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As women take on the new role of motherhood, changes in their environment and social dynamics can significantly influence their physical activity levels. These changes can result in postpartum stress and make it challenging for new mothers to initiate and maintain physical activity during this period. The purpose of this study was to identify why some women are more, or less, active by determining what factors could be promoting or inhibiting PA levels during the first year following childbirth. Participants (n = 214; M_{age} = 31.53 years, SD = 3.996) completed a web-based survey assessing physical activity (PA) levels prior to pregnancy and after birth, psychosocial constructs from behavioral theories to understand PA barriers and enablers, and environmental factors that may be promoting or preventing PA. Paired samples t-test indicated significant decreases in self-reported MVPA from pre-pregnancy (M = 38.24, SD = 27.98) to postpartum (M = 24.72, SD = 23.18), with a quarter of the sample (25%) currently reporting no moderate-to-vigorous PA. Though there were no significant relations or differences identified in current MVPA based on demographic or environmental factors, most of the psychosocial variables examined in this study demonstrated positive and significant correlations with MVPA. Results of a hierarchical regression analysis suggested prior MVPA and self-efficacy to engage in physical activity were the strongest predictors of current MVPA, explaining 47.7% of the variance in this sample of postpartum women. Based on open-ended responses, women reported the key factors related to decreased PA during the transition from pre-pregnancy to the postpartum period were barriers such as time or motivation, sleep/fatigue/no energy, and caregiver responsibilities. On the other hand, women reported they were able to be more active if they had accountability/social support, experienced positive mental and physical health factors, and increased motivation and time. Continued research should focus on developing women's self-efficacy for promoting and maintaining higher levels of PA during the prenatal and postpartum period.

ADDRESSING PHYSICAL ACTIVITY BEHAVIOR IN EARLY MOTHERHOOD

by

Stacey Herzog Bender

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Approved by

_____

Dr. Erin Reifsteck
Committee Chair

DEDICATION

This project is dedicated to all the baby mamas out there, and to all the wonderful people (big and small) involved in their lives. Also, to all the future moms who get to look forward to motherhood!

APPROVAL PAGE

This dissertation written by Stacey Herzog Bender has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Chair	Dr. Erin Reifsteck
Committee Members	Dr. Diane Gill
	Dr. Laurie Wideman Gold

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CHAPTER I: PROJECT OVERVIEW

As women take on the new role of motherhood, changes in their environment and social dynamics can significantly influence their physical activity (PA) levels. These changes can result in stress and make it challenging for new mothers to initiate and maintain PA during the postpartum period (i.e., within 12 months of giving birth). Although it may be challenging for postpartum women to initiate and maintain PA levels during this time, PA is a key behavior that can promote health and well-being, including improved psychosocial well-being, less anxiety and depression, improved cardiovascular fitness, and less urinary stress incontinence (Evenson et al., 2009). With PA in young women already below the national guidelines, strategies for increasing PA levels in women of childbearing age before, during, and after pregnancy are needed (Dipietro et al., 2019). The American Congress of Obstetricians and Gynecologists (ACOG) recommends that pregnant women complete 30 minutes or more of moderate-to-vigorous physical activity (MVPA) on most or all days of the week and that these guidelines should be continued into the postpartum period (ACOG, 2015). However, many women are not sufficiently active during pregnancy, and PA levels generally decrease during the postpartum period (Doran & Davis, 2011). Being too busy, bad weather, being sick or having a sick child, and being too tired are predictive of physical inactivity (Albright et al., 2015). Other relevant factors such as race, age, education, and intent to work have been shown to significantly correlate with more time spent in sedentary or light activity (Durham et al., 2011). Although postpartum women face PA barriers such as lack of time, fatigue, or depressive symptoms, exploring how postpartum women have been able to overcome proximal behavior barriers to resume previous levels of PA, or even increase their PA, can lead to more informed PA interventions and programming.

Review of Relevant Literature

While becoming a first-time parent is typically a positive experience, it is also life altering and is associated with higher maternal perceived stress and lower maternal PA after giving birth (Whitaker et al., 2014). Although specific exercise recommendations for women in

the postpartum period still have not been identified, ACOG recommends that pregnant women complete 30 minutes or more of MVPA on most or all days of the week and that this activity be continued into the postpartum period (ACOG, 2015). MVPA requires a moderate to large amount of effort and noticeably accelerates the heart rate or causes rapid breathing with a substantial increase in heart rate; these activities can range from brisk walking to aerobics or competitive games and sports (WHO, 2019). Only about 1 in 5 pregnant women meet this recommendation in the United States, and PA has been shown to continue to decline in the postpartum period (Evenson, 2011). Previous researchers found that women who had a first or subsequent child lost an average of 222 minutes of total PA per week, with a significant decline in MVPA specifically (Hull et al., 2010; Rhodes et al., 2014). General guidelines for postpartum women suggest they should complete 150 minutes per week of activity, like average adults; however, in a study by Evenson et al. (2009), women only reported a median of 90 minutes of MVPA at 3 months postpartum and 96 minutes at 12 months. Currently, there is a lack of clarity in PA recommendations during pregnancy and postpartum, which can lead to inconsistent or inaccurate recommendations from health practitioners to mothers (Evenson et al., 2009). Further, interventions are needed to help mothers overcome various physical, psychological, and social barriers to PA and increase MVPA for overall well-being.

Correlates of Postpartum Physical Activity

PA during and after pregnancy has generally been considered safe and provides many benefits, but women often experience a reduction in PA for a variety of reasons. Common barriers to regular exercise reported by mothers are lack of time due to caregiving, household and work responsibilities, lack of social support, lack of childcare, and poor health (Vernon et al., 2010). Women's beliefs about their lack of free time could be compounded by being tired, not feeling well, or not having childcare, making it hard to target specific beliefs that could have the most behavioral impact (Hales et al., 2010).

The adjustment into motherhood makes it hard for postpartum women to prioritize their own health behavior efforts and adopt a new behavior (e.g., PA) while caring for a newborn. Despite these factors, pregnancy is often called a "teachable moment" to adopt health-promoting

behaviors when these behaviors are perceived to improve the women's and babies' health (Polley et al., 2002). As women begin to take on the role of motherhood, we must find better ways to support them.

Need for Further Research on PA in Postpartum Women

With a substantial rise in obesity for women ages 20-39 (Evenson et al., 2009), the development of PA intervention programs that address sedentary behaviors and PA barriers for pregnant and postpartum women is crucial to prevent chronic disease. Recent research with pregnant and postpartum women has shown that only 35% of women who were active before childbirth maintained the same activity levels into the postpartum period (Snyder et al., 2019). Limited postpartum research has incorporated theoretical frameworks to clearly classify PA determinants, and most research has focused predominantly on identifying barriers to postpartum PA while lacking a broad exploration of PA enablers (Saligheh et al., 2016). Although research has identified some barriers, little research has focused primarily on the most immediate or proximal mediators of PA behavior change for postpartum women.

An Integrated Framework for Promoting PA in Postpartum Women

Several theories have been used to examine PA among postpartum women, including the Self-Determination Theory (SDT), Social Cognitive Theory (SCT), Theory of Planned Behavior (TPB), and the Social Ecological Framework (SEF). Studies applying the SDT, SCT, TPB and SEF are limited (e.g., Cramp & Bray, 2011; Guardino et al., 2018; Hales et al., 2010; LaCheminant et al., 2014; Saligheh et al., 2016; Snyder et al., 2019; Vladutiu et al., 2015), but provide researchers and health practitioners with a starting point to identify strategies to increase PA among this population.

SDT holds that the motivation an individual has can influence the likelihood for engaging in and maintaining certain behaviors like PA (Ryan et al., 2009). SDT outlines two types of motivation which are extrinsic or intrinsic; extrinsic motivation involves engaging in a behavior for an external reward whereas intrinsic motivation involves engaging in the behavior for its own sake, like enjoyment (Snyder et al., 2019). Activities that satisfy certain basic psychological needs (i.e., competence, autonomy, relatedness) will foster higher intrinsic motivation, which in

turn is positively associated with maintaining PA behaviors (Ryan et al., 2009). In a study conducted by Snyder et al. (2019), women were found to be most motivated by extrinsic factors related to fitness and appearance, but intrinsic motivators such as competence and interest in the activity type, regardless of the intensity level, showed a positive association with engaging in PA of any kind. The more enjoyment and value that women can find in PA may help lead to increased PA postpartum.

SCT considers the unique way in which individuals acquire and maintain behavior, while also considering the social environment in which individuals perform the behavior (Bandura, 2004). SCT is centered on self-efficacy, which refers to a person's beliefs about his or her capabilities to perform specific behaviors. Research has identified self-efficacy as a strong correlate of PA adherence in postpartum women, with self-efficacy perceptions demonstrating moderate to strong prospective associations with leisure time PA six-months following childbirth (Cramp & Bray, 2011). Importantly, previous PA behaviors are a strong predictor of self-efficacy and intentions to be active in the future, specifically higher levels of exercise and barrier self-efficacy (Cramp & Bray, 2011).

TPB proposes that intention is the central determinant of a given behavior (Ajzen, 1991). When an individual experiences positive attitudes, subjective norms, and perceived behavioral control, their intention will be higher to perform the behavior in the future (Godin & Kok, 1996). Constructs included in the TPB have been shown to influence or mediate PA levels in both pregnant and postpartum women (Hales et al, 2010). Pregnant women's intention to exercise, along with their self-efficacy for exercise, explained around 20% of the variance in postpartum behavior (Hinton & Olson, 2001). As behavior change is facilitated by feelings of self-efficacy, providing ongoing support to postpartum women can help in maintaining the confidence and skills needed to sustain behavior change (Østbye et al., 2008).

The SEF emphasizes the multidimensionality of health behaviors and the interaction between the factors within and across multiple levels of influence (i.e., intrapersonal, interpersonal, community, organizational, and public policy) (Evenson, 2011). For postpartum women, intrapersonal factors (weight loss, PA self-efficacy), interpersonal factors (partner talk,

emotional support, advice about PA), and community factors (perceived neighborhood safety, perceived availability and use of PA facilities) have been found to facilitate PA behaviors at the 3-month and 12-month postpartum periods (Vladutiu et al., 2015).

Given the challenging transitional period women go through in pregnancy and childbirth, factors such as motivation to initiate physical activity and self-efficacy in women's ability to self-manage their conditions need to be addressed (Polley et al., 2002). To design more effective postpartum PA interventions and programs, aspects of these various frameworks incorporated together will allow for a more complete understanding of what the key predictors are for influencing PA behavior.

Purpose and Aims

The purpose of this study was to identify factors that could be promoting or inhibiting women's PA levels during the first year following childbirth. This study focuses especially on proximal variables pertaining to physical activity behaviors (i.e., previous PA behavior, motivation, intention, self-efficacy, and social support). Identifying factors that may promote maternal PA after birth is critical for developing preventive intervention strategies in this population. Specific project aims included:

Specific Aim 1: Examine changes in physical activity levels from prior to pregnancy to the 4 weeks to 12-month postpartum period.

Specific Aim 2: Determine the extent to which physical, psychosocial, and environmental factors relate to women's physical activity in 4 weeks to 12 months postpartum.

Specific Aim 3: Identify perceived facilitators and barriers to physical activity to inform strategies that promote physical activity in postpartum women.

Methods

A cross-sectional, descriptive survey design was used with mothers in the 4-week to 12-month postpartum period. An online survey was administered via Qualtrics to assess physical, psychosocial, and environmental factors related to PA and the frequency and type of leisure time physical activity. Open-ended questions explored what types of activities postpartum women are

participating in, facilitators and enablers of PA, and the resources needed to be more physically active.

Participants

Approval from the Institutional Review Board from the University of North Carolina at Greensboro was obtained during the summer of 2020. Participants were recruited through posting information about the study (Appendix A) in eight closed, online mother support groups in the central Texas area. Members of the mother support groups are invited into these online private groups via referral from a current member with approval from an administrator, or by requesting approval after answering a short questionnaire. The groups provide online community, resources, and support in a welcoming environment through discussion forums. Participants for this project were mothers who were in the 4-week to 12-month postpartum period. Following birth, many health care professionals prescribe a 30–40-day period of rest and recovery. While some women can resume light activity at 4 weeks, some may not be cleared until 6-12 weeks postpartum due to various reasons surrounding the birth, their health, or the health of their child(ren). The 4 weeks to 12-month postpartum period not only allowed for inclusion of the first activities women are choosing to do and why, but also to examine behaviors before the initial 3-month (12 weeks) postpartum period that is typically studied. To participate in the study, women had to be at least 18 years of age, a member of at least one of the online groups, and not currently pregnant (Appendix B).

Participants included 214 women (M_{age} = 31.53 years, SD = 3.996) who identified predominantly as White (n = 119 White, n = 2 Black/African American, n = 11 Hispanic, n = 7 Asian, n = 8 Multiracial, n = 67 no response/missing). Close to a quarter (23.4%; n = 50) of the women in this sample were of advanced maternal age (age 35 or older). Women across the one month to 12 months postpartum period were represented in the sample with mean of 5.43 months (SD = 3.447) postpartum. About half of the sample (n = 100) were first-time moms (primiparous) and 114 were seasoned moms (multiparous). The majority held at least a bachelor's degree or higher (n = 23 Associate's degree or some college, n = 68 Bachelor's degree, n= 42 Master's degree, n = 14 Doctoral or professional degree, n = 67 no response/missing) and most

participants' household income was between $50K-$300K (*n* = 5 for <$35K, *n* =12 for $35k-$50K, *n* =57 for $50k-100K, *n* = 63 for $100k-300K, *n* = 4 $300k-500k, *n* = 6 prefer not to answer). Additional demographic information is included in Appendix C.

Measures

The survey (Appendix D) was designed to assess relevant constructs from an integrated PA promotion framework based on SDT, SCT, TPB, and SEF to develop an enhanced understanding of PA barriers and enablers in postpartum women. Along with the basic inclusion/exclusion demographic questions (e.g., age, postpartum period, pregnancy), additional questions included number of children, relationship status, employment, and income. Participants were asked about their physical and sociodemographic characteristics, the amount of PA before pregnancy and their current postpartum PA, self-efficacy, intrinsic motivation, PA intentions, social support for PA, and environmental factors affecting PA as outlined below.

Physical and Sociodemographic Characteristics. Physical characteristics included delivery type, number of births, whether the pregnancy was high-risk, exercise clearance, physical limitations, birthing injuries, fertility treatments, weight gain, and whether the participant was breastfeeding or had gestational diabetes. Sociodemographic characteristics including relationship status, race/ethnicity, age, employment status, maternity leave, education level, and household income were collected, which were adapted from Snyder et al. (2019).

The Godin and Shephard Leisure-Time Physical Activity Questionnaire (LTPA). The LTPA Questionnaire was used for assessment of self-reported PA of the participants in a typical week prior to pregnancy and postpartum (Godin, 2011). Previous research has demonstrated Godin to be a valid and reliable measure of self-reported PA based on the relationship between leisure score index and physical fitness indicators, as well as other energy expenditure scores (Amireault & Godin, 2015). Similar retrospective approaches with the Godin and Shephard questionnaire have been used to measure pre- and post-cancer patient PA levels or examine PA levels during past cancer treatments (Courneya & Friedenreich, 1999; Garcia et al., 2017). MVPA was calculated as the main outcome variable to determine PA scores that gave a summary score of only strenuous and moderate activities. Weekly MVPA levels were computed

using the equation: (frequency of strenuous activity/week X 9) + (frequency of moderate activity/week X 5). Higher total scores represent greater participation in PA. A score of 24 or higher was classified as "active" and below 24 was considered "insufficiently active" (Amireault & Godin, 2015). Additional follow-up items were included to further describe PA levels.

Self-Efficacy. Barrier self-efficacy (e.g., feeling tired, lack of time; Marcus & Forsyth, 2009) was assessed through 5 items**.** Four additional items were used to assess task self-efficacy based on physical activity guidelines for completing aerobic and muscle-strengthening activities. Participants answered each item on a 5-point Likert scale of 1 (not at all confident) to 5 (extremely confident). Items were totaled and averaged separately for a barrier self-efficacy score and a task self-efficacy score. The internal consistency of the barrier self-efficacy measure in the current sample was acceptable ($\alpha = .75$). The internal consistency of the task self-efficacy measure in the current sample was good ($\alpha = .84$).

Motivation. Two subscales from the Intrinsic Motivation Inventory (IMI) assessed participants' interest/enjoyment and perceived value/usefulness of physical activity (Ryan et al., 1991). For this study, general PA terminology was used (e.g., *I enjoy doing physical activity*). Responses were rated on a 1-5 scale with 1 being "not at all true" and 5 being "very true" and averaged for each subscale. Both the PA interest/enjoyment scale ($\alpha = .92$) and the PA value/usefulness scale ($\alpha = .89$) demonstrated high internal consistency in the current sample.

Subjective Norms and Intentions. Two items from previous research assessing behaviors and attitudes from the TPB framework (Hales et al., 2010) were asked in a 5-point Likert rating (Not at all true, extremely true) response format to assess subjective norms (i.e., "Most people who are important to me think that I should engage in PA") and intentions to be physically active in the future (i.e., "I intend to engage in regular physical activity during the next 6 months").

Social Support Scale. Participants answered 26 items based on their friend and family support of their physical activity through a 5-point Likert scale rating (none/does not apply to very often) (Sallis et al., 1987). Friend is defined as friends, acquaintances, or coworkers, while family includes members of the household. Scores were obtained by summing ten items under

the “Family Participation” subscale and summing ten items under the “Friend Participation” subscale. The additional items reflecting “Friend Rewards and Punishment” and “Family Rewards and Punishment” were not used in the analysis. Higher scores indicated greater degrees of social support for PA. Both the “Family Participation” ($\alpha = .92$) and “Friend Participation” ($\alpha = .91$) scales demonstrated excellent internal consistency in the current sample.

Perceived Environment & Crime and Safety Index. Participants were asked about the current walkability and accessibility of their residential area under 3 subscales for a better understanding of their environmental considerations. Participants answered 11 items total based on previous scales used in McGinn and Evenson (2005) study, with 2 items through a 5-point Likert scales (e.g., no private facilities in my community, excellent) for private and public facilities, 3 items through 4-point Likert scales (e.g., strongly disagree, strongly agree) for environmental barriers, and 6 items through 4-point Likert scales (e.g., strongly disagree, strongly agree) for crime and safety of their current neighborhood. Higher scores in the first 2-item subscales of private and public facilities and the 6-item crime safety index indicated greater access to facilities and higher feelings of safety in their current neighborhood. Higher scores in the environmental barriers meant difficulty being active in their current environment. All three measures had acceptable internal consistency in the current sample ($\alpha = .74$ to $.77$).

Open-Ended Questions. Open-ended questions were included to further understand specific barriers, facilitators, types of activities completed, and what resources or materials could be beneficial in promoting PA.

Data Analysis

Survey responses were analyzed to provide a general picture of how active mothers are in the 4-week to 12-month postpartum period and how physical, psychosocial, and environmental factors influence their PA. Upon completion of data collection through Qualtrics, the data were downloaded into SPSS for data cleaning, scoring, and analysis. Incomplete or blank survey responses, women who were not in the 4-weeks to 12-months postpartum period, and women who did not complete the LTPA questionnaire were removed from analysis ($n = 175$), resulting in the final sample of 214 participants. Descriptive analyses were completed for the

demographics, current and prior PA levels, and all psychosocial outcome measures. A paired t-test was used to look at pre-pregnancy and postpartum differences in MVPA, along with added context gleaned from open-ended responses, to address Aim 1. Several analyses were conducted to address aim 2. Independent t-tests were used to compare current MVPA levels based on whether the women were breastfeeding, how many live births they have had, and what type of birth they had (vaginal or Cesarean). Correlations were used to look at the relationships among current MVPA levels and psychosocial and environmental factors. A hierarchical regression analysis was then examined to identify the strongest predictors of PA in the early postpartum period. In conjunction with the results from the regression analysis, the open-ended responses provide added insight into which specific modifiable factors can help postpartum women be more active or what is keeping them from being as active as they would like to be to address aim 3. Bootstrapping procedures with 10,000 replications were conducted for statistical analyses with significance determined based on 95% bias-corrected confidence interval. The open-ended questions were grouped into common categories and reported as frequencies. Data were reviewed by a second coder to resolve discrepancies, identify similar answers, and finalize the coding scheme to allow for greater reliability and consistency of the emerging common categories (Creswell, 2014).

Results

The changes in physical activity levels (MVPA prior to pregnancy and postpartum MVPA) are presented first, followed by the physical and demographic variables, psychosocial and environmental variables, and perceived barriers and enablers to postpartum PA.

Changes in Physical Activity Levels

Prior to pregnancy, 12% of participants reported no moderate-to-vigorous physical activity (MVPA) and this doubled to 25% during the postpartum period. When comparing frequencies of prior MVPA and current MVPA, almost 21% (n = 38) of the participants reported some physical activity but classified as insufficiently active prior to pregnancy compared to 31% (n = 66) for current MVPA (see Table 1). Combined, a total of 56% of the participants were currently inactive or insufficiently active during the postpartum period. Notably, results from the

paired samples t-test indicated significant decreases in self-reported units of MVPA from pre-pregnancy to postpartum (M_{diff} = -13.52 (*SD* = 1.80, *BCa 95% CI Lower* = -17.10 and *Upper* = -9.87). Prior MVPA was significantly and positively related to current MVPA (*r* = .566). The results also showed that being more physically active postpartum (*r* = .445) and prior to pregnancy (*r* = .427) was related to greater intentions to be active in the next 6 months.

Table 1. Prior MVPA vs Current MVPA

Prior MVPA	**Percentage**	**N**
No MVPA: 0 units	12.4	23
Insufficiently Active: <24 units	20.5	38
Active: ≥24 units	67.1	124
Current MVPA	**Percentage**	**N**
No MVPA: 0 units	24.8	53
Insufficiently Active: < 24 units	30.8	66
Active: ≥24 units	44.4	95

n = 214 for current MVPA; *n* = 185 for prior MVPA

When reporting types of current strenuous PA, participants most frequently reported running (*n* = 36), high intensity interval training (HIIT; *n* = 18) and cycling (*n* = 17). For current moderate-intensity PA, most women reported walking (*n* = 99), weightlifting (*n* = 32), and dancing (*n* = 8). Mild types of PA reported most frequently included walking (*n* = 105), yoga (*n* = 37), stretching (*n* = 34) and housework/chores/kids (*n* = 18). Additional breakdowns of all types of activities reported pre-pregnancy and postpartum are in Appendix E.

Participants were asked, "When thinking about your physical activity levels prior to pregnancy, compared to now, how has the type/quality of your physical activity changed (activities, timing, setting)?". A total of 176 out of the 214 participants' responses were grouped into common categories (see Table 2), with the most common responses being *Negative Changes/Decreased* (*n* = 63), *Time/Motivation* (*n* = 35) and *New Activities/Routine* (*n* = 31).

Table 2. Prior PA vs Current PA Changes

Category	Frequency
Negative Changes/Decreased	63
Time/Motivation	35
New Activities/Routine	31
Positive Changes/Increased	12
COVID	10
Home/Caregiver responsibilities/Childcare	9
Restrictions/Medical	5
No Change	11
Broad Answers	10

Note: Total responses are greater than the number of respondents as many participants provided multiple responses.

Physical & Demographic Variables

There were no significant correlations between current MVPA and participants' age or number of months postpartum, though greater MVPA participation was associated with lower BMI in postpartum women (*r = -.187, BCa 95% CI Lower = -.297* and *Upper = -.075)*. There were also no significant differences in current MVPA based on breastfeeding status, delivery type, or number of live births (Appendix F). Further, there were no significant differences in MVPA based on participants' income (greater vs. less than $100k) or employment status (employed full-time vs. not employed full-time).

Psychosocial & Environmental Variables

Most of the psychosocial variables examined in this study demonstrated positive and significant correlations with MVPA (see Table 3). Environmental factors were not significantly related to current or prior MVPA (see Table 4). The self-efficacy variables (i.e., barrier & task), the intrinsic motivation variables (i.e., PA enjoyment, value), and the social support from family and friends' variables were entered into a hierarchical regression model predicting current MVPA after controlling for prior MVPA. Prior MVPA and barrier and task self-efficacy were significant predictors of current MVPA (see Table 5). After accounting for prior MVPA (model 1, *Adj* R^2 = .33) and self-efficacy (model 2; *Adj* R^2 = .48), adding the motivation (model 3) and social support (model 4) variables did not significantly increase the amount of variance explained.

Table 3. Correlations among MVPA & Psychosocial Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Current MVPA										
2. Prior MVPA	**.566**									
3. Barrier SE	**.460**	**.351**								
4. Task SE	**.549**	**.375**	**.543**							
5. PA Enjoy	**.353**	.497	**.435**	**.489**						
6. PA Value	**.309**	.371	**.376**	**.518**	**.507**					
7. PA Norms	.123	.159	.116	**.284**	**.222**	**.355**				
8. Future Intentions	**.445**	**.427**	**.429**	**.568**	**.506**	**.663**	.444			
9. Family Part.	**.246**	**.219**	**.260**	**.231**	**.288**	**.239**	.434	**.334**		
10. Friend Part.	**.192**	**.314**	**.276**	**.227**	**.328**	**.273**	.301	**.426**	**.510**	
M	23.76	37.72	2.27	2.94	3.53	4.57	5.66	6.15	27.64	22.36
SD	22.75	28.20	.76	1.09	1.01	.556	1.25	1.07	10.52	9.26
Range	0-122	0-196	1-4.6	1-5	1-5	2.40-5	2-7	2-7	10-50	10-46

Note: Significant values (bold) based on 95% bias-corrected confidence intervals
SE= Self-efficacy, *MVPA*= Moderate-to-Vigorous Physical Activity, *PA*= Physical Activity

Table 4. Correlations among MVPA & Environmental Variables

Variable	1	2	3	4	5
1. MVPA					
2. Prior MVPA	**.566**				
3. Priv_Pub_Access	-.08	.014			
4. Barriers_Access	.052	.056	**-.434**		
5. Crime & Safety	.003	-.047	.355	**-.460**	
M	23.76	37.72	3.93	1.97	3.05
SD	22.75	28.20	.94	.80	.51
Range	0-122	0-196	1-5	.33-4	1-4

Note: Significant values (bold) based on 95% bias-corrected confidence interval

Table 5. Summary of Hierarchical Regression Analysis for Weekly MVPA

	Model 1			**Model 2**			**Model 3**			**Model 4**		
	B	***SE***	***95% CI***	***B***	***SE***	***95% CI***	***B***	***SE***	***95% CI***	***B***	***SE***	***95% CI***
Variable												
Prior MVPA	**.50**	**.07**	**.36 to .64**	**.35**	**.08**	**.19 to .47**	**.38**	**.08**	**.2 to .51**	**.34**	**.08**	**.22 to .52**
Barrier SE				**6.9**	**2.6**	**1.7 to 12.4**	**7.5**	**2.7**	**2.2 to 12.9**	**7.7**	**2.8**	**2.2 to 13.2**
Task SE				**5.6**	**1.8**	**2.0 to 9.2**	**6.7**	**1.9**	**2.9 to 10.4**	**6.6**	**1.8**	**2.8 to 10.2**
PA Enjoy							-1.3	2.0	-5.6 to 2.9	-1.1	2.0	-5.6 to 3.3
PA Value							-4.0	2.7	-9.3 to .79	-3.8	2.5	-9.2 to 1.4
Family Part.										.16	.17	-.18 to .50
Friend Part.										-.25	.20	-.62 to .12
Adj R^2		.33			.48			.48			.48	
F for change in R^2		**75.6**			**21.2**			1.3			1.1	
p-value		.01			.01			.27			.35	

n = 150; Note: Unstandardized estimates are reported. Significant values (bold) based on 95% bias-corrected confidence intervals.

Physical Activity Enablers & Barriers

Participants were asked, "What helps you to be physically active?". For the enablers question, responses from 146 of the 214 participants were grouped into common categories (see Table 6), with the most common responses for fostering increased PA including *Spouse/Family/Friend/Group Support/Accountability* (*n* = 47) and *Mental & Physical Health/Feel good/Body Image/Weight loss* (*n* = 40), and *Time/Motivation* (*n* = 34). Some examples reported by women in this study include:

> A schedule and having my husband/friends keep me accountable.
>
> Encouragement from friends and family, having someone to do physical activities with to help with kids.
>
> I know that exercising makes me feel my best, which makes me be a better mom. I also want to stay in shape, so I encourage myself to keep it up.
>
> Wanting to be healthy for my family and myself. I feel better when physically active.

Table 6. Physical Activity Enablers

Category	Frequency
Spouse/Family/Friend/Group Support/ Accountability	47
Mental & Physical Health/Feel good/Body Image/Weight loss	40
Time/Motivation	34
Planning/Schedule/Routine	19
Work/Responsibilities/Childcare	10
Weather	8
Equipment	8
Goals	6
Kids	6
Experience	5
No Response/None/Blank	68

Note: Total responses are greater than the number of respondents as many participants provided multiple responses.

Results for the barrier question asking, "What keeps you from being physically active, or as active as you would like to be?" were based on 150 of the 214 participants whose answers were grouped into common categories (see Table 7). The most common responses for hindering PA levels were *Time/Motivation* (*n* = 58), *Kids/Childcare* (*n* = 51), and *Tired/Exhausted/Sleep/Fatigue* (*n* = 46). Common answers included:

> "Feeling like I don't have time or can't take time. My kids aren't good nappers so I don't really have time when they're napping. I've had good intentions of working out in the early morning before they wake up but then I end up sleeping too."

> "Time management with my infant. Having a different work schedule than my family and friends. Lack of self-discipline and self-motivation. Lack of sleep from my infants sleep schedule."

> "Time, energy. Working full time and taking care of the household doesn't leave a lot of me time. Also, when I have that me time I don't immediately jump to physical activity. Most of the time I would prefer to take a nap. Also, there are certain activities I don't enjoy like running or working out at a gym."

Notably, time and motivation were frequently reported as both enablers and barriers to current physical activity levels. Some individuals noted aspects like "Having the time, energy,

and motivation" helped to enable them in engaging PA while also stating barrier responses like "I make up excuses or I am too tired and choose to relax because I earned it. Or I'll choose to take a nap instead."

Table 7. Physical Activity Barriers

Category	Frequency
Time /Motivation	58
Kids/Childcare	51
Tired/Exhausted/Sleep/Fatigue	46
Schedule/Routine	20
Weather	19
Work/School	18
Covid	12
Injury/Illness	7
Guilt	2
No Response/None/Blank	64

Note: Total responses are greater than the number of respondents as many participants provided multiple responses.

Discussion

The purpose of this study was to examine physical activity behaviors and correlates in postpartum women. Previous research has shown about 26% of non-pregnant women achieve the minimum recommendation of 150 minutes of moderate intensity PA per week (Evenson et al., 2004), whereas less than 15% of women achieve the minimum recommendations during pregnancy, about one third of pregnant women do not engage in any PA (Rand et al., 2020), and 57% reported rarely or never exercising one year postpartum in a study consisting of primarily white women by Olson et al. (2003). Findings from the current study align with previous research and suggest that physical activity levels generally tend to decrease in the postpartum period as compared to pre-pregnancy (Albright et al., 2015; Cramp & Bray, 2010; Evenson et al., 2012; Evenson et al., 2013; Guardino et al., 2018; Saligheh et al., 2016; Snyder et al., 2019; Vladutiu et al., 2015). Declines in PA may have important health consequences for women like excessive weight gain and retention (Evenson, 2011), while a return to PA after pregnancy is associated with positive health benefits like less anxiety and depression, improved cardiovascular fitness, and improved social well-being (Evenson et al., 2009). In the current sample, postpartum women who were more active also had lower overall BMI, suggesting that increasing activity

during this lifespan period has implications for long term health, since higher BMI correlates with myriad of health problems (Field et al., 2001; Hurt et al., 2010; Renehan et al., 2008).

The dictum that "past behavior is the best predictor of future behavior" is supported by empirical evidence and suggests a strong correlation between past and future behaviors (Ajzen, 2011). Women who maintain or increase their sport and exercise from pre-pregnancy through to the postpartum period experience better well-being compared to women who do not (Saligheh et al., 2016). Consistent with previous research (Pereira et al., 2007), insufficient activity prior to pregnancy, and during pregnancy, was a strong predictor of postpartum PA levels. This is an important finding as it suggests public health efforts should concentrate on promoting PA even before pregnancy in addition to helping women transition into safe and appropriate activities after childbirth. Pregnancy offers an ideal opportunity for women to learn about guidelines and resources for engaging in safe physical activity. Health care providers should capitalize on the opportunity to address physical activity behaviors during this critical window in the maternal health trajectory given that providers have the most frequent interactions with female patients during the 6-week to 9-months gestation period.

Higher self-efficacy to engage in PA and overcome barriers to PA participation were associated with higher levels of MVPA in the current sample. Self-efficacy has consistently been identified as a strong correlate of physical activity adherence, with other research also showing that higher self-efficacy perceptions have moderate to strong prospective associations with leisure-time PA in the postpartum period (Cramp & Bray, 2011). As self-efficacy seems to be a key factor in PA levels for postpartum women, understanding and promoting women's beliefs about their abilities to participate in PA and engage in self-regulatory skills to overcome various barriers of motherhood is important. For those initiating exercise, several forms of self-efficacy, such as barrier efficacy and scheduling efficacy, appear to be necessary to help motivate participation (DuCharme & Brawley, 1995). Other strategies that can be used in future interventions or program development to help increase self-efficacy could include greater education efforts by healthcare providers and breastfeeding advocates, support for mothers on how to be more active (i.e., lifestyle activities) while emphasizing benefits of physical activity, and group-based interventions to encourage adherence and commitment to learning behavior

change skills (Cramp & Bray, 2011; Snyder et al., 2019). Future research and program strategies should consider providing resources and demonstrations/examples of safe exercise and activities for women at all three stages of motherhood (before pregnancy, during pregnancy, and after childbirth).

Though not as highly correlated with current PA, as prior PA and self-efficacy were, social support of family or friends who positively reinforced the women's PA participation and who engaged in PA with them were individually correlated with higher MVPA levels and frequently reported as an enabler of PA in women's open-ended responses. Similarly, Evenson et al. (2009) found that partner support was viewed as a common enabler of physical activity as early as three months postpartum. As having some type of support or accountability was most frequently mentioned to help enable physical activity, future research and interventions should concentrate on providing women with the opportunity to have more accountability and group settings that provide ample encouragement. Practical support such as help with childcare and other responsibilities, as well as affirmation of the importance for taking time away from responsibilities to be active, are important for facilitating women's physical activity in the postpartum period (Evenson et al., 2009). Future research and intervention strategies should consider offering group settings that can provide childcare or "Mommy and Me" type classes that are kid friendly to help combat these barriers. Researchers should also consider helping mothers to engage in more positive self-regulatory skills to overcome various barriers of motherhood when they feel they will be less motivated, too fatigued, or have their schedule thrown off due to teething, sleep regressions, other childhood development milestones, or even weather changes. Also consistent with Evenson et al. (2009), environmental barriers were cited less often than intra- and interpersonal barriers, and many of the women is this study also reported time, fatigue, childcare, and schedule issues as barriers to being physically active. Future research that explores how environmental factors such as access and proximity to community centers or parks and policies related to childcare and work can interact with postpartum women's intra- and interpersonal barriers or enablers is needed (Evenson et al., 2009).

Limitations and Recommendations

While other studies have used similar self-reported measures and recall for physical activity levels (Albright et al., 2015; Evenson et al., 2009; Evenson et al., 2012; Snyder et al., 2019; Vladutiu et al., 2019), there is always the possibility of bias in reporting current or prior physical activity levels. Bias in self-report data is common, with issues of recall errors or social desirability (Cramp & Bray, 2011). Additionally, the participants in this sample were mostly white, married, educated, and reported higher incomes, which limits generalizability to all postpartum women. The participants were also recruited from motherhood support groups on social media and may have access to more social support networks than other women. Finally, data gathered for this study were cross sectional and only assessed women's PA level at one point in their postpartum period; gathering more information at multiple time points during the postpartum period would be beneficial to understand how aspects change over time (breastfeeding, sleep regressions, returning to work, etc.) and may help illuminate the need to target different support strategies based on different time periods postpartum. The distributions of MVPA prior to pregnancy and postpartum suggests there are potentially some women who were not active prior to pregnancy and still not active postpartum, some who were already active prior to pregnancy and still active postpartum, and some who were active prior to pregnancy but were not active in the postpartum period. These different groups of women may require different intervention strategies to promote their PA during the postpartum period based on whether they would be maintaining behavior or adopting a new behavior, which should be explored further in future research. It should also be noted that the study took place during the COVID-19 pandemic, so PA levels and enablers and barriers should be considered within this context.

Future research should include more emphasis on which time periods following birth might have the greatest impact on PA, self-efficacy, and social support. Tools and specific interventions to help manage the enablers and barriers of PA and promote social support are needed and should be implemented and evaluated to determine if they can improve not only PA levels, but also the mental and emotional well-being of mothers. This would include things like providing tailored exercise prescription with PA modifications for early postpartum time periods

and for specific birth injuries, a social support system and accountability measures, and resources to help with mental health or postpartum depression.

Conclusion

The transition into motherhood is a complex issue with certain stressors that make it challenging for new mothers to initiate and maintain a physically active lifestyle. Although a relatively small and homogeneous group, data from the current study with postpartum women strongly suggest that women who are active during the pre-pregnancy period are more likely to be active in the postpartum period, highlighting the importance of establishing positive, healthy physical activity patterns prior to pregnancy. Those who were more physically active in the postpartum period were more likely to have higher self-efficacy, motivation, and family and friends to support them in their PA. As this study shows that prior MVPA and self-efficacy seem to be the biggest drivers of current MVPA in postpartum women, greater education specifically emphasizing the importance of PA for women throughout the reproductive years and to encourage confidence in women's ability to complete PA safely should be a focus of healthcare providers and allied health professionals who work with women. Future interventions should also focus on increasing postpartum women's involvement in other modes of PA, encourage health professionals and /or family and friends to provide encouragement to women about PA, and improve social support systems (Vladutiu et al., 2019). Postpartum women need more support and resources to help them stay active as moms, but also to help facilitate the transition of becoming active during and after pregnancy. Having more detailed PA guidelines and online resources could help in bridging these important life transitions for women.

CHAPTER II: DISSEMINATION

For immediate dissemination, a summary of the results with recommendations will be reported to the online communities that the survey was sent to. The summary of results will also be sent to the women who provided their email at the end of the survey. These participants will be the first to receive access to the dissemination through an emailed link that also includes the suggestion to forward to any other mothers or friends who might be interested in or impacted by the results. This provides a unique opportunity to get this information out to current pregnant mothers, mothers in the postpartum period, or women intending to get pregnant with their first or subsequent child as starting PA before and during pregnancy can greatly improve the intentions of continuing PA into the postpartum period.

Findings will be disseminated through an online brochure format created in Canva to highlight the main findings from the survey, three safe exercises to perform at any time pre- or post-natal, an "advice corner", general takeaways, recommendations based off the survey, and some local and global resources for postpartum women (See Appendix F). Additional benefits to using the online brochure format through Canva include being easily accessible in an online format, but also easily printable if OB/GYN and pre- and post-natal offices and advocates would like to showcase the brochure in their workspace. Women can easily click on the link to read through the brochure as it relates to them currently, or in the near future.

The first page first panel asks, "Is it safe to exercise after giving birth?". Directly under the question, the panel states that it is safe to exercise after giving birth and gaining clearance from the doctor to continue exercise regimens. The next panel briefly describes who completed the survey and what the postpartum survey entailed. The panel also briefly describes some of the main findings from the survey results. The third, and last, panel on the first page has more detailed findings from the survey and breaks down the percentages of women in the survey who were not active, insufficiently active, and sufficiently active prior to pregnancy and in the postpartum stage. The panel also lists the top three physical activity enablers (e.g., social support/ accountability, mental and physical health benefits, and time and motivation) and

barriers (e.g., tired/fatigued, kids/childcare, and time and motivation) reported in the open-ended responses from the study.

The participants of this study were asked, "What types of resources or materials would help you to be more physically active?". For this question, responses from 131 of the 214 participants were grouped into common categories (see Table 9), with the most common responses for resources to help with PA including *Childcare/Kid Friendly/More Help* (n = 27), *Workout Equipment/Clothes/Gear/Facilities* (n = 20), and *Specific Postpartum Activity Resources* (n = 16). Notably, *Workout Videos/Apps/Classes/Subscriptions/Memberships* and *General PA/Exercise Information* were mentioned too. The data from this question show that postpartum women desire to have more information and resources in general. When considering the four most commonly reported categories after wanting childcare or help with their children, these women believe that having better access to physical activity and exercise information and platforms could help them to be more active. For these reasons, I included a few safe exercises and more resources for the women to find other safe and specific exercises, or contacts to some businesses that could help facilitate safe PA.

Table 8. Physical Activity Resources

Category	**Frequency**
Childcare/Kid Friendly/More Help	27
Workout Equipment/Clothes/Gear/Facilities	20
Specific Postpartum Activity Resources	16
Workout Videos/Apps/Classes/Subscriptions/Memberships	13
General PA/Exercise Information	12
Friends/Support/Encouragement/Community	11
Time/Schedule	10
COVID	8
Motivation	3
Social Media	1
No Response/None/No Interest	27

Note: Total responses are greater than the number of respondents as many participants provided multiple responses.

The second page first panel has three safe exercises that can be completed prior to, or after pregnancy. The three exercises include pictures and descriptions for reference. The three exercises included are glute bridges, “bird dog”, and toe taps. The middle panel on page two has sections that include the “advice corner” and “takeaways”. The “advice corner” provides the following quotes from study participants to help promote physical activity and positive affirmations:

> Any activity is worth it - even a slow walk. You don’t have to run a marathon to benefit.
>
> Just do your best! Try to find the time even if it’s only 10 minutes and do what makes you happy.
>
> It’s absolutely okay to not be the IG mom that is back to pre-preggo clothes and activity immediately after giving birth. It’s okay to give yourself grace!

The “takeaways” section includes the following:

> Try to stay just as active before pregnancy, during, and after.
>
> Don't be afraid to ask your OB, Physician, or any health professionals for postpartum resources or tips.
>
> Find an activity buddy or a good social support system to help keep you active and accountable!

The last panel on the second page includes some recommendations on how to help increase self-efficacy, given that self-efficacy was a key correlate of postpartum PA in the study. The recommendations section provides the following on helping to increase self-efficacy:

> Goal setting is crucial! Set manageable goals to get you started (e.g., walking 3x per week with your baby). Work up to the bigger goals.
>
> Look at the bigger picture of what you want to accomplish (e.g., confidence, weight loss, strength, enjoyment).

Celebrate your accomplishments big and small, and remember healing takes time. Use positive self-talk, don't criticize yourself!

Identify your obstacles, and plan how to overcome them (e.g., tired, fussy baby, teething, childcare/support).

The last panel also includes resources like ACOG's women's health resources, a local pelvic floor specialist, an Austin, Texas area OB/GYN group, "11 Postpartum Fitness Tips for New Moms" from the What to Expect website, and my contact information.

CHAPTER III: ACTION PLAN

There is significant potential for this project to contribute to addressing physical activity related behaviors in postpartum women. The findings from this project provide further scientific evidence that the transition to motherhood represents an unprecedented challenge for most women related to self-care. Determining what motivates and facilitates women in the 4 weeks to 6-month period, and understanding what women are doing to achieve the physical activity guidelines or their personal physical activity goals, could contribute information to provide more targeted intervention strategies for future studies.

Short-Term Plans

These results strongly suggest that establishing physical activity patterns prior to pregnancy is paramount for improving physical activity in the postpartum period. Women need more resources available to them to help increase self-efficacy and provide a variety of safe ways to be physically active. My first steps will be to disseminate the project findings to postpartum women and local women's health providers via an online brochure created on Canva, as described in Chapter II. Results can also be disseminated to any OB/GYN offices, breastfeeding classes, or any other healthcare providers working with women before, during, and after pregnancy that would like to display the brochure in print in their offices. Secondly, I will attempt to target professional associations and conferences like Postpartum Support International and the National Perinatal Association to further disseminate my findings and recommendations of this study. I also plan to submit a manuscript for potential publication in a relevant scholarly journal such as *Journal of Women's Health, Women's Health Issues*, *Psychology of Sport and Exercise, Journal of Physical Activity and Health, Women & Health, Women in Sport and Physical Activity Journal,* or *Maternal and Child Health Journal*.

Long-Term Plans

Future research and intervention or program strategies could focus on increasing PA through appropriate PA education and provide an emphasis on building self-efficacy, social support, and accountability. Other implications from the results of surveying postpartum women could contribute to the limited information about postpartum physical activity. Additionally, this information could be used to inform other educational programs for postpartum women and could be used in conjunction with existing educational classes for pregnant women like birthing or breastfeeding classes.

My long-term goals are to continue to advocate for health-enhancing physical activity in postpartum women and potentially pursue further research with and interventions for the postpartum population, with an emphasis on social behavioral aspects of physical activity promotion. Additionally, I hope to work with local physical therapy clinics and universities to promote activity classes for prenatal and postpartum women, while also providing a means of social support and community.

Additionally, in an effort to continue to improve the life-long health and physical activity levels during all periods of motherhood, I would also like to extend my scholarship on the knowledge of the physical activity levels and behaviors of prenatal women by conducting additional longitudinal studies on both prenatal and postpartum populations. In the future, I hope that this line of research could inform the development of tailored resources through an online format or mobile app that assists prenatal and postpartum women with free access to exercise regimens, mental health resources, accountability challenges, and a strong social support group.

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APPENDIX A: FACEBOOK RECRUITMENT MESSAGE

I am currently a mom of 2 boys and working on my doctorate at UNC Greensboro. Please help me learn more about the physical activity levels and behaviors of postpartum women by completing ~25-minute research survey. It is a dream of mine to help fellow moms and learn more about our bodies and minds as we enter the postpartum stage! You can participate if you are 18 years or older, not currently pregnant, and are at least 4-weeks to 12-months out from delivery. Please share with other mom friends in the group who may qualify! Questions? Email: XXXX

Survey Link: XXXX

APPENDIX B: CONSENT FORM

Consent to Act as a Human Participant

Project Title: Addressing Physical Activity Behaviors in Early Motherhood

Principal Investigator: Stacey Bender

Faculty Advisors: Erin Reifsteck, Diane Gill, and Laurie Wideman Gold

What are some general things you should know about research studies?

You are being asked to take part in a research study. Your participation in the study is voluntary. You may choose not to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. There may not be any direct benefit to you for being in the research study. There also may be risks to being in research studies. If you choose not to be in the study or leave the study before it is done, it will not affect your relationship with the researcher or the University of North Carolina at Greensboro.
Details about this study are discussed in this consent form. It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given a copy of this consent form. If you have any questions about this study at any time, you should ask the researchers named in this consent form. Their contact information is below.

What is the study about?

This is a research project. Your participation is voluntary. The goal of this research project is to enhance the understanding of physical activity levels and behaviors of postpartum women.

Why are you asking me?

You are being asked to participate in this survey because you are a mother in the 4-weeks to 12-months postpartum stage and a current member of MISA, Central Texas Moms, Austin Area Moms, and/or Moms Helping Moms.

What will you ask me to do if I agree to be in the study?

If you agree to participate you will be asked to complete the survey which will take approximately 20 minutes. You will be asked questions about your physical activity levels prior to pregnancy and postpartum. You will also be asked to complete questions related to your

current physical activity behaviors, and basic demographic information. There will be a few open-ended questions that are designed for you to offer insight into your previous and current physical activity levels.

What are the risks to me?
The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants.

If you have questions, want more information or have suggestions, please contact Stacey Bender (shbender@uncg.edu) and/or Erin Reifsteck (ejreifst@uncg.edu) who may be reached via email.

If you have any concerns about your rights, how you are being treated, concerns or complaints about this project or benefits or risks associated with being in this study please contact the Office of Research Integrity at UNCG toll-free at (855)-251-2351.

Are there any benefits to society as a result of me taking part in this research?
By participating in this research study, you may indirectly contribute to improved understandings related to the physical activity behaviors of postpartum women.

Are there any benefits to *me* for taking part in this research study?
By participating in this research study, you can elect to receive a summary report of the study's findings related to the physical activity behaviors of postpartum women.

Will I get paid for being in the study? Will it cost me anything?
There are no costs to you, or payments made for participating in this study.

How will you keep my information confidential?
All of the answers you provide in this survey will be anonymous. The survey will not ask your name, email address, or any other identifiable information. All information obtained in this study is strictly confidential unless disclosure is required by law. Data collected from online questionnaires will use Qualtrics, which is a secure online survey collection and storage program. It will also be stored in a protected folder in a secure file-sharing program called Box and will only be accessible by the research team. The data collected from the survey will be kept indefinitely. Absolute confidentiality of data provided through the Internet cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

Will my de-identified data be used in future studies?
All of our participants' de-identified data will be kept indefinitely and may be posted to an on-line repository so other scientists can analyze the data and check our results. Your de-identified data will be kept indefinitely and may be used for future research without your additional consent.

What if I want to leave the study?
You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state. The investigators also have the right to stop your participation at any time. This could be because you have had an unexpected reaction, or have failed to follow instructions, or because the entire study has been stopped.

What about new information/changes in the study?
If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Voluntary Consent by Participant:
By beginning this online survey, you are agreeing that you read, or it has been read to you, and you fully understand the contents of this document and are openly willing consent to take part in this study. All of your questions concerning this study have been answered. You are agreeing that you are 18 years of age or older and are openly providing your consent to take part in this study.

APPENDIX C: OTHER BIOLOGICAL/DEMOGRAPHIC ASPECTS

Other Physical/Demographic Aspects:

Characteristic	Percent
Doctor Clearance	
Yes (*n* = 189)	89.6
No (*n* = 22)	10.4
Maternity Leave	
Yes (*n* = 160)	74.8
No (*n* = 54)	25.2
Maternity Leave Paid	
Yes (*n* = 85)	53.1
No (*n* = 75)	46.9
Gestational Diabetes	
Yes (*n* = 17)	7.9
No (*n* = 197)	92.1
Yes (*n* = 17)	7.9
No (*n* = 197)	92.1
High-Risk	
Yes (*n* = 47)	22
No (*n* = 167)	78
Fertility Treatment	
Yes (*n* = 20)	9.3
No (*n* = 194)	90.7
Employment	
Full-time (*n* = 58)	27.1
Not employed full-time (*n* = 81)	37.9
Income	
Less than $100k (*n* = 74)	52.5
More than $100k (*n* = 67)	47.5

Characteristic	Mean
BMI	27.21
Weight Gain	32.04 lbs

APPENDIX D: SURVEY QUESTIONS

Are you at least 18 years of age?

- ○ Yes
- ○ No

What is your current age?

_____

Are you currently 4-weeks to 12-months postpartum?

- ○ Yes
- ○ No

How many weeks OR months postpartum are you (e.g. 4 months, 0 weeks or 6 weeks, 0 months)?

Weeks	▼ 0 ... 12
Months	▼ 0 ... 12

Have you been cleared for all levels of activity from your doctor?

- ○ Yes
- ○ No (Please explain) _____

Are you currently pregnant?

- ○ Yes
- ○ No

What number of live birth/s is this current infant for you?

▼ 1 … 5+

What was the gestational age (in weeks) of your current infant?

_____

Were you diagnosed with gestational diabetes?

- ○ Yes
- ○ No

Was your pregnancy considered high-risk?

- ○ Yes
- ○ No

Do you currently suffer from any limitations that could affect your levels of physical activity?

- ○ Yes
- ○ No

If yes, please explain.

_____

Was your delivery:

- ○ Vaginal
- ○ Cesarean (C-Section)
- ○ Other _____

Did you have a/an:

- ○ All-natural birth
- ○ Epidural
- ○ Optional Cesarean (C-Section)
- ○ Forced Cesarean (C-Section)
- ○ Other _____

Are you:

- ○ Currently breastfeeding
- ○ Stopped breastfeeding
- ○ Never breastfed

If you stopped breastfeeding, how long did you breastfeed?

_____

Did you receive any fertility treatments?

- ○ Yes
- ○ No

Have you incurred any birthing or postpartum injuries or ailments that currently limit your physical activity?

- ○ Yes
- ○ No

If yes, please explain.

_____

_____

What is your current height?

Feet	▼ 0 ... 11
Inches	▼ 0 ... 11

What is your current weight (in pounds), to the best of your knowledge?

_____

How much weight (in pounds) did you gain with this pregnancy?

_____

To the best of your recollection, how much did you weigh (in pounds) prior to pregnancy?

_____

Did you take maternity leave?

- ○ Yes
- ○ No

If yes, please specify in weeks or months how long you were on leave.

_____

If yes, was it paid?

- ○ Yes
- ○ No

Do you have access to childcare when needed?

- ○ Yes
- ○ No

Is your infant currently in childcare?

- ○ Yes
- ○ No

When thinking about your **CURRENT** levels of physical activity:

	Not at all active	Slightly active	Moderately Active	Very active	Extremely active
How would you describe your current physical activity levels?	○	○	○	○	○

During a typical 7-day period (one week), indicate on average how many times you CURRENTLY participate in strenuous exercise for MORE THAN 15 MINUTES.

Strenuous Exercise: Heart Beats Rapidly (e.g., running, jogging, soccer, basketball, racquetball, pickleball, vigorous swimming, vigorous long-distance bicycling, aerobics, Zumba, calisthenics, jumping rope, vigorous hiking, tennis singles)
# of times per week:

_____

When you are being physically active, what types of strenuous activities are you doing?

_____

During a typical 7-day period (one week), indicate on average how many times do you CURRENTLY participate in moderate exercise for MORE THAN 15 MINUTES.

Moderate Exercise: Not Exhausting (e.g., fast walking, weightlifting, baseball/softball, tennis doubles, easy bicycling, volleyball, badminton, easy swimming/recreational swimming, Tai Chi, popular and folk dancing)
# of times per week:

_____

When you are being physically active, what types of moderate activities are you doing?

_____

During a typical 7-day period (one week), indicate on average how many times you CURRENTLY participate in mild exercise for MORE THAN 15 MINUTES.

Mild Exercise: Minimal Effort (e.g., yoga or mild stretching, archery, fishing, bowling, horseshoeing, golf without use of a cart, easy walking, croquet, billiards)
# of times per week:

_____

When you are being physically active, what types of mild activities are you doing?

_____

When thinking about your physical activity **PRIOR TO PREGNANCY**:

	Not at all active	Slightly active	Moderately Active	Very active	Extremely active
How would you describe your previous physical activity levels prior to pregnancy?	○	○	○	○	○

PRIOR TO PREGNANCY, during a typical 7-day period (one week), indicate on average how many times you participated in strenuous exercise for MORE THAN 15 MINUTES.

Strenuous Exercise: Heart Beats Rapidly (e.g., running, jogging, soccer, basketball, racquetball, pickleball, vigorous swimming, vigorous long-distance bicycling, aerobics, Zumba, calisthenics, jumping rope, vigorous hiking, tennis singles).
# of times per week:

_____

When you were being physically active **PRIOR TO PREGNANCY**, what types of strenuous activities were you doing?

_____

PRIOR TO PREGNANCY, during a typical 7-day period (one week), indicate on average how many times you participated in moderate exercise for MORE THAN 15 MINUTES.

Moderate Exercise: Not Exhausting (e.g., fast walking, weightlifting, baseball/softball, tennis doubles, easy bicycling, volleyball, badminton, easy swimming/recreational swimming, Tai Chi, popular and folk dancing).
# of times per week:

_____

When you were being physically active **PRIOR TO PREGNANCY**, what types of moderate activities were you doing?

_____

PRIOR TO PREGNANCY, during a typical 7-day period (one week), indicate on average how many times you participated in mild exercise for MORE THAN 15 MINUTES.

Mild Exercise: Minimal Effort (e.g., yoga or mild stretching, archery, fishing, bowling, horseshoeing, golf without use of a cart, easy walking, croquet, billiards).
# of times per week:

_____

When you were being physically active PRIOR TO PREGNANCY, what types of mild activities were you doing?

_____

When thinking about your physical activity levels prior to pregnancy, compared to now:

	Extremely decreased	Slightly decreased	Remained about the same	Slightly Increased	Extremely Increased
How would you describe your current physical activity levels compared to before pregnancy?	○	○	○	○	○

How has the type/quality of your physical activity changed (activities, timing, setting)?

_____

Please explain why your physical activity might or might not have changed.

_____

Would you describe where you live as:

- ○ Rural
- ○ Suburban
- ○ Urban

The next question is about facilities that may be available to you in your community. Please think of your community as the area within a 20-minute drive from your home.

*Private recreational facilities are places to be physically active, which you must join or pay a fee to use. Examples of private facilities include YMCA's, health clubs or gyms, martial arts studios, dance studios, or yoga studios.

	There are no private facilities in my community	Poor	Fair	Good	Excellent
Would you say that the availability of private recreational facilities in your community was…	○	○	○	○	○

The next question is about the public recreational facilities in your community or public places where people can walk to get exercise that are free and open to the public but are not located in public schools.

*Examples of public facilities are playgrounds, public pools, or community centers.

	There are no public recreational facilities in my community	Poor	Fair	Good	Excellent
Would you say that the availability of public recreational facilities in your community was ...	○	○	○	○	○

*Please indicate whether any of the following barriers keep you from any outdoor physical activities, such as walking, biking, or gardening in your neighborhood. Again, think of your

neighborhood as the area within about a 20-minute walk or one mile from your home as you think about your answers to these questions.

	Strongly Disagree	Disagree	Agree	Strongly Agree
No sidewalks or poorly maintained sidewalks are a problem in my neighborhood.	○	○	○	○
Lack of walking, jogging, or biking trails is a problem in my neighborhood.	○	○	○	○
Lack of parks or playgrounds is a problem in my neighborhood.	○	○	○	○

How strongly do you agree or disagree with the following statements when thinking about the environment of your current residence.

	Strongly Disagree	Disagree	Agree	Strongly Agree
My neighborhood streets are well lit.	○	○	○	○
Walkers and bikers on the street in my neighborhood can be easily seen by people in their homes.	○	○	○	○
I see and speak to other people when I am walking in my neighborhood.	○	○	○	○
There is a high crime rate in my neighborhood.	○	○	○	○
The crime rate in my neighborhood makes it unsafe to go on walks during the day.	○	○	○	○
The crime rate in my neighborhood makes it unsafe to go on walks at night.	○	○	○	○

Physical activity or exercise includes activities such as walking briskly, jogging, bicycling, swimming, or any other activity in which the exertion is at least as intense as these activities. Choose the option that indicates how confident you are that you could be physically active in each of the following situations:

	Not at all confident	Slightly confident	Moderately confident	Very confident	Extremely confident
When I am tired	○	○	○	○	○
When I am in a bad mood	○	○	○	○	○
When I feel I don't have time	○	○	○	○	○
When I am on vacation	○	○	○	○	○
When it is raining	○	○	○	○	○

Physical activity or exercise includes activities such as walking briskly, jogging, bicycling, swimming, or any other activity in which the exertion is at least as intense as these activities.

Choose the option that indicates how confident you are that you could be physically active in each of the following situations:

	Not at all confident	Slightly confident	Moderately confident	Very confident	Extremely confident
I can be active at least 150 (5x30) minutes every week.	○	○	○	○	○
I know what types of aerobic activity I could complete 3-5 days per week.	○	○	○	○	○
I can complete at least 2 days of muscle-strengthening activities per week.	○	○	○	○	○
I know what types of muscle-strengthening activities I could complete at least 2 days per week.	○	○	○	○	○

When thinking about physical activity, how true are the following statements:

	Not at all true	Slightly true	Somewhat true	Very True	Extremely True
I enjoy participating in physical activity very much	○	○	○	○	○
I think physical activity is fun to do	○	○	○	○	○
Physical activity does not hold my attention at all	○	○	○	○	○
While I'm working out or participating in physical activity, I think about how much I enjoy it	○	○	○	○	○
I think physical activity is boring	○	○	○	○	○

When thinking about physical activity, how true are the following statements:

	Not at all true	Slightly true	Somewhat true	Very True	Extremely True
I believe that participating in physical activity is useful for health	○	○	○	○	○
I believe physical activity is an important activity because it can improve my health	○	○	○	○	○
I believe doing physical activity could be beneficial to me	○	○	○	○	○
I will continue participating in physical activity because it has some value to me	○	○	○	○	○
I think physical activity is important	○	○	○	○	○

Choose the answer that best describes how you feel about physical activity:

	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Most people who are important to me think that I should engage in physical activity.	○	○	○	○	○	○	○
I intend to engage in regular physical activity during the next 6 months.	○	○	○	○	○	○	○

The following questions refer to social support for your physical activity.

Below is a list of things people might do or say to someone who is trying to do physical activity regularly. Please read and answer every question. If you are not physically active, then some of the questions may not apply to you. In that case, please choose "Does not apply". When thinking about your friend support (friends is defined as “friends, acquaintances, or coworkers.”) with your physical activity, please rate how often your friends have said or done what is described during the last 3 months.

	None	Rarely	A few times	Often	Very often	Does not apply
Did physical activities with me.	○	○	○	○	○	○
Offered to do physical activities with me.	○	○	○	○	○	○
Gave me helpful reminders to be physically active, i.e. "Are you going to do your activity tonight?"	○	○	○	○	○	○
Gave me encouragement to stick with my activity program.	○	○	○	○	○	○
Changed their schedule so we could do physical activities together.	○	○	○	○	○	○
Discussed physical activity with me	○	○	○	○	○	○
Complained about the time I spend doing physical activity	○	○	○	○	○	○

Criticized me or made fun of me for doing physical activities	○	○	○	○	○	○
Gave me rewards for being physically active, such as bought or gave me something I like	○	○	○	○	○	○
Planned for physical activities on recreation outings	○	○	○	○	○	○
Helped plan events around my physical activities	○	○	○	○	○	○
Asked me for ideas on how they can be more physically active	○	○	○	○	○	○
Talked about how much they like to do physical activity	○	○	○	○	○	○

The following questions refer to social support for your physical activity.

Below is a list of things people might do or say to someone who is trying to do physical activity regularly. Please read and answer every question. If you are not physically active, then some of the questions may not apply to you. In that case, please choose "Does not apply". When thinking about your family support (family is defined as anyone living in your household) with your physical activity, please rate how often your family has said or done what is described during the last 3 months.

	None	Rarely	A few times	Often	Very often	Does not apply
Did physical activities with me.	○	○	○	○	○	○
Offered to do physical activities with me.	○	○	○	○	○	○
Gave me helpful reminders to be physically active, i.e. "Are you going to do your activity tonight?"	○	○	○	○	○	○
Gave me encouragement to stick with my activity program.	○	○	○	○	○	○
Changed their schedule so we could do physical activities together.	○	○	○	○	○	○
Discussed physical activity with me	○	○	○	○	○	○
Complained about the time I spend doing physical activity	○	○	○	○	○	○

Criticized me or made fun of me for doing physical activities	○	○	○	○	○	○
Gave me rewards for being physically active, such as bought or gave me something I like	○	○	○	○	○	○
Planned for physical activities on recreation outings	○	○	○	○	○	○
Helped plan events around my physical activities	○	○	○	○	○	○
Asked me for ideas on how they can be more physically active	○	○	○	○	○	○
Talked about how much they like to do physical activity	○	○	○	○	○	○

What helps you to be physically active?

_____

What keeps you from being physically active, or as active as you would like to be?

_____

How has your activity changed from pre-pregnancy to postpartum?

_____

What helped you to get to a new normal with your physical activity levels, or what helped you to regain your prior physical activity levels?

_____

What types of resources or materials would help you to be more physically active?

_____

What advice would you give to new mothers trying to become physically active or increase their physical activity levels?

_____

When thinking about your physical activity levels during the COVID-19 pandemic, please answer the following:

	Decreased	Stayed about the same	Increased
How has COVID-19 impacted your physical activity levels?	○	○	○

Please explain why you chose your answer above.

_____

Are you:

- ○ Married
- ○ Widowed
- ○ Divorced
- ○ Separated
- ○ Single
- ○ Living with a partner

What race/ethnicity do you identify as? Please check all that apply.

- [ ] White/Caucasian
- [ ] Hispanic/LatinX
- [ ] Black/African American
- [ ] Asian
- [ ] Native American
- [ ] Hawaiian/Pacific Islander
- [ ] Other _____
- [ ] Prefer not to answer

What is your current education level?

- ○ High school graduate/equivalent or less
- ○ Associates degree or some college (no degree)
- ○ Bachelor's degree
- ○ Master's degree
- ○ Doctoral/professional school degree
- ○ Prefer not to answer

Are you:

- ○ Employed but currently on maternity leave
- ○ Employed full-time
- ○ Employed part-time
- ○ Currently unemployed
- ○ Stay-at-home Mom
- ○ Student
- ○ Other _____
- ○ Prefer not to answer

What was your total household income earned for 2019:

- ○ <35,000
- ○ 35,001~50,000
- ○ 50,001~100,000
- ○ 100,001~300,000
- ○ 300,001~500,000
- ○ >500,000
- ○ Prefer not to answer

APPENDIX E: PHYSICAL ACTIVITY TYPES

Current Strenuous PA

Type	Frequency
Aerobics	4
Barre	3
Beachbody	2
Biking	9
Body weight	2
Bootcamp	2
Boxing	2
Cardio	5
Circuit	1
Cross Fit	3
Cycling	**17**
Dancing	5
HIIT	**18**
Hiking	7
Jogging	4
House Chores/Kids	3
Jump rope	4
Pilates	1
Peloton	1
Rowing	1
Running	**36**
Strength Training	3
Swimming	1
Weightlifting	7
Videos	4
Yoga	3
Volley/Basketball	1
Walking	5
Zumba	3
None/No Response	64

Note: Most common responses in bold

Prior Strenuous PA

Type	Frequency
Aerobics	5
Barre	3
Beachbody	3
Biking	6
Bootcamp	5
Boxing	3
Cardio	7
Circuit	0
Cross Fit	4
Cycling	12
Dancing	5
HIIT	**21**
Hiking	8
Jiu Jitsu	1
Jogging	6
House Chores/Kids	2
Jump rope	2
Pilates	1
Peloton	1
Rowing	2
Running	**59**
Strength Training	5
Swimming	6
Weightlifting	**16**
Videos	3
Yoga	3
Sports	7
Walking	4
Zumba	4
None/No Response	8

Note: Most common responses in bold

Current Moderate PA

Type	Frequency
Aerobics	1
Barre	3
Biking	6
Body weight	7
Cardio	1
Core	3
Dancing	8
HIIT	2
Hiking	5
Jogging	3
House Chores/Kids	1
Pilates	6
Running	2
Sex	1
Strength Training	5
Swimming	5
Weightlifting	**32**
Videos	3
Yoga	6
Sports	2
Walking	**99**
None/No Response	79

Note: Most common responses in bold

Prior Moderate PA

Type	Frequency
Aerobics	1
Barre	3
Beachbody	1
Biking	9
Body weight	1
Cardio	4
Core	1
Dancing	3
HIIT	1
Hiking	12
Jogging	2
House Chores/Kids	3
Pilates	8
Running	3
Strength Training	4
Swimming	4
Weightlifting	**42**
Videos	3
Yoga	9
Walking	**79**
None/No Response	66

Note: Most common responses in bold

Current Mild PA

Type	Frequency
Biking	1
Body weight	2
Core	3
Dancing	1
fishing	2
Hiking	4
House Chores/Kids	**18**
Pilates	2
Stretching	**34**
Swimming	0
Weightlifting	2
Videos	2
Yoga	**37**
Walking	**105**
Work	2
None/No Response	49

Note: Most common responses in bold

Prior Mild PA

Type	Frequency
Fishing	3
Hiking	2
House Chores/Kids	9
Pilates	1
Sports	1
Stretching	**21**
Weightlifting	2
Videos	1
Yoga	**43**
Sports	0
Walking	**93**
Work	2
None/No Response	72

Note: Most common responses in bold

APPENDIX F: PHYSICAL AND DEMOGRAPHIC MEAN DIFFERENCES

Weekly Moderate to Vigorous Physical Activity (MVPA) Comparisons

Characteristics	**MVPA Units (Observed *M* ± *SD*)**	**Bootstrapped Bias-Corrected 95% CIs for Mean Differences**
Breastfeeding status		
Currently (*n* = 160)	23.08 ± 21.69	-10.71 to 4.72
Not Currently (*n* = 54)	25.78 ± 25.76	
# of Births		
primiparous (*n* = 100)	22.02 ± 21.48	-9.15 to 2.70
multiparous (*n* = 114)	25.28 ± 23.81	
Type of birth		
Vaginal (*n* = 153)	23.11 ± 21.47	-10.58 to 4.39
Cesarean (*n* = 58)	25.95 ± 25.94	
Income		
<$100K (*n* = 74)	25.18 ± 24.14	-9.48 to 6.49
>$100K (*n* = 67)	26.84 ± 23.69	
Employment		
Employed Full-Time (*n* = 58)	23.41 ± 23.21	-11.74 to 3.67
Not Employed Full-Time (*n* = 81)	27.46 ± 23.86	

APPENDIX G: CANVA BROCHURE

Is it Safe to Exercise After Giving Birth?

Absolutely!

Once you have received clearance at your 4 to 6-week postpartum visit, you should be able to continue working back up to your pre-pregnancy physical activities.

Postpartum Survey

- 214 postpartum women (4-weeks to 12-months) completed a survey asking about their activity levels, what helps them to be more active, and what may be keeping them from activity.
- The survey found that physical activity levels generally decline after giving birth.
- The most common types of moderate to vigorous activities listed were running, walking, and weightlifting.
- Self-efficacy was found to have a strong connection with physical activity levels.
  - ↑ self-efficacy = ↑ activity levels
  - ↓ self-efficacy = ↓ activity levels
- Physical activity levels prior to pregnancy were a strong predictor of activity levels in the 4-week to 12-month postpartum period. It's important to become active before pregnancy, and maintain activity during pregnancy, and after birth.

Findings

Pre-Pregnancy | Postpartum
12% **25%**
of women reported zero activity

Pre-Pregnancy | Postpartum
21% **31%**
of women were not sufficiently active

Pre-Pregnancy | Postpartum
67% **44%**
of women were sufficiently active

Physical Activity Enablers

Social Support/Accountability
Mental & Physical Health Benefits
Time & Motivation

Physical Activity Barriers

Tired/Fatigued
Kids/Childcare
Time & Motivation

Safe Postpartum Exercises

Glute Bridge: Emphasize your pelvic tilt and squeeze your bottom. Hold for 30 seconds.

Bird Dog: Lift opposite arm and opposite leg. Keep a flat back and core engaged. Hold for 30 seconds on each side.

Toe Taps: Lift one leg with a 90 degree angle. Keep core engaged while lightly tapping toes on the ground. Try to do 5-10 repetitions with each leg.

Advice Corner

"Any activity is worth it - even a slow walk. You don't have to run a marathon to benefit."

"Just do your best! Try to find the time even if it's only 10 minutes and do what makes you happy."

"It's absolutely okay to not be the IG mom that is back to pre-preggo clothes and activity immediately after giving birth. It's okay to give yourself grace!"

Takeaways

- Try to stay just as active before pregnancy, during, and after birth.
- Don't be afraid to ask your OB, Physician, or any health professionals for postpartum resources or tips.
- Find an activity buddy or a good social support system to help keep you active and accountable!

Recommendations

- Goal setting is crucial! Set manageable goals to get you started (e.g. walking 3x per week with your baby). Work up to your bigger goals.
- Look at the bigger picture of what you want to accomplish (e.g. confidence, weight loss, strength, enjoyment).
- Celebrate your accomplishments, big and small, and remember healing takes time. Use positive self-talk, don't criticize yourself!
- Identify your obstacles, and think of how to overcome them (e.g. tired, baby teething, childcare/support).

Resources

ACOG Women's Health Resources
https://www.acog.org/womens-health

Hays County PT - Pelvic Floor Specialist
https://www.hayscountypt.com

Austin Area OB/GYN
http://gynics.com

11 Postpartum Fitness Tips for New Moms
https://www.whattoexpect.com/first-year/postpartum/postpartum-fitness-tips

My Contact:
[redacted]