

Is a general or specific exercise recommendation more effective for promoting physical activity among postpartum mothers?

Journal of Health Psychology
1–15

© The Author(s) 2017

Reprints and permissions:

sagepub.co.uk/journalsPermissions.nav

DOI: 10.1177/1359105316687627

journals.sagepub.com/home/hpq



Emily L Mailey and Wei-Wen Hsu

Abstract

This comparative effectiveness trial examined the effects of a behavior change intervention supplemented by a general or specific exercise recommendation on physical activity among postpartum mothers. Participants ($N=49$) attended three workshop sessions that provided the exercise recommendation and taught self-regulatory skills. Physical activity, self-efficacy, planning, and barriers were assessed at baseline, post-intervention, and 6-month follow-up. Self-reported physical activity increased significantly in both groups ($p<.001$), but the increase was larger in the general condition ($p=.03$). Both groups reported increased planning and decreased barriers. Postpartum mothers may benefit from interventions that teach strategies for overcoming barriers while allowing them to choose preferred activities.

Keywords

exercise behavior, intervention, physical activity, postpartum, self-efficacy

Introduction

There is strong evidence that physical activity declines across the transition to motherhood (Bellows-Riecken and Rhodes, 2008). Retrospective studies have consistently demonstrated large percentages of mothers who were regularly active prior to parenthood are no longer meeting the national physical activity recommendations after having a child (Albright et al., 2006; McIntyre and Rhodes, 2009). Furthermore, several recent prospective studies have corroborated these findings. For example, Hull et al. (2010) found that individuals who had a first or subsequent child during a 2-year investigation lost an average of 3.7 hours of physical activity per week. Similarly, Rhodes et al. (2014) found moderate-vigorous physical activity (MVPA) declined significantly

among women, but not men, who became first-time parents. Given the vast array of benefits of engaging in physical activity during the postpartum period (e.g. improved cardiovascular health, weight loss, and increased psychological well-being; Larson-Meyer, 2002; Norman et al., 2010; Sampselle et al., 1999), these declines are concerning.

Kansas State University, USA

Corresponding author:

Emily L Mailey, Department of Kinesiology, Kansas State University, 1A Natatorium, 920 Denison Ave., Manhattan, KS 66506, USA.

Email: emaily@ksu.edu

Mothers are likely to experience a variety of barriers to engaging in regular physical activity (Mailey et al., 2014). Specifically, lack of time and guilt have emerged as salient barriers during the postpartum period (Brown et al., 2001; Mailey et al., 2014; Miller and Brown, 2005). After adding childcare responsibilities to existing occupational and household duties, many parents report that there are simply not enough hours in the day to engage in physical activity (Albright et al., 2006; Brown et al., 2001; Pereira et al., 2007; Verhoef and Love, 1994). Furthermore, mothers who subscribe to the notion that a mother's primary role is to take care of others' needs before her own may feel guilty for taking time for leisure activities such as physical activity (Lewis and Ridge, 2005; Miller and Brown, 2005). Moreover, during the postpartum period, defined as the first year after childbirth, mothers are not only adjusting to the new demands of caring for an infant but also recovering physically and psychologically from pregnancy and childbirth (Kwee and McBride, 2016; Mottola, 2002).

In light of these concerns, a number of interventions have been developed for postpartum women. Several theory-based interventions have elicited significant increases in physical activity by teaching participants self-regulatory skills such as goal setting, self-monitoring, and developing plans for overcoming barriers. For example, Cramp and Brawley (2006) found women exposed to these skills evidenced significantly greater changes in frequency and volume of physical activity compared to women who only had access to a commercial fitness facility. Similarly, in a randomized controlled trial conducted in Australia, participants who received a social cognitive theory-based intervention consisting of a goal-setting consultation and 3–5 weekly tailored text messages reported significant increases in frequency of MVPA compared to women in a control condition (Fjeldsoe et al., 2013). Although these findings are encouraging, they are limited by a lack of follow-up assessment to determine whether initial changes in physical activity were maintained over time. Such follow-up is critical in

light of other physical activity interventions for mothers that have demonstrated poor maintenance of intervention effects over time (Cody and Lee, 1999; Mailey and McAuley, 2014; Miller et al., 2002).

Previous research has demonstrated that self-efficacy (i.e. one's beliefs in her capabilities to carry out a specific course of action) is a key predictor of physical activity among mothers (Cramp and Brawley, 2009), but declines in self-efficacy are not uncommon when one is undertaking a challenging new behavior such as physical activity (McAuley et al., 2011). For postpartum mothers, regardless of their previous levels of physical activity, resuming an active lifestyle after childbirth could be considered a "new behavior" because many of the barriers they face are unfamiliar, and they may feel overwhelmed by the new demands that make it difficult to prioritize time for oneself (Evenson et al., 2009). Furthermore, they may be discouraged by the declines in physical strength and endurance related to pregnancy and childbirth. Thus, postpartum mothers may benefit from a specific exercise recommendation that emphasizes gradual progression to rebuild physical capabilities at a pace that is manageable, thus facilitating mastery experiences that build self-efficacy. This progressive approach has been effective for increasing physical activity in other sedentary populations such as older adults (Ashe et al., 2015). Additionally, a structured, efficacy-building program may help new parents bridge the intention–behavior gap by exactly outlining the specific behaviors to be accomplished, thus minimizing effortful deliberations about what to do and facilitating effective goal pursuit (Gollwitzer, 1999; Sniechotta et al., 2005).

However, because parents of infants frequently encounter unpredictable barriers that make it difficult to establish a reliable routine, a structured program may not be ideal if these barriers prevent mothers from adhering to the recommended protocol. Furthermore, if the type of physical activity recommended is not perceived to be enjoyable to an individual, her motivation to prioritize the behavior may be

limited (Ekkekakis, 2013). Some have argued that allowing individuals to choose the activities they would like to pursue, regardless of whether they are optimal for improving fitness, is a preferred approach for facilitating enjoyment and building autonomous motivation (Segar and Richardson, 2014), which is a strong predictor of physical activity maintenance over time (Inglelew and Markland, 2008; Teixeira et al., 2012). Postpartum mothers may gain confidence in their ability to fit physical activity into their lives if they accrue mastery experiences by engaging in activities they want to pursue, and these activities lead to immediate positive outcomes such as increased energy and improved mood (Kwan and Bryan, 2010).

Thus, the purpose of this comparative effectiveness trial was to determine whether a general or specific exercise recommendation would be more effective for promoting physical activity among postpartum mothers in the context of a behavior change intervention. Previous research has not examined whether a structured exercise program or a general physical activity recommendation is more conducive to building self-efficacy and promoting physical activity in this population. The decision to compare two active interventions, at the expense of including a control group, was based on (1) anticipation of a limited sample size and consideration of how to best move the science forward given those constraints; (2) previous research that has demonstrated behavioral interventions that give participants “something” are superior to control conditions (Mohr et al., 2009), including among mothers (Fjeldsoe et al., 2015; Mailey and McAuley, 2014); and (3) ethical concerns about withholding an intervention from postpartum women who expressed an interest in increasing their physical activity. Furthermore, this study adds to the current body of postpartum intervention literature by using an objective measure of physical activity and including a 6-month follow-up to determine whether initial intervention effects were maintained over time.

Methods

Participants

Participants were females between 6 weeks and 12 months postpartum who were not meeting the current physical activity recommendation of 150 minutes of moderate-intensity activity per week. For safety reasons, all participants had to have a physician’s approval to resume physical activity following childbirth in order to proceed with participation.

Procedures

All procedures were approved by a university institutional review board. Participant recruitment began in February 2013, and follow-up data collection was complete in December 2014. Participants were recruited via flyers distributed at a local pediatric office, social media sites aimed at local mothers, and university email lists. Individuals who expressed interest in the study were directed to an eligibility survey. Those who met all inclusion criteria were mailed a packet that included an informed consent document, a physician authorization form, and an accelerometer with an accompanying log and instructions. Additionally, they received a link to complete the questionnaires via email. Participants were instructed to wear the accelerometer for 1 week and complete the questionnaires during the same week. After wearing the accelerometer for 7 days, they sent the accelerometer and log back to the investigator in a provided self-addressed, stamped envelope. All individuals provided written informed consent and received written physician permission prior to beginning the intervention.

Once all baseline measures were received from an individual, she was asked to indicate her availability for an initial group workshop session. Participants were then matched with others whose availability was compatible (e.g. weekends vs weekdays). Once an initial group session time was determined, the group was randomly assigned to the specific recommendation intervention (SRI) or the general recommendation intervention (GRI) using a random

number generator. This strategy was selected because scheduling challenges precluded randomization at the individual level. Additionally, during periods of slow enrollment, group sessions could be scheduled more promptly if it was not necessary to run a corresponding group simultaneously. Participants were not aware that there were two different interventions.

The interventions consisted of three workshop sessions and are described in detail below. Briefly, each session lasted approximately 1.5 hours, and sessions were scheduled 1 month apart. Thus, the total duration of the intervention was 2 months. Sessions were scheduled based on participant availability, and group size ranged from 2 to 7 participants. At the end of the third and final session, participants received an accelerometer and were asked to wear the accelerometer and complete the questionnaires online during the week immediately following the final meeting. Participants returned the accelerometer and log via mail. Then, 6 months after post-intervention data collection, participants received an email invitation to participate in a final follow-up. Individuals who responded to confirm their availability to complete the follow-up received the accelerometer via mail and completed the questionnaires online. Instructions for wearing the accelerometer and completing the questionnaires were identical to the previous two time points.

Interventions

All participants, regardless of group assignment, were invited to attend three workshop sessions. An investigator with training and experience in delivering physical activity interventions led all sessions, which not only followed a planned curriculum but also allowed time for discussion and interaction among participants. Table 1 details the intervention activities implemented during each of the three sessions and classifies each according to the behavior change technique (BCT) taxonomy (Michie et al., 2013) and related theoretical construct(s). The BCTs were primarily derived from the Health Action Process Approach (HAPA), which identifies

constructs that align with both the motivational (i.e. building intentions to be active) and volitional (i.e. translating intentions to behavior) phases of the behavior change process (Schwarzer and Luszczynska, 2008). Thus, participants in both groups engaged in overlapping core activities such as goal setting, identifying physical activity benefits, developing strategies for overcoming key barriers (i.e. problem solving/coping planning), and discussing relapse prevention strategies. An example of a worksheet all participants completed (overcoming barriers) is included in Supplemental Figure 1. During each workshop session, participants would revise their goals based on the successes experienced and challenges encountered over the past month. Additionally, because pedometers have been shown to be effective tools for promoting increases in physical activity (Bravata et al., 2007; Richardson et al., 2008), all participants received an Omron pedometer and accompanying software which could be used to download and view individual data. Participants were encouraged to wear the pedometer daily across the 2-month intervention period to self-monitor their physical activity. During the first two sessions, each group also completed several unique condition-specific activities, which are described in more detail below.

SRI. Participants assigned to the SRI received a recommended exercise protocol that emphasized gradual progression and mastery experiences. "Couch to 5k" is a commercially available program that is designed to help individuals move from being inactive to being able to jog for 30 consecutive minutes (http://www.coolrunning.com/engine/2/2_3/index.shtml). Individuals are instructed to complete three 30-minute workouts each week, and each workout incorporates walking and jogging to help individuals build their stamina and motivation gradually. The "Couch to 5k" program was selected based on anecdotal endorsements of the program during our previous research with mothers. Specifically, a number participants who admitted to "hating running/exercise" initiated the program and reported it

Table 1. Activities implemented during each intervention session.

Activity in session	Behavior change technique	Theoretical construct(s)	Session implemented	SRI	GRI
1. Identify benefits associated with becoming more active	9.3. Comparative imagining of future outcomes	Outcome expectancies	1	X	X
2. Focus on immediate positive outcomes	5.6. Information about emotional consequences	Outcome expectancies	1	X	X
3. Discuss impact of physical activity on kids/family	13.1. Identification of self as role model	Outcome expectancies	1	X	X
4a. Redefine "exercise" to include any movement	13.2. Framing/reframing	Autonomy; action self-efficacy	1		X
4b. Introduce "Couch to 5k" program	8.7. Graded tasks	Action self-efficacy	1	X	
5. Set SMART goals	1.1. Goal setting (behavior)	Intention	1	X	X
6. Wear pedometer daily	2.3. Self-monitoring of behavior	Competence	1, 2, 3	X	X
1. Share success stories from past month	15.3. Focus on past success	Action/maintenance self-efficacy	2, 3	X	X
2. Identify barriers and develop strategies for overcoming them	1.2. Problem solving	Coping planning; maintenance self-efficacy	2	X	X
3a. Discuss why weight loss and health are not optimal motives	13.3. Incompatible beliefs	Outcome expectancies; autonomy	2		X
4a. Identify core values and link to enjoyable activities	13.4. Valued self-identity	Autonomy	2		X
3b. Add exercise sessions to calendar	1.4. Action planning	Action planning	2	X	
4b. Show video vignettes of active mothers exhibiting self-efficacy	6.2. Social comparison	Action/maintenance self-efficacy; relatedness	2	X	
5. Social support contract	3.1. Social support (unspecified)	Relatedness	2	X	X
6. Revise SMART goals	1.5. Review behavior goals	Intention; maintenance self-efficacy	2, 3	X	X
1. Introduce cues to action	7.1. Prompts/cues	Action planning	3	X	X
2. Discuss "tiny habits"	8.3. Habit formation	Maintenance self-efficacy	3	X	X
3. Discuss relapse prevention	1.2. Problem solving	Recovery self-efficacy; coping planning	3	X	X
	13.5. Identity associated with changed behavior				
	15.1. Verbal persuasion about capability				
4. Complete exercise contract	1.8. Behavioral contract	Intention	3	X	X

SRI: specific recommendation intervention; GRI: general recommendation intervention. Behavior change techniques are classified according to Michie et al.'s (2013) taxonomy.

transformed their perceptions of their physical capabilities and of exercise itself. For this study, "Couch to 5k" seemed especially suitable for postpartum mothers because it is recommended for individuals who are sedentary and deconditioned, and all participants reported being inactive and having given birth in the past year. In addition, the weekly time commitment is manageable, there are no associated equipment or membership costs, and the program can be adjusted to suit an individual's needs. Most importantly, the focus on gradual progression minimizes discomfort and facilitates regular success experiences that help individuals gain confidence in their capabilities. Participants in this group were encouraged to set goals and develop action plans that focused on undertaking the "Couch to 5k" program. An example of a handout participants in this group received is provided in Supplemental Figure 2.

GRI. Participants assigned to the GRI did not receive a specific exercise recommendation; rather, they were encouraged to accumulate physical activity in any way that suited their current lifestyle. A core goal of the GRI was to support autonomy or the participants' sense that they are choosing to engage in the behavior because they enjoy it and/or because the behavior is consistent with their core goals and values (Deci and Ryan, 1987). They were guided through activities designed to facilitate the development of autonomous physical activity motives. For example, they identified their core roles and values and then selected activities that would enhance their ability to succeed in those roles (e.g. doing yoga helps reduce my stress, which makes me a more patient parent). They were encouraged to disregard cultural expectations about what type of exercise they "should" be doing and focus on pursuing enjoyable activities that would enhance their daily well-being. Additionally, they were advised to broaden their definitions of "exercise" to include any enjoyable and feasible forms of physical activity. The importance of being flexible and adopting a "some is better than none" attitude was

emphasized throughout the intervention. An example of a worksheet participants in this group completed is provided in Supplemental Figure 3.

Measures

Demographics. Participants provided demographic information, including age, race, marital status, employment status, and education. In addition, they indicated the number and age(s) of their child(ren).

Physical activity. Physical activity was measured objectively using ActiGraph accelerometers (model GT3X+). Participants were asked to wear the accelerometer on the left hip during all waking hours for seven consecutive days. In addition, they were asked to complete a daily log indicating the exact times they started and stopped wearing the monitor each day, as well as any periods of monitor removal (e.g. for bathing). Subject log diaries were then used to determine wear time, such that only periods during which the participant indicated she was wearing the monitor were included in the analyses. Activity counts were summed across 60-second epochs. Based on previously established cutpoints, activity that exceeded 1952 counts per minute was classified as MVPA (Freedson et al., 1998). Total minutes of moderate and vigorous activity were summed across the week and then averaged over the total number of days of wear to determine average daily minutes of MVPA.

Additionally, self-reported leisure-time exercise was assessed using the Godin Leisure-Time Exercise Questionnaire (GLTEQ; Godin and Shephard, 1985). This brief measure asks participants to report the current frequency of engaging in strenuous (e.g. running), moderate (e.g. easy bicycling or swimming), and light (e.g. bowling or golf) leisure-time exercise for at least 15 minutes per session during a typical week. This measure is widely used and has previously demonstrated adequate test-retest reliability and concurrent validity with objective measures of physical activity and energy

expenditure (Jacobs et al., 1993; Shephard, 2003).

Barriers. The Exercise Barriers Scale presented six commonly endorsed barriers to exercise among parents: lack of time, lack of motivation, feeling guilty, feeling too tired, lack of enjoyment, and too busy with other responsibilities. Participants were instructed: "The following items list factors that often prevent individuals from exercising regularly. Please indicate the extent to which each of the following interferes with your physical activity routine." Participants rated each barrier on a scale from 1 (*not at all*) to 5 (*always*). This scale was reduced from the original Exercise Barriers Scale (Sechrist et al., 1987) to include a concise list of relevant barriers. Barriers were examined separately and summed to yield a total score (range: 6–30; $\alpha = .61-.81$).

Self-efficacy. The Barriers Self-efficacy Scale assesses participants' perceived capabilities to adhere to their exercise goals in the face of commonly identified barriers to participation (e.g. lack of support and schedule conflicts). Consistent with recommendations to best capture the situation-specific nature of self-efficacy (McAuley et al., 2012), the measure was modified slightly from its original version (McAuley, 1992) to include two barriers specific to parents (lack of childcare and feeling guilty about spending time apart from children). For each of the 13 items (e.g. "I am confident I could meet my exercise goals if my schedule became very busy"), participants responded by indicating their confidence to execute the given behavior on a 100-point percentage scale ranging from 0 percent (*not at all confident*) to 100 percent (*highly confident*). Total strength of self-efficacy was determined by calculating the mean of all items, resulting in a maximum possible efficacy score of 100. Internal consistency for this scale was good ($\alpha = .81-.91$).

Planning. The Exercise Planning and Scheduling Scale (Rovniak et al., 2002) was used to

assess planning. This scale includes 10 items related to scheduling and planning exercise as part of one's daily routine (e.g. "I schedule my exercise at specific times each week."). Participants were told, "The following questions refer to how you fit exercise into your lifestyle," and asked to indicate the extent to which each of the statements described them on a scale from 1 (*does not describe*) to 5 (*describes completely*). Responses were summed to yield a total score (range: 10–50; $\alpha = .78-.89$).

Data analysis

The effects of the intervention on physical activity and targeted constructs were analyzed using a series of mixed design 2 (group) \times 3 (time) repeated measures analyses of variance (ANOVAs). Dependent variables included self-reported physical activity, accelerometer-measured MVPA, self-efficacy, and planning. Effect sizes (Cohen's d) were calculated to assess the magnitude of change within groups for all variables. Changes in reported barriers were examined using a mixed design repeated measures multivariate analysis of variance (MANOVA), with all six individual barriers included as dependent variables and group included as the between-subject factor.

Results

Participant characteristics and retention

A total of 79 individuals responded to advertisements and completed the initial eligibility questionnaire (see CONSORT diagram, Figure 1). Of these, 62 were eligible to participate, and 49 completed all baseline data collection and were randomized to either the SRI ($n = 25$) or the GRI ($n = 24$). There were no significant demographic differences between groups. On average, participants were 32.3 years old (range: 25–40 years). A majority of participants were married (93.9%), White (87.8%),

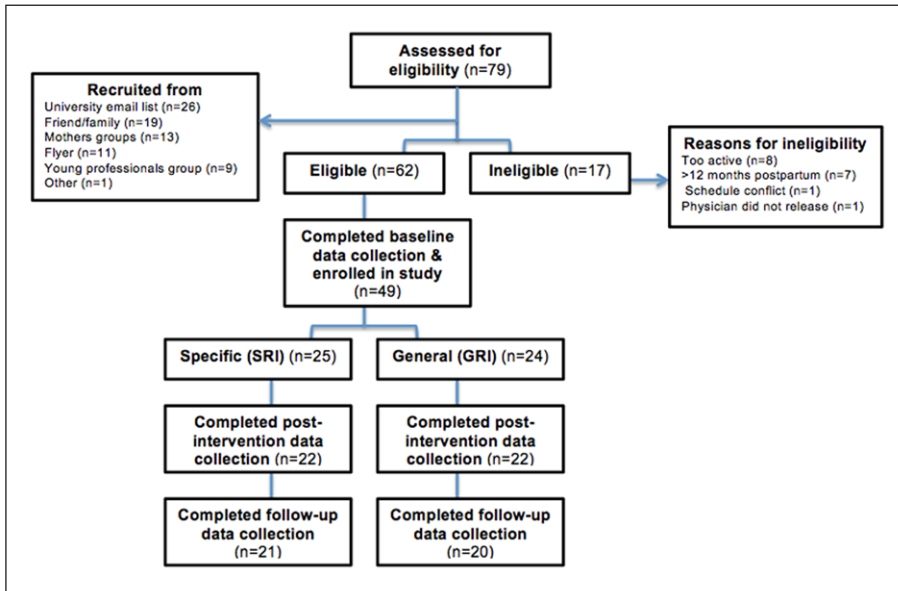


Figure 1. CONSORT diagram.

college-educated (98.0%), and employed outside of the home (75.5%). The average age of the infant was 5.8 months, and it was the first child for 67.3 percent of the sample.

All participants attended the first workshop session. Subsequently, five participants withdrew from the study (three from SRI, two from GRI). Of the 44 individuals who completed the intervention, 40 attended all workshop sessions, and the remaining 4 attended two of the three workshop sessions. An additional 3 participants (1 from SRI and 2 from GRI) failed to complete the 6-month follow-up, which left a total of 41 participants who provided data at all three time points (84% retention). Valid accelerometer data at all time points were available for 39 of the 41 participants (20 from SRI and 19 from GRI). Only 51.2 percent of the 41 completers submitted usable pedometer data, so additional analyses of step data were not conducted. Participants who dropped out of the study had significantly higher accelerometer-measured MVPA at baseline than those who completed the study (35.9 vs 24.5 min/day; $p=.03$). Dropouts and completers did not differ on any other baseline or demographic variables.

Intervention effects on physical activity

For self-reported physical activity, three significant outliers (>3 standard deviation (SD) above the mean) were identified and removed prior to analysis. Descriptive statistics for all variables at all time points are reported by group in Table 2. There were no significant differences between groups at baseline. There was a significant main effect for self-reported physical activity ($F(2, 35)=20.50$, $p<.001$, $\eta^2=.54$), such that both groups reported significant increases in physical activity immediately following the intervention ($p<.001$) and small, but nonsignificant declines in physical activity during the follow-up period ($p=.28$). Additionally, there was a significant group by time interaction effect ($F(2, 35)=3.93$, $p=.03$, $\eta^2=.18$), which revealed physical activity increased more across the 8-month study period in the GRI condition ($p=.004$) compared to the SRI condition ($p=.13$). However, after correcting for non-sphericity using the Huynh-Feldt adjustment, this effect was reduced ($F(1.80, 35)=2.28$, $p=.12$, $\eta^2=.06$).

Accelerometer-measured MVPA exhibited a nonsignificant quadratic effect ($F(2, 36)=2.91$, $p=.07$, $\eta^2=.14$) and a nonsignificant interaction effect ($F(2, 36)=0.44$, $p=.65$, $\eta^2=.02$). Overall, MVPA increased across the initial intervention period in both groups, but both groups exhibited substantial decreases in MVPA across the follow-up period.

Intervention effects on self-efficacy, planning, and barriers

For barriers self-efficacy, neither the main effect ($F(2, 38)=0.98$, $p=.39$, $\eta^2=.05$) nor the interaction effect ($F(2, 38)=0.02$, $p=.98$, $\eta^2=.001$) was statistically significant. However, effect sizes revealed both groups reported modest increases in self-efficacy (Table 2). The intervention elicited a significant increase in planning ($F(2, 38)=12.40$, $p<.001$, $\eta^2=.40$) that was sustained across the follow-up period and did not differ between groups ($F(2, 38)=0.89$, $p=.42$, $\eta^2=.05$; Table 2).

The MANOVA examining changes in exercise barriers yielded a main effect approaching statistical significance ($F(12, 27)=2.05$, $p=.06$, $\eta^2=.48$) and a nonsignificant interaction effect ($F(12, 27)=1.18$, $p=.34$, $\eta^2=.35$). Figure 2 depicts changes in the six specific barriers examined. The two most prominent barriers, “too busy” and “lack of time,” declined significantly ($p=.03$; $p=.001$) across the 8-month study duration. Additionally, participants reported significant decreases in “feeling guilty” as a barrier ($p=.009$). “Lack of motivation,” “too tired,” and “no enjoyment” did not change significantly.

Discussion

This study was designed to examine the relative effectiveness of two behavior change interventions supplemented by a specific or general exercise recommendation to promote physical activity among postpartum mothers. Although both intervention approaches were effective at eliciting some short-term increase in physical activity, the increases were larger and better sustained in the GRI group (i.e. those who

Table 2. Intervention effects on physical activity and targeted constructs.

Variable	Group (n)	1. Baseline, M (SD) (range)	2. Post-intervention, M (SD) (range)	3. Follow-up, M (SD) (range)	Mean diff (d), (1–2) (95% CI)	Mean diff (d), (2–3) (95% CI)	Mean diff (d), (1–3) (95% CI)
GLTEQ	GRI (19)	12.4 (10.8) (0 to 39)	30.4 (16.2) (6 to 56)	26.1 (17.8) (3 to 72)	17.9 (1.31) (8.8 to 27.0)	-4.24 (-0.25) (-15.4 to 6.9)	13.7 (0.93) (3.9 to 23.4)
	SRI (19)	13.2 (14.0) (0 to 59)	20.7 (15.5) (0 to 50)	17.9 (17.3) (0 to 63)	7.39 (0.51) (-2.3 to 17.1)	-2.76 (-) (-13.6 to 8.0)	4.63 (0.30) (-5.7 to 15.0)
MVPA	GRI (19)	26.1 (14.1) (6.1 to 47.1)	33.6 (17.47) (5.1 to 67.2)	27.9 (12.2) (9.4 to 54.4)	7.46 (0.47) (-3.0 to 17.9)	-5.65 (-0.38) (-15.6 to 4.3)	1.81 (0.14) (-6.9 to 10.5)
	SRI (20)	23.4 (12.4) (5.3 to 51.5)	26.7 (9.73) (13.6 to 47.0)	24.3 (9.43) (10.6 to 51.3)	3.34 (0.30) (-3.8 to 10.5)	-2.38 (-0.25) (-8.5 to 3.8)	0.96 (0.09) (-6.1 to 8.0)
Self-efficacy	GRI (20)	41.2 (14.5) (19.23 to 71.54)	45.4 (17.3) (19.23 to 88.46)	43.9 (16.2) (19.23 to 80.77)	4.19 (0.26) (-6.0 to 14.4)	-1.50 (-0.09) (-12.2 to 9.2)	2.69 (0.18) (-7.1 to 12.5)
	SRI (21)	39.0 (14.1) (13.85 to 70)	42.7 (20.0) (14.62 to 93.08)	42.3 (24.0) (6.15 to 96.15)	3.77 (0.21) (-7.0 to 14.6)	-0.48 (-0.02) (-14.3 to 13.3)	3.30 (0.17) (-9.0 to 15.6)
Planning	GRI (20)	15.3 (5.66) (10 to 30)	20.8 (8.01) (10 to 36)	21.2 (8.71) (10 to 38)	5.55 (0.79) (1.1 to 10.0)	0.35 (0.05) (-5.0 to 5.7)	5.90 (0.80) (1.2 to 10.6)
	SRI (21)	18.2 (5.68) (10 to 31)	22.0 (7.88) (10 to 38)	21.1 (8.86) (10 to 40)	3.86 (0.55) (-0.4 to 8.1)	-0.90 (-0.11) (-6.1 to 4.3)	2.95 (0.39) (-1.7 to 7.6)
Total	GRI (20)	20.1 (3.87) (13 to 27)	17.8 (4.97) (10 to 29)	18.3 (4.59) (10 to 25)	-2.25 (-0.52) (-5.1 to 0.6)	0.45 (0.10) (-2.6 to 3.5)	-1.80 (-0.42) (-4.5 to 0.9)
barriers	SRI (20)	19.4 (2.44) (14 to 28)	17.9 (4.85) (7 to 24)	18.1 (4.87) (7 to 26)	-1.50 (-0.39) (-4.0 to 1.0)	0.15 (0.04) (-3.0 to 3.3)	-1.35 (-0.34) (-3.8 to 1.1)

GLTEQ: Godin Leisure-Time Exercise Questionnaire; MVPA: moderate-vigorous physical activity (min/day) measured by accelerometer; post-intervention: 2 months after baseline; follow-up: 8 months after baseline; d: effect size (Cohen's d); 1–2: change from baseline to post-intervention; 2–3: change from post-intervention to follow-up; 1–3: change from baseline to follow-up; CI: confidence interval; SD: standard deviation.

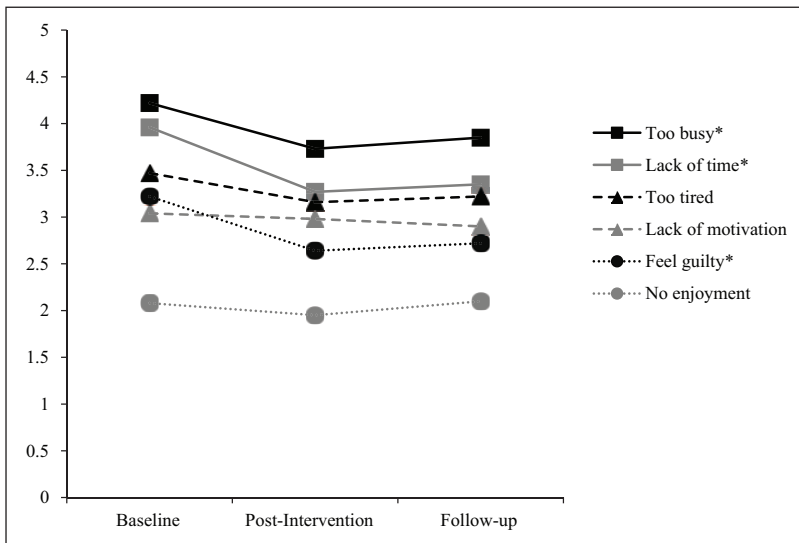


Figure 2. Changes in perceptions of barriers in the total sample across the study duration.

*A statistically significant change from baseline to follow-up.

received a general recommendation to increase physical activity). Participants in the GRI group also demonstrated a larger increase in accelerometer-measured MVPA across the intervention period, but this increase was not sustained across the follow-up period. These findings are consistent with previous research among mothers that has demonstrated positive immediate intervention effects are difficult to sustain over time (Cody and Lee, 1999; Mailey and McAuley, 2014; Miller et al., 2002).

Furthermore, previous research has shown less robust estimates of accelerometer-measured physical activity compared to self-reported physical activity, and there are several possible explanations for this. First, it is possible that participants were engaging in types of exercise (e.g. swimming and upper body exercises) that would not be captured by the accelerometer, which was worn on the hip and removed for aquatic activities. A more likely explanation is that the GLTEQ asked participants to report activities of a “typical week,” whereas the accelerometer was worn during an assigned week and thus would be more sensitive to temporary declines in physical activity (e.g. due to illness or travel). Participants’ estimation of a “typical week” may

be subject to recall or social desirability biases. Although the evidence that social desirability biases physical activity estimates is mixed (Adams et al., 2005; Motl et al., 2005), it is certainly possible that the “typical” activity patterns reported were more reflective of an optimal or ideal week.

Overall, the results provide some support for the utility of providing a general recommendation to increase physical activity, though additional research is needed to replicate these findings. The relative effectiveness of the general recommendation approach (as opposed to a specific recommendation to partake in a progressive running program) warrants further exploration and discussion. The type of activity recommended for the “Couch to 5k” program may be one explanation for these findings. Despite the fact that the program is designed to be gradual and adaptable, running is an intense form of exercise, and there is a large body of evidence documenting an inverse relationship between exercise intensity and enjoyment (Ekkekakis et al., 2011). Although anecdotal evidence has demonstrated that mothers have had positive experiences with the “Couch to 5k” program, these mothers had *chosen* to

undertake the program and thus were participating autonomously. Thus, future studies might consider recommending a different type of exercise with higher reports of enjoyment. Enjoyment is a key determinant of physical activity (Salmon et al., 2003), so it is possible that the GRI afforded participants the opportunity to pursue preferred activities that would bring about positive emotional experiences (Ekkekakis and Lind, 2006). This is consistent with the position that allowing for autonomy in setting one's goals is likely to improve physical activity participation (Segar and Richardson, 2014). Importantly, participants in the GRI condition did exhibit moderate increases in MVPA, which suggests that they were choosing to engage in activities of sufficient intensity to yield health benefits. Thus, reframing "exercise" to include any type of movement may be a useful intervention strategy to incorporate in future interventions for mothers.

Both interventions successfully elicited increases in self-regulatory skills (i.e. exercise planning) and decreases in perceptions of commonly reported barriers among mothers (i.e. lack of time and guilt). These results are encouraging, as previous physical activity interventions for mothers have identified self-regulatory strategies such as goal setting and planning as key drivers of changes in physical activity (Fjeldsoe et al., 2013; Mailey and McAuley, 2014). In this study, both groups were exposed to activities that have been deemed "central to self-management" such as goal setting and self-monitoring (Greaves et al., 2011; Michie et al., 2009), which may have helped them to increase their physical activity. Although the nature of the goals may have differed between groups, all participants were encouraged to set attainable goals, monitor their progress, and be flexible to account for unexpected barriers. Importantly, engaging in these activities during intervention sessions led participants to perceive barriers such as lack of time to be less formidable. Time constraints are likely to be an ongoing obstacle to physical activity for parents (Mailey et al., 2014; Wilcox et al., 2002), but those who feel better equipped to cope with these constraints

are more likely to resist relapse and maintain an active lifestyle over time (Ziegelmann et al., 2006).

It is useful to point out that although neither of the interventions was a rigorous application of one particular behavioral theory, several theories can be identified as potential bases for future physical activity interventions for this population, of which two will be presented here. First, the autonomy-supportive nature of the GRI is consistent with self-determination theory (SDT), which posits that more autonomous motives are linked to better physical activity maintenance (Ryan and Deci, 2000; Silva et al., 2011). While the anticipation of positive outcomes may be enough for an individual to initiate a behavior, the extent to which he or she derives satisfaction from engaging in the behavior is critical for maintenance (Rothman et al., 2004). Affording individuals the opportunity to choose enjoyable activities is likely to facilitate this sense of satisfaction (Chang and Pham, 2013). Future interventions for postpartum mothers should consider employing the full SDT framework and examining the extent to which changes in autonomy, competence, and relatedness contribute to physical activity maintenance over time.

The second relevant theoretical approach is the HAPA. The results of this study also shed light on the value of planning, a self-regulatory strategy that is central to theories such as HAPA that distinguish between the motivational and volitional phases of the behavior change process (Schwarzer and Luszczynska, 2008). The HAPA identifies strategies such as action and coping planning as critical for translating intentions to action. For mothers who are attempting to balance multiple demands (e.g. childcare, work, and household tasks), scheduling specific times for exercise (i.e. action planning) and having plans for overcoming barriers (i.e. coping planning) may significantly increase the likelihood that they will follow through on their goals/intentions (Gaston and Prapavessis, 2014; Schwarzer, 2008). However, these strategies are only relevant when someone has already developed the motivation/intention to change her

behavior, so future interventions should consider sequencing activities such that building autonomous motivation (e.g. by choosing enjoyable activities) precedes focusing on self-regulatory strategies such as planning. When combining multiple theoretical constructs in an intervention, as suggested above, including frequent assessments of these constructs throughout the intervention will help shed light on the relative importance of different constructs at different stages of the behavior change process (Rothman et al., 2004).

Strengths, limitations, and future directions

This study has several strengths that improve upon previous physical activity interventions for mothers. First, few interventions for mothers have included an objective measure of physical activity. Accelerometers are a valid, reliable tool for assessing physical activity and corroborating self-reported data. In this study, the accelerometer data showed similar, but less robust, effects, perhaps supporting common assertions that self-reported data are subject to a number of biases and over reporting (Adams et al., 2005). Second, this study included a 6-month follow-up to examine the extent to which changes in physical activity were sustained beyond the initial intervention period. Although participants exhibited modest declines on some variables during the follow-up period, intervention effects were largely sustained. It is encouraging that 6 months after the intervention ended, participants reported continued use of exercise planning strategies and less interference from exercise barriers. Participant retention was high in the study, so these results were not likely impacted by differential changes among dropouts.

Several limitations must also be acknowledged. First, the study did not have a no-treatment control group with which to compare the two interventions. Because numerous previous studies have demonstrated the effectiveness of behavioral interventions compared to control conditions, this study aimed to advance the literature by focusing specifically on the relative effectiveness of two different approaches

(Glasgow and Steiner, 2012). However, the lack of control group makes it difficult to ascertain the unique efficacy of each approach. Second, the study did not include a measure of autonomy or motivation. Because the extent to which autonomy was supported differed between groups, assessing this construct may have improved understanding of the mechanisms through which the interventions affected physical activity. Furthermore, process data were not collected to explain *how* participants changed their physical activity behaviors. Gathering participant feedback on the value, acceptance, and use of each aspect of the intervention, and the extent to which they believe these aspects facilitated behavior change, would be useful for informing future interventions for mothers. Additionally, the size of groups attending the workshops varied, so the group-mediated effects of the intervention may have differed from one group to another. Finally, despite varied recruitment strategies, the sample was small and consisted primarily of white, highly educated working mothers. Future studies might consider utilizing a randomized sampling strategy to reduce sampling bias, and additional research is certainly warranted to determine the extent to which these findings can be generalized to larger, more diverse samples of mothers.

Conclusion

In conclusion, this study provides preliminary support for the notion that a general recommendation to increase physical activity, supplemented by self-regulatory strategies that help mothers develop plans for overcoming prominent barriers such as lack of time, is an effective strategy for increasing physical activity among postpartum mothers. Allowing mothers to choose types of physical activity that are enjoyable and feasible may be important for promoting physical activity maintenance over time. Future interventions should employ full theoretical frameworks (e.g. SDT and/or HAPA) to determine whether these approaches lead to sustainable increases in self-efficacy, autonomy, and long-term physical activity maintenance.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by a Kansas State University Small Research Grant (USRG #2903). Research was conducted at the Physical Activity and Nutrition Clinical Research Consortium.

References

- Adams SA, Matthews CE, Ebbeling CB, et al. (2005) The effect of social desirability and social approval on self-reports of physical activity. *American Journal of Epidemiology* 161(4): 389–398.
- Albright CL, Maddock JE and Nigg CR (2006) Physical activity before pregnancy and following childbirth in a multiethnic sample of healthy women in Hawaii. *Women & Health* 42(3): 95–110.
- Ashe MC, Winters M, Hoppmann CA, et al. (2015) “Not just another walking program”: Everyday Activity Supports You (EASY) model: A randomized pilot study for a parallel randomized controlled trial. *Pilot and Feasibility Studies* 1: 4.
- Bellows-Riecken KH and Rhodes RE (2008) A birth of inactivity? A review of physical activity and parenthood. *Preventive Medicine* 46(2): 99–110.
- Bravata DM, Smith-Spangler C, Sundaram V, et al. (2007) Using pedometers to increase physical activity and improve health: A systematic review. *JAMA* 298(19): 2296–2304.
- Brown PR, Brown WJ, Miller YD, et al. (2001) Perceived constraints and social support for active leisure among mothers with young children. *Leisure Sciences* 23(3): 131–144.
- Chang HH and Pham MT (2013) Affect as a decision-making system of the present. *Journal of Consumer Research* 40: 42–63.
- Cody R and Lee C (1999) Development and evaluation of a pilot program to promote exercise among mothers of preschool children. *International Journal of Behavioral Medicine* 6: 13–29.
- Cramp AG and Brawley LR (2006) Moms in motion: A group-mediated cognitive-behavioral physical activity intervention. *International Journal of Behavioral Nutrition and Physical Activity* 3(1): 23.
- Cramp AG and Brawley LR (2009) Sustaining self-regulatory efficacy and psychological outcome expectations for postnatal exercise: Effects of a group-mediated cognitive behavioural intervention. *British Journal of Health Psychology* 14(3): 595–611.
- Deci EL and Ryan RM (1987) The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology* 53(6): 1024–1037.
- Ekkekakis P (2013) Redrawing the model of the exercising human in exercise prescriptions: From headless manikin to a creature with feelings. In: Rippe JM (ed.) *Lifestyle Medicine* (2nd edn). Hoboken, NJ: Wiley Blackwell, pp. 1421–1433.
- Ekkekakis P and Lind E (2006) Exercise does not feel the same when you are overweight: The impact of self-selected and imposed intensity on affect and exertion. *International Journal of Obesity* 30: 652–660.
- Ekkekakis P, Parfitt G and Petruzzello SJ (2011) The pleasure and displeasure people feel when they exercise at different intensities: Decennial update and progress towards a tripartite rationale for exercise intensity prescription. *Sports Medicine* 41: 641–671.
- Evenson KR, Aytur SA and Borodulin K (2009) Physical activity beliefs, barriers, and enablers among postpartum women. *Journal of Women's Health* 18(12): 1925–1934.
- Fjeldsoe BS, Miller YD and Marshall AL (2013) Social cognitive mediators of the effect of the MobileMums intervention on physical activity. *Health Psychology* 32(7): 729–738.
- Fjeldsoe BS, Miller YD, Graves N, et al. (2015) Randomized controlled trial of an improved version of MobileMums, an intervention for increasing physical activity in women with young children. *Annals of Behavioral Medicine* 49: 487–499.
- Freedson PS, Melanson E and Sirard J (1998) Calibration of the Computer Science and Applications, Inc. accelerometer. *Medicine & Science in Sports & Exercise* 30(5): 777–781.
- Gaston A and Prapavessis H (2014) Using a combined protection motivation theory and health

- action process approach intervention to promote exercise during pregnancy. *Journal of Behavioral Medicine* 37(2): 173–184.
- Glasgow RE and Steiner JF (2012) Comparative effectiveness research to accelerate translation: Recommendations for an emerging field of science. In: Brownson RC, Coldit GA and Proctor EK (eds) *Dissemination and Implementation Research in Health: Translating Science to Practice*. New York: Oxford University Press, pp. 72–93.
- Godin G and Shephard RJ (1985) A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences* 10(3): 141.
- Gollwitzer PM (1999) Implementation intentions: Strong effects of simple plans. *American Psychologist* 54(7): 493–503.
- Greaves CJ, Sheppard KE, Abraham C, et al. (2011) Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. *BMC Public Health* 11: 119.
- Hull EE, Rofey DL, Robertson RJ, et al. (2010) Influence of marriage and parenthood on physical activity: A 2-year prospective analysis. *Journal of Physical Activity & Health* 7(5): 577–583.
- Ingledeu DK and Markland D (2008) The role of motives in exercise participation. *Psychology & Health* 23(7): 807–828.
- Jacobs DR, Ainsworth BE, Hartman TJ, et al. (1993) A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine & Science in Sports & Exercise* 25(1): 81–91.
- Kwan BM and Bryan A (2010) Affective response to exercise as a component of exercise motivation: Attitudes, norms, self-efficacy, and temporal stability of intentions. *Psychology of Sport and Exercise* 11(1): 71–79.
- Kwee JL and McBride HL (2016) Working together for women's empowerment: Strategies for interdisciplinary collaboration in perinatal care. *Journal of Health Psychology* 21(11): 2472–2752.
- Larson-Meyer DE (2002) Effect of postpartum exercise on mothers and their offspring: A review of the literature. *Obesity* 10(8): 841–853.
- Lewis B and Ridge D (2005) Mothers reframing physical activity: Family oriented politics, transgression and contested expertise in Australia. *Social Science & Medicine* 60(10): 2295–2306.
- McAuley E (1992) The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *Journal of Behavioral Medicine* 15(1): 65–88.
- McAuley E, Mailey EL, Mullen SP, et al. (2011) Growth trajectories of exercise self-efficacy in older adults: Influence of measures and initial status. *Health Psychology* 30(1): 75–83.
- McAuley E, White SM, Mailey EL, et al. (2012) Exercise-related self-efficacy. In: Tenenbaum G, Eklund R and Kamata A (eds) *Handbook of Measurement in Sport and Exercise Psychology* (2nd edn). Champaign, IL: Human Kinetics, pp. 239–247.
- McIntyre CA and Rhodes RE (2009) Correlates of leisure-time physical activity during transitions to motherhood. *Women & Health* 49(1): 66–83.
- Mailey EL and McAuley E (2014) Impact of a brief exercise intervention on physical activity and social cognitive determinants among working mothers: A randomized trial. *Journal of Behavioral Medicine* 37: 343–355.
- Mailey EL, Huberty JL, Dinkel D, et al. (2014) Physical activity barriers and facilitators among working mothers and fathers. *BMC Public Health* 14: 657.
- Michie S, Abraham C, Whittington C, et al. (2009) Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychology* 28(6): 690–701.
- Michie S, Richardson M, Johnston M, et al. (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.
- Miller YD and Brown WJ (2005) Determinants of active leisure for women with young children—An “ethic of care” prevails. *Leisure Sciences* 27(5): 405–420.
- Miller YD, Trost SG and Brown WJ (2002) Mediators of physical activity behavior change among women with young children. *American Journal of Preventive Medicine* 23(2): 98–103.
- Mohr DC, Spring B, Freedland KE, et al. (2009) The selection and design of control conditions for randomized controlled trials of psychological interventions. *Psychotherapy and Psychosomatics* 78: 275–284.

- Motl RW, McAuley E and DiStefano C (2005) Is social desirability associated with self-reported physical activity? *Preventive Medicine* 40: 735–739.
- Mottola M (2002) Exercise in the postpartum period: Practical applications. *Current Sports Medicine Reports* 1(6): 362–368.
- Norman E, Sherburn M, Osborne RH, et al. (2010) An exercise and education program improves well-being of new mothers: A randomized controlled trial. *Physical Therapy* 90(3): 348–355.
- Pereira MA, Rifas-Shiman SL, Kleinman KP, et al. (2007) Predictors of change in physical activity during and after pregnancy: Project Viva. *American Journal of Preventive Medicine* 32(4): 312–319.
- Rhodes RE, Blanchard CM, Benoit C, et al. (2014) Physical activity and sedentary behavior across 12 months in cohort samples of couples without children, expecting their first child, and expecting their second child. *Journal of Behavioral Medicine* 37(3): 533–542.
- Richardson CR, Newton TL, Abraham JJ, et al. (2008) A meta-analysis of pedometer-based walking interventions and weight loss. *Annals of Family Medicine* 6(1): 69–77.
- Rothman AJ, Baldwin AS and Hertel AW (2004) Self-regulation and behavior change: Disentangling behavioral initiation and behavioral maintenance. In: Baumeister RF and Vohs KD (eds) *Handbook of Self-Regulation: Research, Theory, and Applications*. New York: Guilford Press, pp. 574–591.
- Rovniak LS, Anderson ES, Winett RA, et al. (2002) Social cognitive determinants of physical activity in young adults: A prospective structural equation analysis. *Annals of Behavioral Medicine* 24(2): 149–156.
- Ryan RM and Deci EL (2000) Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist* 55(1): 68–78.
- Salmon J, Owen N, Crawford D, et al. (2003) Physical activity and sedentary behavior: A population-based study of barriers, enjoyment and preference. *Health Psychology* 22(2): 178–188.
- Sampselle CM, Seng J, Yeo S, et al. (1999) Physical activity and postpartum well-being. *Journal of Obstetric, Gynecologic, and Neonatal Nursing* 28(1): 41–49.
- Schwarzer R (2008) Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology* 57(1): 1–29.
- Schwarzer R and Luszczynska A (2008) How to overcome health-compromising behaviors: The Health Action Process Approach. *European Psychologist* 13(2): 141–151.
- Sechrist KR, Walker SN and Pender NJ (1987) Development and psychometric evaluation of the exercise benefits/barriers scale. *Research in Nursing & Health* 10(6): 357–365.
- Segar ML and Richardson CR (2014) Prescribing pleasure and meaning: Cultivating walking motivation and maintenance. *American Journal of Preventive Medicine* 47(6): 838–841.
- Shephard RJ (2003) Limits to the measurement of habitual physical activity by questionnaires. *British Journal of Sports Medicine* 37(3): 197–206.
- Silva MN, Markland D, Carracca EV, et al. (2011) Exercise autonomous motivation predicts 3-yr weight loss in women. *Medicine & Science in Sports & Exercise* 43(4): 728–737.
- Sniehotta FF, Scholz U and Schwarzer R (2005) Bridging the intention-behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health* 20(2): 143–160.
- Teixeira PJ, Carracca EV, Markland D, et al. (2012) Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity* 9(1): 78.
- Verhoef MJ and Love EJ (1994) Women and exercise participation: The mixed blessings of motherhood. *Health Care for Women International* 15(4): 297–306.
- Wilcox S, Richter DL, Henderson KA, et al. (2002) Perceptions of physical activity and personal barriers and enablers in African American women. *Ethnicity & Disease* 12(3): 353–362.
- Ziegelmann JP, Lippke S and Schwarzer R (2006) Adoption and maintenance of physical activity: Planning interventions in young, middle-aged, and older adults. *Psychology & Health* 21(2): 145–163.