisfaction with outcomes as a result of exercising more. Create a plan for moving forward in order to maintain what you started.
---	---	--

Appendix F: Weekly PDF Summaries

MOVE MORE MOMMY: PRE INTERVENTION

Getting Started

Expectations and Motivation are important, BUT success at regular exercise involves **SELF-REGULATION**.



Session One Key Points:

Expectations

Believing that engaging in regular exercise will produce certain desired outcomes, such as weight maintenance or increased energy.

Motivation

Expectations serve as motivators to start exercising. However, making a lifestyle change such as engaging in regular exercise is CHALLENGING and requires self-regulation.

Self-regulation

Being able to plan and track your exercise. Managing your thoughts or actions in order to avoid having "life" get in the way of exercising.



Your Notes:

The goal of our program is to help you learn to **SELF-REGULATE** your exercise behaviour.

Move More Mommy is a GROUP program. Not because of convenience but because research shows exercise groups are a source of motivation and support.

Discussion Board:

1. Introduce yourself to the group.
2. Let your group members know why you joined the program.

Goal Setting

GOAL SETTING is important as it gives you something
to strive for



Session Two Key Points:

Goals

Having a goal is a key ingredient to successfully overriding the thoughts and behaviours that get in the way of becoming a regular exerciser.

Action Plans

Involves making a plan each week in terms of when you will exercise.



a total of 120 minutes at the Y.

Be as specific as you can.

E.g., I plan to exercise Mon., Wed. and Fri. for

Set REALISTIC ACTION PLANS

Building is the key. Start with shorter exercise sessions and try to increase a little each week. Also try to build in increased challenges. For example, increase the pace of your walks, add in some routes with hills or a fitness class that you have not done before.

Your Notes:

In order to achieve your
GOAL you need to make
ACTION PLANS.

Discussion Board:

1. Let your other group members know what exercise sessions you plan to do.

Keeping Track

KEEPING TRACK makes you accountable to your goals.



Key Points:

KEEP TRACK

Recording your completed exercise session using the Journal is a way to keep track and see if you are reaching your goals.

KEEP TRACK EVERYDAY

It is important to keep track of your completed exercise on a daily basis. Recording this information on a daily basis will help you avoid forgetting what you did.

FEEDBACK

By entering in your action plans and by keeping track of your actual exercise sessions, the website will give you feedback on whether or not you are reaching your exercise goal.

Keeping Track is perhaps the most important lifestyle behaviour you will learn.

Discussion Board:

1. What do you like about keeping track?
2. What do you find challenging about keeping track?

Progress & Rewards

REWARDING yourself involves identifying your progress at achieving your goals and choosing a reward to acknowledge your success.



Key Points:

FEEDBACK

By entering in your action plans and by keeping track of what you actually did, the website will create a +/- score. This score is meant to provide you with feedback about your progress at achieving your goals.

FALLING SHORT

Don't be discouraged. Today is a new day and moving forward you can work towards bridging the gap between your planned numbers and your actual exercise numbers.

REWARDS

Plan to redeem your rewards after a specific amount of progress towards your goals. Use the feedback feature on your dashboard to guide you. Some example rewards include a night out, a bubble bath or massage.



Your Notes:

One way to keep motivated to reach your exercise goals is to reward yourself when you make progress towards your goals.

Discussion Board:

1. Post your ideas for how you and other group members can reward yourselves.

Overcoming Obstacles

OBSTACLES are things or situations that get in the way of you achieving your exercise goals.



Key Points:

OBSTACLES

Every week you will encounter one, if not several obstacles to your exercise goals. The key is to try to predict some of the obstacles that might get in the way of you and your exercise program.

SOLUTIONS

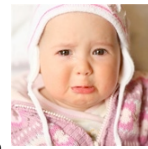
For each obstacle you encounter or think you might encounter, brainstorm some possible solutions. Try these solutions when the obstacle arises.

EXAMPLE OBSTACLE & SOLUTION

Obstacle: Sick baby

Solution(s):

- Exercise at home when baby is sleeping.
- Swap today's exercise session to a day when you have not planned to exercise.



Your Notes:

Creating solutions is all about adjusting your plan. Research has shown that people who adjust are more likely to succeed at reaching their goals.

Discussion Board:

1. Post an **OBSTACLE** you have faced and describe how you overcame it.

Someone to Lean On

Having a **SUPPORT** person can help you become a regular exerciser.



Key Points:

SUPPORT

Support for being active can come in many forms. For example:

- Encouragement
- Advice, or suggestions about how to exercise
- Someone to exercise with

Make sure you and your support person are on the same page. Know what each person's expectations are. For example, tell your partner if you need lots of encouragement.

BE A ROLE MODEL

There is lots of evidence that parents who were more active had more active children. This means what you do in terms of exercise today will help build a foundation for your kids' exercise. Be their role model today and for years to come.

Your Notes:

Exercising with a partner can make exercise more fun.

Discussion Board:

1. Who is your support person(s)?
2. Look for someone to exercise with outside of class time. Let your group members know this.

Setbacks

SETBACKS are completely normal and there is no reason for you to feel like giving up.



Key Points:

SETBACKS

A setback is missing or breaking some plan or scheduled event several times or on a consistent basis. Obstacles or lack of motivation may cause SETBACKS. During setbacks you may feel like you have “thrown in the towel”.

GETTING BACK ON TRACK

Setbacks occur when you have lost sight of your goals. The key is to get back on track. Do this by taking the time to implement the strategies

Such as:

- Make action plans
- Track your activity
- Think of some rewards and reward yourself for getting back on track
- Find an exercise partner



Your Notes:

If you have experienced a
SETBACK get back on track
TODAY.

Discussion Board:

1. Tell the group about a time when you experienced a setback. Let us know what you did to get back on track.
2. Recall what motivated you to start exercising. Let the group know if these still motivate you today. Or do you have any new motivators?

Maintain What You Started

Your task: Maintain the exercise patterns you have started to develop.



Key Points:

RECAP

You have spent the last 8 weeks learning the self-regulatory skills that help to improve exercise levels. These include Action Planning, Keeping Track, Overcoming Obstacles, Tracking your Progress and Rewarding yourself when you have achieved your goals.

WHY YOU STARTED

Recall the expectations you had at the beginning of the program. E.g., you may have expected to lose weight, or be more energetic. Think about these expectations and ask yourself am I SATISFIED with my progress in achieving these outcomes.

CREATE A PLAN

For the last 8 weeks, you have been physically active during the class time. Have you thought about how you are going to replace this exercise time? Create a 4-week exercise plan.

Your Notes:

CONTINUE TO USE THE WEBSITE.

Discussion Board:

1. Tell the group what your overall exercise goal is.
2. Give an outline of your 4-week plan for achieving this goal.

Satisfaction with attained outcomes is a key motivator of keeping people physically active.

Curriculum Vitae

Name: Sarah Gray

Post-secondary Education and Degrees: The University of Western Ontario
London, Ontario, Canada
2007-2011 B.A. Honors Specialization Kinesiology

Western University
London, Ontario, Canada
2012-2014 M.S.C Health and Rehabilitation Science

Honours and Awards: Western Graduate Research Scholarship
2012-2013, 2013-2014

Ontario University Athletics Achievement Award
2011-2012

Related Work Experience VP Finance
Health and Rehabilitation Sciences Graduate Student Society
May 2013-2014

Research Assistant
CIHR Exercise at Western Study
September 2013-January 2014

Selection Committee
Health and Rehabilitation Sciences Research Forum Committee
October 2013-February 2014

Teaching Experience Guest Lecture
Individual and Community Participation in Health
Western University, course code: HS4245B
January 2013

Guest Lecture
Social Determinants of Health
Western University, course code: HS1002B
March 2014

Languages Spoken English, French (Bilingual Certificate; June 2007).

Presentations:

Gray, Cramp, Burke, & Kossert. *More More Mommy: A postnatal exercise eHealth intervention (pilot study)*. Oral Presentation: Western Health and Rehabilitation Sciences Graduate Research Forum, London, Ontario, February 2013.

Gray, Cramp, Burke, & Kossert. *Move More Mommy: A postnatal exercise eHealth intervention (pilot study)*. Poster Presentation: Faculty of Health Sciences Research Forum, London, Ontario, 2013.

Gray, Cramp, Burke, & Kossert. *Move More Mommy: A postnatal exercise eHealth intervention (pilot study)*. Oral Presentation: Western Research Forum, London, Ontario, 2013.

Gray, Cramp, Burke, & Kossert. *Move More Mommy: An Internet-based postnatal exercise intervention*. Oral Presentation: 3-Minute Thesis Competition, London, Ontario, 2013.

Gray, Cramp, Burke, & Kossert. *Move More Mommy: A postnatal exercise eHealth intervention (pilot study)*. Oral Presentation: Canadian Society for Psychomotor Learning and Sport Psychology Annual Conference, Kelowna, British Columbia, October 2013.

Gray, Cramp, Burke, & Kossert. *Move More Mommy: A postnatal exercise eHealth intervention (pilot study)*. Oral Presentation: Western Health and Rehabilitation Sciences Graduate Research Forum, London, Ontario, February 2014.

Gray, Cramp, Burke, & Kossert. *Move More Mommy: A postnatal eHealth physical activity intervention (pilot study)*. Oral Presentation: Eastern Canada Sport and Exercise Psychology Symposium, Toronto, Ontario, March 2014.

Cramp, Gray, & Burke. *A meta-analysis of postnatal physical activity interventions*. Poster presentation: International Society for Behavioural Nutrition and Physical Activity Annual Meeting, San Diego, California, May 2014.