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Towards an understanding of change in physical activity from pregnancy through postpartum

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ABSTRACT

Objective: The purpose of this paper was to describe the rationale, data collection, and proposed analyses for examination of mediators of change in physical activity from pregnancy to postpartum among a cohort of pregnant women.
Method: The Pregnancy Infection and Nutrition 3 (PIN3) Study enrolled 2006 pregnant women into the cohort from 2001 to 2005. All women lived in central North Carolina upon enrollment. Physical activity was assessed using a self-reported one-week recall, measured twice during pregnancy and once each at 3- and 12-months postpartum. On a subset of women, one-week accelerometer measures were also collected during the two postpartum time periods. Potential mediators (intrapersonal, interpersonal, community) were collected during pregnancy and postpartum through interviews and take home questionnaires.
Results: To assess mediation of physical activity among our cohort, we will first describe change in physical activity and the mediators, as well as their associations, through pregnancy into the postpartum period. Following this, the product of coefficients approach will be applied to examine whether each measure had indirect effects on change in physical activity. Each individual level mediator will be examined one at a time and across the time points in which it was available. The Sobel standard error approximation formula will be used to test for significance of the mediation effect.
Conclusions: This study will provide evidence to develop appropriate interventions targeted at physical activity and will help focus efforts on the appropriate time periods between pregnancy and postpartum.

Introduction

Physical activity is recommended for pregnant and postpartum women. In 2002, the American Congress of Obstetricians and Gynecologists (ACOG) updated their exercise recommendations for pregnant women, stating that in the absence of medical or obstetric complications, 30 min or more of moderate exercise a day on most or all days of the week is advised (ACOG, 2002). According to the ACOG recommendations, many of the morphologic and physiologic changes of pregnancy persist at least one month postpartum. Thus, they recommend that prepregnancy exercise routines be resumed gradually, based on a woman's physical capability. In 2008, the US government released physical activity guidelines for Americans, including recommending specifically for pregnant and postpartum women that they attain at least 150 min of moderate intensity aerobic activity spread over a week if not already highly active or doing vigorous intensity activity (U.S. Department of Health and Human Services, 2008). Healthy pregnant women who engaged in vigorous aerobic activity or were highly active prior to pregnancy are encouraged to continue physical activity.

Despite these recommendations, the prevalence of physical activity in the United States among pregnant and postpartum women remains suboptimal. Only about one in five pregnant women met ACOG recommendations for physical activity in the United States (Evenson & Wen, 2010a). The decline in physical activity may persist into postpartum for some women, although definitive studies are lacking (Pereira et al., 2007). The postpartum period represents a time period for establishing a behavioral pattern contributing to the health of the mother (Peterson et al., 2002). Childrearing demands coupled with fatigue, depression, and social isolation may exacerbate unhealthy activity patterns (Peterson et al., 2002).

The lack of physical activity contributes to excess weight gain during pregnancy and weight retention during postpartum. Gestational weight gain is the strongest predictor of postpartum weight retention (Gunderson & Abrams, 2000). A consensus panel on physical activity in the prevention and treatment of obesity

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concluded that the development of physical activity interventions for pregnant women represented a potentially fruitful avenue for the prevention of overweight and obesity (Grundy et al., 1999). However, to date few studies have addressed the reasons why women reduce their physical activity during pregnancy and how it changes into the postpartum period (Clarke & Gross, 2004; Rutkowska & Lepecka-Klusek, 2002). Exploration into the correlates of physical activity during pregnancy is one of the first steps to understanding where to focus interventions, building upon existing qualitative work (Devine, Bove, & Olson, 2000; Evenson, Moos, Carrier, & Siega-Riz, 2008; Kieffer, Willis, Arellano, & Guzman, 2002).

Correlates of physical activity during pregnancy and postpartum

Cross-sectional studies have indicated that lower participation in leisure activity or exercise during pregnancy was associated with older age (Evenson, Savitz, & Huston, 2004; Owe, Nystad, & Bo, 2008; Zhang & Savitz, 1996), lower English language acculturation (Chasan-Taber et al., 2007; Gollenberg, Pekow, Markenson, Tucker, & Chasan-Taber, 2008), fair or poor general health (Evenson et al., 2004), overweight or higher body mass index (Owe et al., 2008; Zhang & Savitz, 1996), smoking (Owe et al., 2008), higher parity or number of live births (Domingues & Barros, 2007; Owe et al., 2008; Schmidt, Pekow, Freedson, Markenson, & Chasan-Taber, 2006), pelvic or musculoskeletal pain (Owe et al., 2008), nausea (Owe et al., 2008; Pereira et al., 2007), and an unfavorable reproductive history (Zhang & Savitz, 1996). Leisure activity or meeting recommendations for physical activity was associated with younger age (Petersen, Leet, & Brownson, 2005), higher education (Domingues & Barros, 2007; Evenson et al., 2004; Mottola & Campbell, 2003; Ning et al., 2003; Owe et al., 2008; Petersen et al., 2005), health insurance (Evenson & Wen, 2010a), employment (Domingues & Barros, 2007), higher income (Domingues & Barros, 2007; Ning et al., 2003; Petersen et al., 2005), being married (Domingues & Barros, 2007; Petersen et al., 2005), non-Hispanic White race/ethnicity (Evenson & Wen, 2010a; Ning et al., 2003; Petersen et al., 2005), having no children (Mottola & Campbell, 2003; Ning et al., 2003; Pereira et al., 2007; Rutkowska & Lepecka-Klusek, 2002), not smoking (Mottola & Campbell, 2003; Ning et al., 2003; Petersen et al., 2005), living in an urban area (Rutkowska & Lepecka-Klusek, 2002), and in the first trimester of pregnancy (Evenson & Wen, 2010a). In contrast, other studies found that meeting recommendations for physical activity or reporting higher levels leisure activity was more common among Hispanic or African American pregnant women (Schmidt et al., 2006), those with lower education (Schmidt et al., 2006), those with a history of adverse pregnancy outcomes (Gollenberg et al., 2008), and those with self-report of illicit drug use (Gollenberg et al., 2008). Leisure activity during pregnancy was also associated with exercise prior to pregnancy (Chasan-Taber et al., 2007; Hinton & Olson, 2001; Ning et al., 2003; Pereira et al., 2007), exercise intention (Hausenblas, Symons Downs, Giacobbi, Tuccitto, & Cook, 2008), and physical activity advice during pregnancy (Domingues & Barros, 2007).

Fewer studies have explored correlates of physical activity during postpartum (Albright, Maddock, & Nigg, 2005; Blum, Beaudoin, & Caton-Lemos, 2004; Larson-Meyer, 2002; Pereira et al., 2007; Smith, Cheung, Bauman, Zehle, & McLean, 2005). In one prospective cohort study, insufficient leisure activity between prepregnancy to 6 months postpartum was associated with prepregnancy exercise, weight retention, employment (45 or more hours/week) in early pregnancy, and reporting lack of child care as a barrier to physical activity (Pereira et al., 2007). Exploration into correlates of other types of physical activity, beyond leisure activities, is needed (Chasan-Taber et al., 2007) and no studies have examined correlates of objectively measured physical activity. Furthermore, few studies have prospectively explored factors influencing physical activity from pregnancy through the postpartum period.

Intervention studies on physical activity during pregnancy and postpartum

To date, a few but growing number of behavioral interventions have been developed and rigorously tested with a primary focus on physical activity or exercise, either during pregnancy or postpartum (for example: Aittasalo et al., 2008; Albright, Maddock, & Nigg, 2009; Cramp & Brawley, 2009; Ebbeling et al., 2007; Hausenblas, Brewer, et al., 2008; Mottola et al., 2010; Peterson et al., 2002; Santos et al., 2005; Symons Downs et al., 2009; van Zutphen, Milder, & Bemelmans, 2008; Wen et al., 2007; Yeo, 2009). Exploration of mediators of change in physical activity during or after pregnancy is needed to identify factors to focus intervention efforts, where interventions have shown success. Other studies focus on weight gain or weight retention, incorporating components of physical activity into the intervention (for example: Claesson et al., 2008; Kinnunen et al., 2007; Leermakers, Anglin, & Wing, 1998; Olson, Strawderman, & Reed, 2004; Ostbye et al., 2009; O'Toole, Sawicki, & Artal, 2003). An assessment of the mediators that influenced physical activity is often not reported in intervention studies. Evaluating an existing cohort of pregnant and postpartum women to identify mediators of physical activity change would be an efficient and meaningful contribution to inform interventions in this population.

Theoretical framework of current project

Scientists have urged investigators to focus on quantifying and reporting the causal pathways and mechanisms of physical activity behavior change from a multilevel perspective, in order to further our knowledge of this behavior (Baranowski, Anderson, & Carmack, 1998; Bauman, Sallis, Dzewaltowski, & Owen, 2002; Masse, Dassa, Gauvin, Giles-Corti, & Motl, 2002; Pellmar, Brandt, & Baird, 2002). Traditionally, physical activity interventions have not been successful, in part because (1) current theoretical formulations to predict physical activity behavior were quite limited and (2) interventions were not substantially affecting mediator variables (Baranowski et al., 1998). With the lack of evidence from the literature on mediation variables to focus on in an intervention of physical activity from pregnancy through postpartum, we proposed a study to fill this gap. Very few studies among pregnant and postpartum women include intrapersonal, interpersonal, and community measures; we propose to gather all of these in one study.

The current study will examine the intrapersonal, interpersonal, and community level mediators of change in physical activity (i) during pregnancy and during pregnancy to 3-months postpartum using self-reported physical activity and (ii) from 3- to 12-months postpartum using self-reported and objectively measured physical activity. The socioecologic framework or perspective guides this process; the framework emphasizes the multidimensionality of health behaviors, as well as the interaction between and interdependence of factors within and across the levels (intrapersonal, interpersonal, and community (neighborhood/environment, organizational, or public policy factors) levels) (McLeroy, Bibeau, Steckler, & Glanz, 1988; National Cancer Institute, National Institutes of Health, & US Department of Health and Human Services, 2005; Sallis & Owen, 1997). We propose that physical