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Journal

Health Care For Women International, 39(3)

ISSN

0739-9332

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Publication Date

2018-03-04

DOI

10.1080/07399332.2017.1402333

Peer reviewed

HHS Public Access

Author manuscript

Health Care Women Int. Author manuscript; available in PMC 2018 August 23.

Published in final edited form as:

Health Care Women Int. 2018 March ; 39(3): 263–274. doi:10.1080/07399332.2017.1402333.

Spousal influence on physical activity in physically inactive pregnant women: A cross-sectional study

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Abstract

Regular physical activity (PA) is recommended during pregnancy, but the prevalence of pregnant women who met the recommended level for PA is very low. In this descriptive study, we examined the association between spousal characteristics (belief, knowledge, social support, and PA level) and pregnant women's PA level in 18 couples living in the San Francisco Bay Area. Among other spousal characteristics, only spousal PA level was a significant predictor of pregnant women's PA level regardless of whether it was unadjusted or adjusted by spouses' age and body index mass (p = .01). Our finding shows a need to develop strategies to incorporate spousal support for PA.

Keywords

online survey; physical activity; pregnant women; spouses

World Health Organization (WHO) identified physical inactivity as the fourth leading risk factor for global mortality and a main cause for non-communicable diseases such as cardiovascular diseases, type 2 diabetes mellitus, and some cancers (WHO, 2010). According to the 2008 Physical Activity Guidelines for Americans, all adults should perform at least 150 minutes per week of moderate-intensity aerobic activity and this guideline applies to healthy women during and after pregnancy (U.S. Department of Health and Human Services, 2008). The American College of Obstetrics and Gynecology (ACOG) also published the updated guidelines for pregnant women, recommending women with uncomplicated pregnancies engage in at least 20-30 minutes per day of exercise on most or all days of the week (ACOG, 2015). The prevalence of pregnant women who met the recommendation was only 28.9% according to a recent estimate in the United States (Hesketh & Evenson, 2015). This trend was also found among pregnant women worldwide

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Conflicts of Interest: The authors have no conflict of interest to disclose.

—that is, many pregnant women do not engage in as much physical activity (PA) as recommended in their country (Evenson et al., 2014).

There is substantial evidence of health benefits of regular PA during pregnancy including possible prevention of gestational diabetes, gestational hypertensive disorders, and excessive weight gain (Choi, Lee, & Fukuoka, 2016; Magro-Malosso, Saccone, Di Tommaso, Roman, & Berghella, 2017; Yu, Xie, & Shen, 2017). There are also some psychological benefits from PA including reduced fatigue, stress, and depressive symptoms, and improved well-being (Haakstad, Torset, & Bø, 2016; Pivarnik et al., 2006). Despite these benefits, pregnant women are identified as a vulnerable population group at increased risk of physical inactivity. In addition, in a recent systematic review of randomized controlled trials, only three out of nine interventions were found to be significant and clinically meaningful in improving PA among pregnant women (Pearce, Evenson, Downs, & Steckler, 2013). The strategies used in the three interventions were not specifically different from those used in the rest of six insignificant interventions. Truly, we need to identify and develop strategies to increase PA among pregnant women.

Social support for women during their pregnancies is critical for optimal maternal and infant well-being (Collins, Dunkel-Shetter, Lobel, & Scrimshaw, 1993). The presence of social support may also be important to initiate regular PA. In a focus study of 96 low-income overweight or obese pregnant women, lack of social support was a barrier to increasing PA and a source of daily stress (Chang et al., 2014). In a study of 84 pregnant women, lack of family support was identified as a major barrier to participating in leisure-time PA during early pregnancy among those who were physically inactive prior to pregnancy, but was not a barrier for those who were physically active prior to pregnancy (Da Costa & Ireland, 2013). That is, social support might help physically inactive women overcome their challenges and adopt physically active lifestyle during pregnancy.

Support from spouse/partner may benefit physically inactive women during pregnancy by giving advice, helping women feel better about themselves, directly providing help while the pregnant women participate in PA, or exercising together (Thornton et al., 2006). In theory, social support may facilitate better health behaviors because it reduces perceived barriers to managing a difficult situation or increases the motivation to care for oneself. It is also possible that support from spouse/partner may directly motivate pregnant women to engage in healthier practices such as PA (Uchino, Uno, & Holt-Lunstad, 1999). In addition, spousal PA level was a significant predictor of other partner's PA level in non-pregnant populations including in middle-aged and older adults (Cobb et al., 2016; Satariano, Haight, & Tager, 2002). Given that lack of social support from spouse/partner is often reported as a barrier to being physically active among pregnant women (Evenson, Moos, Carrier, & Siega-Riz, 2009), it is essential to examine spouse/partner's characteristics that may influence pregnant women's PA levels including spouse/partner's belief, knowledge, social support, and PA level.

In a prospective study, marriage/cohabitation was not associated with decreases in PA whereas parenthood had a significant effect on decreases in PA; having a child, either first child or subsequent child, was significantly associated with decreased PA in male as well as

female parents (Hull et al., 2010). Although adults might become less physically active during parenthood, little is known about the influence of spouse/partner and its association with pregnant women's PA behaviors. Thus, the authors' purpose in this study was to examine the association between spouse/partner's characteristics (belief, knowledge, support for PA, and PA level) and pregnant women's PA.

Methods

Design and sample

In this descriptive study, 18 pregnant women (called as "Pregnant Women Group) and 18 partners or spouses (called as "Spouse Group") of the pregnant women who completed the survey were analyzed. This is a sub-study of a pilot randomized controlled trial of a 12-week PA program for pregnant women with gestation age of between 10-20 weeks. The main results of this pilot study were reported somewhere else (Choi, Lee, Vittinghoff, & Fukuoka, 2016). While the Pregnant Women Group who was enrolled in the pilot trial completed the survey at baseline visit, the Spouse Group completed the same survey via online during a similar time period as their pregnant partner.

Approval from the University of California at San Francisco (UCSF) Institutional Review Board was obtained prior to participant recruitment. Pregnant participants were recruited from the prenatal clinics and communities in the San Francisco Bay area. Inclusion criteria were 1) 18-40 years of age; 2) pregnant, 10-20 weeks of gestation; 3) sedentary lifestyle; 4) intent to be physically active; 5) access to a home telephone or a mobile phone; 6) access to a computer; and 7) ability to communicate in English. Exclusion criteria were 1) known medical or obstetric complication that restricts PA and 2) current participation in lifestyle modification programs that may potentially confound results of this study. Fifty-seven pregnant women were screened for initial eligibility over the phone and of those, thirty women were eligible to participate in the pilot trial. Signed written informed consent was obtained from pregnant participants prior to the study.

Once pregnant women were enrolled in the trial, research staff sent the email invitation for their partners/spouses to complete the online survey. The inclusion criteria for partners/spouses were 1) having a pregnant partner/spouse and 2) ability to communicate in English. Implied consent was obtained from spouses by letting them choose either responding or not responding to the email invitation that contains the purpose and process of the study including privacy, safety, participant's right to stop the study anytime, the researcher's contact information, and the online survey link. Eighteen out of 30 partners/spouses responded to the invitation and completed the online survey. Because all participants identified their marital status as married, the term "spouse" was used throughout the manuscript. The baseline survey data collection was completed prior to randomization. A ten-dollar gift card was mailed to those spouses who completed the survey. The pregnant women received $50 when they completed all the trial visits.

Measures

Demographic characteristics including age, ethnicity/race, gender, education, annual household income, employment, marital status, and childbearing history (pregnant women only) were collected. For body mass index calculation, self-reported pre-pregnancy body weight and height collected during telephone screening were used for pregnant women, and self-reported body weight and height for spouses.

The Social Support and Exercise Survey is a 24-item, self-report measure with two subscales to assess both friend and family social support related to PA during the past three months. To assess spouses' social support for their pregnant women, the Social Support and Exercise Survey questionnaire was modified by changing the wordings of the items (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). For example, "*my family* did physical activities with *me*" was modified to "*I* did physical activities with *her*." Responses were on 5-point Likert rating scales (ranging from 1, "none" to 5, "very often"). Cronbach's alpha of the revised measure was 0.92 in this study.

The Multidimensional Outcome Expectations for Exercise Scale (MOEES) was used to assess spouses' belief about what will result from engaging in PA during pregnancy to pregnant women. The MOEES consists of three domains of outcome expectations for exercise (i.e., physical, social, and self-evaluative outcome expectations). The MOEES was modified to assess spouses' belief about pregnant women's benefits (Wójcicki, White, & McAuley, 2009). For example, "Exercise will improve *my* ability to perform daily activities" was modified to "Exercise will improve *her* ability to perform daily activities." Responses were on 5-point Likert rating scales (ranging from 1, "strongly disagree" to 5, "strongly agree").

Spouses' knowledge of PA during pregnancy was assessed with 5 items regarding the recommended amount, types, and precautions of PA during pregnancy based on the ACOG guideline for exercise during pregnancy (ACOG, 2002). The total number of correct answers was computed for each spouse.

For pregnant women, the Stanford Brief Physical Activity Survey was used to select those who were inactive (Taylor-Piliae et al., 2006) and Physical Activity Stages of Change was used to select those who were considering being physically active in the future or the near future (Marcus & Forsyth, 2009). Pregnant women's PA was measured by the 7-Day Physical Activity Recall (PAR). The 7-Day PAR is an interviewer-administered PA recall instrument that assesses the frequency, duration, and intensity of PA performed during the last 7 days. A trained research staff helped participants recall significant events over the previous 7 days, starting with the most recent day. Based on the manual for the 7-Day PAR, daily energy expenditure (kcal/day) was calculated (Sarkin, Campbell, & Gross, 1997).

Spouses' PA was measured with a short-form of the International Physical Activity Questionnaire (IPAQ), by which the frequency and duration of walking, moderate activities, and vigorous activities in the prior 7 days were measured. An overall total PA MET-minutes/week score was computed based on walking, moderate, and vigorous PA. The validity of the IPAQ was tested by comparing it with an accelerometer ($\rho = 0.33$, 95% confidence interval =

0.26-0.39) (Craig et al., 2003). PA level was grouped into three categories: high, moderate, and low based on frequency, duration, and types of activity. Due to the online survey format designed for spouses to increase convenience, a self-administered survey format of PA, IPAQ, was used for spouses whereas an interviewer-administered PA recall questionnaires (the 7-Day PAR and the Stanford Brief Physical Activity Survey) were used for pregnant women.

The survey questionnaire data were managed using REDCap (Research Electronic Data Capture), a secure web-based application to support data capture for research studies, hosted at the UCSF.

Data Analysis

Because spouses' PA levels were not normally distributed, log transformation was done to meet the assumptions for statistical analyses (Shumaker, Ockene, & Riekert, 2008). Pearson correlation coefficients were computed among spouses' belief, knowledge, support, log-transformed PA level, and pregnant women's PA to explore the associations among spouses' characteristics and pregnant women's PA. The effects of spouses' belief, knowledge, support, and log-transformed PA level on pregnant women's PA were evaluated using univariate and multivariate linear regression analyses. Age and body mass index (BMI) were adjusted in the multivariate model. All analyses were performed using SPSS 22. A 2-sided level of significance of 0.05 was used.

Results

Characteristics of The Pregnant Women and Spouse Groups

The baseline sample characteristics are shown in Table 1. The mean age of pregnant women (33.7±3.0 years) was younger than the mean age of spouses (35.7±4.2 years). There was one female spouse and the rest of spouses were male. There were more primiparous women than multiparous women (55.6% vs. 44.4%). While about 17% of the pregnant women were normal weight before they became pregnant, 33% of the spouses were currently normal weight. All pregnant participants were physically inactive based on the Stanford Brief Physical Activity Survey during telephone screening. In contrast, about 82% of spouses were either highly or moderately physically active based on the IPAQ.

The mean (±SD) of spouses' belief on the benefits of PA during pregnancy for pregnant women was 65.9 (±6.8), out of possible score ranges between 18 and 90. The mean of spouses' knowledge about the recommendation for pregnant women's PA was 3.2 (±1.2) out of possible score ranges between 1 and 5. The mean of spousal support for PA was 38.4 (±9.3), out of possible score ranges between 13 and 65. These scores were around the midpoints of the possible score ranges.

Relationships Among Spouses' Characteristics and Pregnant Women's Physical Activity

Spouses' belief was positively and significantly correlated with spouses' knowledge (r = 0.54, p = 0.020) and it was also positively correlated with spousal support for pregnant women's PA (r = 0.32, p = 0.19) (See Table 2). Spouses' knowledge was also positively

correlated with spousal support for pregnant women's PA ($r = 0.38$, $p = 0.12$), spousal PA ($r = 0.23$, $p = 0.35$), and pregnant women's PA ($r = 0.326$, $p = 0.19$). Spousal support for pregnant women's PA was positively correlated with spousal PA ($r = 0.37$, $p = 0.13$) and pregnant women's PA ($r = 0.33$, $p = 0.19$). Spousal PA was positively and significantly correlated with pregnant women's PA ($r = 0.89$, $p < 0.001$).

Univariate and Multivariate Linear Regression

Unadjusted, and age and BMI adjusted, linear regression models in predicting pregnant women's PA level measured by the 7-Day PAR are shown in Table 2. Among spouse's belief, knowledge, social support, and PA level, only spousal PA level was a significant predictor of pregnant women's PA level regardless of whether it was either unadjusted or adjusted by spouses' age and BMI ($p = .01$).

Discussion

There is a general notion in earlier studies about the overall positive consequences of social support on improving one's physical and mental health (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). However, we still have little understanding about what kind of support promotes best outcome in physically inactive pregnant women and how to formulate better interventions. To respond to these questions, we conducted an online survey among spouses of physically inactive pregnant women who were participating in an ongoing pilot study. First of all, all of the pregnant participants were currently physically inactive whereas the majority (82%) of their spouses reported either highly or moderately active. Pregnancy is a life transition in which women may experience dramatic physical as well as emotional changes, resulting in the decline of PA. Hull et al. also reported that marriage and cohabitation did not impact PA, but having a child significantly reduced PA (Hull et al., 2010). Given that almost half of pregnant women were multiparous, these pregnant women might have already experienced reduced PA due to the responsibility of taking care of their own children at home.

Spouse's leisure-time PA was a significant predictor of other partner's leisure-time PA after adjustment for covariates in a study conducted among older adult couples (Satariano, Haight, & Tager, 2002). An individual's level of PA was influenced by his or her spouse's level of PA in middle-aged and older spouses (Cobb et al., 2016). In the current study, spouse's PA level was a significant predictor of pregnant women's PA level. Although pregnant women's PA level was not active enough to be categorized as moderate or high, all of them were either at the stage of contemplation or preparation of participating in regular PA. Physically active spouses may have potential to act as a role model or promoter in enhancing health-promoting behaviors in their pregnant spouses; in this way they may provide support for their pregnant women to initiate PA. Our finding also emphasized a need to include spouses into PA programs for physically inactive pregnant women and to develop strategies to incorporate spousal support for PA among physically inactive pregnant women.

Spousal belief, knowledge, and social support were not significant predictors of pregnant women's PA levels. It may be due to the small sample size. However, the stronger association of spousal PA level with pregnant women's PA rather than that of spousal

support with pregnant women's PA should be noted. Spousal support such as encouragement, reminders may not be influential enough for physically inactive pregnant women to increase their PA levels whereas spouse's PA level was a strong predictor of pregnant women's PA. Development of a PA intervention targeting pregnant women as well as spouses may have a potential to increase physically inactive pregnant women's PA level. Spouses who are physically active may well understand the benefits of PA through their own experiences and be willing to provide emotional or practical support. Also, negative influence of beliefs or attitudes of people (family and friends) around pregnant women due to lack of information or misperception regarding pregnant women's PA were often addressed as factors that undermine pregnant women's efforts to participate in PA (Campbell, Johnson, Messina, Guillaume, & Goyder, 2011; Clarke & Gross, 2004; Leiferman, Swibas, Koiness, Marshall, & Dunn, 2011). When health care providers advise physically inactive women to engage in PA, health care providers should also assess spouse's PA level.

While our study contributes to the understanding of spousal influence on pregnant women's PA, there are a few limitations in this study. First, the study sample is very small and does not represent a typical population of pregnant women. The high proportion of pregnant participants in the study was older, highly educated, and some ethnic groups were over-represented. Second, due to the design of the present study, the presented associations cannot suggest causality. Lastly, because we recruited spouses whose pregnant partners were physically inactive, but intended to increase physical activity, our study findings may not be generalized to spouses whose pregnant partners are physically inactive and still do not plan to participate in physical activity. While such limitations are acknowledged, important conclusions can be drawn. First, PA behaviors vary between pregnant women and their spouses. Second, spouses' characteristics such as PA level are closely associated with pregnant women's PA level. In terms of the clinical implications to help pregnant women who were physically inactive prior to pregnancy engage in PA, the involvement of spouses in PA should be considered as a source of social support. We recommend further research to identify spousal characteristics that are linked to promoting pregnant women's PA in a study with a large sample size and to test a potential efficacy of a PA intervention study targeting spouses of pregnant women as well as pregnant women.

Acknowledgments

This study was supported by the National Heart, Lung, Blood Institution (3R01HL104147-02S1) from the National Institutes of Health (NIH); the National Institutes of Health (NIH), through UCSF-CTSI Grant Number UL1 RR024131; Sigma Theta Tau International Honor Society Alpha Eta Research Award. The contents of this publication are solely the responsibility of the authors and do not necessarily represent the official views of the NIH or Sigma Theta Tau International Honor Society. We also thank Victoria Phan, BS, Joelle Takahashi, BA, Jihyeon Lee, MS, Stephen Weinstein, MD, Joanne Vogel, MD, and the MoTHER Study participants and their spouses.

Appendix Sample Items of Instruments

Spouse	
Instrument	**Sample Item**
Social Support and Exercise Survey (revised)	I did physical activities with her.
Multidimensional Outcome Expectations for Exercise Scale (revised)	Exercise will improve her ability to perform daily activities.
Pregnancy Physical Activity Knowledge	True or False: During pregnancy, only aerobic exercises are recommended, not strength training.
International Physical Activity Questionnaire	In the past 7 days, on how may days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? Thank about only those physical activities that you did for at least 10 minutes at a time.
Pregnant Women	
Stanford Brief Activity Survey	Are you employed? Can you tell me about the work that you do? In a typical day at work, what kind of physical activity do you engage in? How do you get to/from work?
Physical Activity Stages of Change	Are you currently physically active?
	Do you intend to become more physically active in the next 6 months?
7-Day Physical Activity Recall	Where you employed in the last seven days?
	How many days of the last seven did you work?
	How many total hours did you work in the last seven days?
	What two days do you consider your weekend days?

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Table 1

Baseline Characteristics

Variable	Pregnant participant (n=18) mean±SD or % (n)	Spouse (n=18) mean±SD or % (n)
Age (years)	33.7±3.0	35.7±4.2
Race		
Asian	33.3 (6)	22.2 (4)
Black	5.6 (1)	5.6 (1)
Hispanic/Latina	11.1 (2)	5.6 (1)
Pacific islander	0 (0)	5.6 (1)
White (Non-Hispanic)	50 (9)	55.6 (10)
More than 1 race	46.7 (7)	5.6 (1)
Gender		
Male	0 (0)	94.4 (17)
Female	100 (18)	5.6 (1)
Education		
High school	0 (0)	5.6 (1)
Some college	5.6 (1)	11.1 (2)
College degree	44.4 (8)	38.9 (7)
Graduate degree	50.0 (9)	44.4 (8)
Household income		
$20,001-$40,000	0 (0)	5.6 (1)
$40,001-$75,000	11.1 (2)	0 (0)
>$75,000	83.3 (15)	88.9 (16)
Decline to state	5.6 (1)	5.6(1)
Employment		
Employed	88.9 (16)	83.3 (15)
Unemployed and looking for a job	5.6 (1)	5.6 (1)
Homemaker/Other	5.6 (1)	11.1 (2)
Childbearing history		
Primiparous	55.6 (10)	
Multiparous	44.4 (8)	
BMI category[1]		
Normal weight	16.7 (3)	33.3 (6)
Overweight	55.6 (10)	50.0 (9)
Obese	27.8 (5)	16.7 (3)
Physical activity category[2]		
Low (inactive)	100 (18)	16.7 (3)
Moderate	0	38.9 (7)
High	0	44.4 (8)
Physical activity level[3]	2501.7±353.6	2653.1±2922.6

[1]Pre-pregnancy BMI for Pregnant participants.

[2]For pregnant women, physical activity category was assessed with the Stanford Brief Physical Activity Survey and for spouses, the International Physical Activity Questionnaire was used.

[3]For pregnant women, physical activity level was assessed with the 7-Day Physical Activity Recall (kcal/day) and for spouses, the International Physical Activity Questionnaire was used (MET-minutes/week).

Table 2

Correlations of Spousal Characteristics on Pregnant Women's Physical Activity (N=18)

Characteristics	Belief	Knowledge	Social support	Physical activity
Knowledge	.54*			
Social support	.32	.38		
Physical activity	.09	.23	.37	
Pregnant women's physical activity	.09	.19	.33	.89**

* $p<0.05$,

** $p<0.001$

Table 3

Unadjusted and Adjusted Linear Regression Models for Predicting Pregnant Women's Physical Activity Level (N=18)

	Unadjusted			Adjusted[1]		
Variable	***B***	***SE B***	***β***	***B***	***SE B***	**β**[a]
Belief	6.34	12.82	.12	11.31	14.96	.22
Knowledge	−14.60	75.74	−.05	9.59	98.96	.03
Social support	12.99	8.95	.34	13.78	10.09	.36
Spousal physical activity level	510.45	177.53	.58*	546.52	185.70	.63*

[1] Adjusted for age and body mass index

* $p<0.05$