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Physical Activity Beliefs and Behaviors during Pregnancy and their Association with Provider Counseling among Women in the Southern United States

RESEARCH

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ABSTRACT

Background: Physical inactivity, obesity, and chronic disease rates during pregnancy are strikingly high in the Southern United States. The present study examined sociodemographic factors related to the beliefs and behaviors of women in the South regarding physical activity (PA) during pregnancy and whether women›s beliefs and behaviors during pregnancy were associated with provider counseling.

Methods: A sample of 292 women in the South completed an online survey. Participants provided sociodemographic data and recalled health beliefs and PA from their recent pregnancy. Descriptive statistics and correlation analyses were used to describe and assess relationships between variables. Linear regressions examined the association between women's beliefs and behaviors during pregnancy and provider counseling while controlling for sociodemographic factors.

Results: There was large agreement among the sample. Feeling tired and lacking motivation were the main barriers to PA, and improved health was the primary benefit. Participants felt most susceptible to anxiety and depression. Providers were the leading source of support for PA, although provider counseling was not significantly correlated with increased PA. Participants engaged primarily in light household and caregiving activities. Sociodemographic factors had a stronger association with beliefs and behaviors than provider counseling.

Conclusion: Participants viewed PA as beneficial; however, they had specific barriers to exercise during pregnancy and did not perceive themselves as susceptible to common health conditions. Participants looked to providers as their primary support for PA, although provider counseling appears ineffective. Providers should encourage patients to be active using established counseling techniques such as motivational interviewing to support PA.

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INTRODUCTION

According to the World Health Organization (WHO), physical inactivity is a leading cause of cardiovascular disease, diabetes, cancer, and mortality (Organization, 2020). In the United States, the South is a large and diverse portion of the country with the lowest physical activity (PA) levels, the highest rates of individuals classified as overweight and obese, and chronic health conditions such as high blood pressure, Type 2 diabetes, and stroke (CDC, 2021). During pregnancy, as few as 10% to 15% of patients attain the minimum recommended activity level of 20–30 minutes per day (Borodulin et al., 2008, Newton and May, 2017, Santo et al., 2017). Sociodemographic factors may influence beliefs and behaviors regarding PA during pregnancy in the South, where cultural norms reinforce sedentary behavior. According to the Health Belief Model, individuals must consider themselves susceptible to a health threat and believe that the benefits of changing their behavior outweigh the effort required. Understanding patients' health beliefs and risk perceptions during pregnancy are necessary to increase healthy behaviors and reduce chronic disease (Alemu, 2017).

Another factor contributing to the low levels of PA during pregnancy may be ineffective counseling by providers (e.g., midwives and obstetricians). Pregnant patients often want clear and specific guidance regarding PA (Harrison et al., 2019); however, existing methods are often limited and not aligned with current guidelines (Lott et al., 2019, Whitaker et al., 2019). Providers report numerous barriers that inhibit their ability to properly counsel their patients, including lack of time, lack of interest from patients, concern for offending women (Whitaker et al., 2016), lack of skill (McParlin et al., 2017), patient attitudes, differences in social and cultural background, and accessibility to resources (Murray-Davis et al., 2020). Given the low levels of PA and high rates of chronic disease in the South, examining how sociodemographic factors and provider counseling are related to PA beliefs and behaviors may provide novel information that can be used to improve provider messaging and patient outcomes.

This retrospective cross-sectional correlational study aimed to examine: 1) sociodemographic factors related to beliefs and behaviors of women in the South regarding PA during pregnancy; and 2) whether women's beliefs and behaviors during pregnancy are associated with provider counseling.

METHODS

PARTICIPANTS

We conducted a planned secondary analysis of a cross-sectional predictive correlational study evaluating PA during pregnancy in the Southern United States (Rebelle, 2022). The present investigation utilized the Health Belief Model as the theoretical framework.

The anonymous and voluntary online sample was recruited via Qualtrics from June 2021 through August 2021 using an open online survey. Of the competing data collection services, Qualtrics provides a convenience sample closest to a probability sample representative of the United States (Boas, 2020, Zack, 2019) and removes the researcher from the data collection process, ensuring anonymity. Additionally, Qualtrics has systems to reduce duplicate or erroneous entries to improve the data quality. Qualtrics tested the survey for usability and functionality prior to data collection. The final sample broadly represented recently pregnant women throughout the South.

A participant was eligible for inclusion if they were at least 18 years of age at the start of their last pregnancy beginning in 2016 or later (i.e., after the release of updated guidelines on PA from the American College of Obstetricians and Gynecologists (ACOG)), identified as a cisgender woman, lived and gave birth in the South, and had an uncomplicated pregnancy. Each participant signed an online consent. Participants were allowed to terminate the survey, although incomplete surveys were not included in the final data.

Although retrospective self-reported data is prone to error or recall bias, studies have shown that recalling information from past pregnancies may be less susceptible (Carter et al., 2015, Chin et al., 2017, Headen et al., 2017). Additionally, the broad sample reduced the risk of homogeneity, which can be present in self-selecting samples from specific locations. Institutional Review Board approval (IRB-2021-3551) was obtained prior to all data collection.

G*Power (Faul et al., 2009) analysis determined that a minimum sample size of n = 184 provided ample power (.95) to establish significant associations at a .05 α-level and medium effect size (*f* = .15). All analyses were conducted using Statistical Package for the Social Sciences V28 (SPSS Inc., Chicago, IL).

PROTOCOL

In the analysis, the criterion variables included beliefs (perceived barriers and benefits of PA, perceived susceptibility to health conditions, and exercise self-efficacy) and behaviors (PA (light and above) and sedentary activity) during pregnancy. Beliefs were measured using the Health Belief Model Scales for adult physical activity (Hayslip, 1996) and the Physical Exercise Self-Efficacy Scale (Schwarzer, 2005). Beliefs were measured on ordinal Likert scales and treated as continuous variables in the regressions. Although this method has some debate, using Likert data on interval scales in parametric testing is an accurate and robust method of analysis (Meyers, 2016). The behavior variables were measured retrospectively using the Pregnancy Physical Activity Questionnaire (PPAQ) (Chasan-Taber et al., 2004) with permission from the author. The original authors showed each instrument to be valid and reliable (Chasan-Taber et al., 2004; Hayslip, 1996; Schwarzer, 2005). The PPAQ measured the overall intensity (light, moderate, and vigorous) of PA during pregnancy across four categories (household/caregiving, occupational, sports/exercise, transportation) and sedentary activity. In this article, *PA* includes all four categories of activity, while *exercise* refers to the single subcategory sports/exercise.

For this study, *provider counseling* was defined as provider advice about exercise during pregnancy (yes or no) and means from two subscales of the Health Belief Model Scales, including provider cue to action and provider support for PA. Participants were asked whether their provider's recommendation was a major reason for starting exercise (cue to action) and a source of influence or approval (support). Women responded on a 1–5 scale, from strongly disagree to strongly agree. The initial study reported the Cronbach's alphas (α) for the Health Belief Model Scales and PPAQ, showing excellent reliability ranging from .80 to .93 (Rebelle, 2022).

We included several a priori sociodemographic factors that have been shown to confound PA beliefs and behaviors in previous studies, including age, BMI, race and ethnicity, education, household income, parity, marital status, exercise before pregnancy, and perceived health status during pregnancy. A detailed description of these variables was included in the initial study (Rebelle, 2022). Self-reported race and ethnicity data were a series of dichotomous variables: non-Hispanic American Indian or Alaska Native, non-Hispanic Asian or Pacific Islander, non-Hispanic Black, Hispanic, non-Hispanic White, and participants that identified as other or multiracial. With just 1% of the total responses, American Indian or Alaska Native was merged with other or multiracial in the regression models and used as the reference.

STATISTICAL ANALYSIS

For the secondary analysis, descriptive statistics were used to create a detailed profile of the sample. We also examined the subscales of the instruments to identify participants' most salient beliefs, types and intensities of PA, and accompanying sociodemographic factors to determine the sociodemographic factors related to beliefs and behaviors of women in the South regarding PA during pregnancy. Because several sociodemographic variables were not normally distributed, we performed 2-tailed Spearman's rho correlations to assess the relationships among the interval and ordinal variables. Point-biserial correlations were used when one of the variables was dichotomous.

To address the secondary aim, we assessed correlations and performed a series of unadjusted and adjusted multiple linear regressions to examine the associations between provider counseling and participants' beliefs and behavior during pregnancy. The Health Belief Model stipulates that beliefs must be considered in the context of individual factors. For this reason, pertinent sociodemographic factors were included in the adjusted regression models with the predictor variables of interest. The sociodemographic factors in the analysis were chosen a priori because of their frequency in prenatal PA literature. Additionally, the sociodemographic factors accurately reflect the diversity of patients in the South that prenatal care providers are expected to counsel during pregnancy.

The criterion variables in the regression models consisted of the mean for the following scales: barriers, benefits, susceptibility to health problems, self-efficacy (as measured by the Health Belief Model Scales and the Physical Exercise Self-Efficacy Scale), PA (light and above), and sedentary behavior (as measured by the PPAQ). Each model met all assumptions for regression.

RESULTS

Of the 305 participants in the initial study, 13 did not include information about provider support and were excluded from the secondary analysis. The final dataset for this study included n = 292. There were no other missing data points, and any outliers were left in the analysis as they were within range of the multiple-choice survey selections.

The diverse sample consisted of women from every southern state (as defined by the United States Bureau of the Census) (1995) and Washington, DC. Participants' BMI was calculated using self-reported height and weight at the onset of pregnancy, with 50% considered overweight or obese and 15% underweight (Table 1).

Table 1 Sociodemographic Statistics (n = 292).

CHARACTERISTIC	MEAN ± SD OR N (%)
Age(y) at start of last pregnancy	29.5 ± 5.8
BMI at start of last pregnancy	26.3 ± 6.5
Race/Ethnicity	
American Indian or Alaska Native	3 (1.0)
Asian or Pacific Islander	17 (5.6)
Black	45 (14.8)
Hispanic	43 (14.1)
Non-Hispanic White	172 (56.4)
Other/Multiracial	25 (8.2)
Education	
Less than high school or GED	8 (2.7)
High school graduate or GED	58 (19.9)
Some college	58 (19.9)
2-year degree/Associate's degree	39 (13.4)
4-year degree/Bachelor's degree	86 (29.5)
Graduate degree (e.g., Master's or Doctorate)	43 (14.7)
Annual household income	
Less than $10,000	21 (7.2)
$10,000 – $19,999	15 (5.1)
$20,000 – $29,999	21 (7.2)
$30,000 – $39,999	41 (14.0)
$40,000 – $49,999	24 (8.2)
$50,000 – $59,999	29 (9.9)
$60,000 – $69,999	17 (5.8)
$70,000 – $79,999	22 (7.5)
$80,000 – $89,999	20 (6.8)
$90,000 – $99,999	14 (4.8)
$100,000 – $149,999	53 (18.2)
More than $150,000	15 (5.1)
Parity	
1	126 (43.2)
2	101 (34.6)
3	44 (15.1)
4 or more	21 (7.2)
Marital status	
Separated/Divorced/Widowed/Never married	54 (18.5)
Married/Living with partner	238 (81.5)
Exercise before pregnancy	
Less than 150 mins of exercise per week	190 (65.1)
150 mins or more of exercise per week	102 (34.9)

(Contd.)

CHARACTERISTIC	MEAN ± SD OR N (%)
Health status during your last pregnancy	
Excellent	73 (25.0)
Very good	112 (38.4)
Good or average	81 (27.7)
Fair	19 (6.5)
Poor	7 (2.4)
Advice about physical activity from prenatal health provider	
Yes	192 (65.8)
No	100 (32.4)

Descriptive statistics revealed similar beliefs among the sample, with few notable exceptions (Table 2). Most participants agreed that being too tired was their primary barrier to PA. Women in the study perceived many benefits to PA, with the overarching benefit of improved health; however, nearly all of the activity among the sample was incidental rather than a conscious decision to exercise. Participants engaged in primarily light activity during pregnancy resulting from household and caregiving (57.3%) and more moderate levels of occupational (26.8%) and transportation (11.9%) activities.

Women in the study perceived their health through their prenatal experience rather than through long-term health concerns and felt most susceptible to psychological health threats. For example, participants believed they were more susceptible to anxiety (183, 62.7%) and depression (153, 52.4%) rather than inactivity (106, 36.3%) or obesity (103, 35.3%), even though the sample engaged in little exercise and half were in the overweight or obese category at the onset of pregnancy. Fewer participants considered themselves at risk of diabetes (103, 35.3%), heart attack (71, 24.4%), or stroke (54, 18.5%).

Although participants had many areas of high agreement, some perceptions varied based on sociodemographic factors. For women categorized as obese, perceived susceptibility was more physical, e.g., feeling stiff and sore, than psychological. Among non-Hispanic Black women, reducing the risk of heart attack was perceived as the greatest benefit of PA; however, just 19% felt personally susceptible to a heart attack (see Table 2).

Table 2 Salient Beliefs about Physical Activity During Pregnancy.

Data are n(%) of agreeance among the total sample unless noted otherwise.

† High level of agreeance only among participants that identified as Non-Hispanic Black, n = 45.

†† High level of agreeance only among participants categorized as overweight or obese, n = 146.

BELIEFS	n(%) n = 292
Barriers	
Too Tired	247(88.6)
Lack of Motivation	219(75.0)
Too Lazy	175(59.9)
Not Enough Time	149(51.0)
Benefits	
Improved Health	258(88.3)
Releasing Tension	233(79.8)
Feeling Better Psychologically	229(78.4)
Sense of Accomplishment	229(78.4)
Increasing Mental Alertness	214(73.3)
Getting Stronger	200(68.5)
Reduced Risk of Heart Attack†	32(76.2)
Cues to Action	
Not Fitting Comfortably in Clothing	154(53.3)
Shortness of Breath	133(45.6)
Provider Recommendation	126(43.2)
Support from Others	
Provider	116(39.7)
Spouse/Partner	108(37)

(Contd.)

BELIEFS	n(%) n = 292
Susceptibility	
Anxiety	183(62.7)
Depression	153(52.4)
Stiffness and Soreness††	82(56.2)
High Blood Pressure††	77(52.8)

The leading cues to action for PA were intrapersonal. Not fitting comfortably into clothing ranked highest, particularly among participants categorized as overweight or obese (96, 65.7%). The primary interpersonal cue to action was a provider's recommendation for PA. Perceived support for PA was generally low, yet, participants agreed that providers were their main source of support for PA (116, 39.7%), highest among non-Hispanic Black women (22, 52.4%).

Two-tailed Spearman's rho and point-biserial correlations showed that women were more likely to rate their healthcare providers as a primary source of support if they had received a provider cue to action (r_s = .462, p < .001) or provider advice (r_{pb} = .330, p < .001) for PA. Moreover, participants perceived a slight increase in the benefits of PA if they received provider counseling (advice: r_{pb} = .130, p = .026; cue to action: r_s = .264, p < .001; support: r_s = .179, p = .002). Although provider counseling was positively correlated with beliefs, the analysis showed that counseling was not significantly correlated with any type or intensity of PA during pregnancy. The only significant correlation between provider counseling and behavior was a small increase in sedentary behavior (advice: r_{pb} = .160, p = .006; cues to action: r_s = .153, p = .009; support: r_s = .169, p = .004).

Further examination showed that sociodemographic factors had stronger correlations with beliefs and behaviors during pregnancy than provider counseling, with exercise before pregnancy as a leading factor. Participants who reported prepregnancy exercise were more likely to exercise during pregnancy, perceived less fatigue, and had higher motivation for exercise than those who were less active (Table 3). The analysis also showed that feeling tired and unmotivated during pregnancy correlated with decreased self-efficacy for exercise (r_s = –.271, p < .001; r_s = –.383, p < .001), which may make it more difficult to begin exercise during pregnancy compared to maintaining or increasing prepregnancy activity levels.

	EXERCISE BEFORE PREGNANCY†	INCOME ††	EDUCATION ††	HISPANIC †	NON-HISPANIC BLACK†	NON-HISPANIC WHITE†
Barriers	–.276**	–.188**	–.229**	–.034	–.079	.031
Benefits	.276**	.035	.161*	–.003	.107	–.050
Susceptibility to Serious Health Problems	–141*	–.114	–.135*	–.080	–.168*	.162
Self-Efficacy	.186**	.014	.130*	–.037	.053	–.063
Exercise/Sport Activity	.363**	.045	.039	.072	–.064	.028
Household/Caregiving Activity	–.065	–.123*	–.161**	.147*	–.049	–.140
Occupational Activity	–.065	.102	.115*	.080	.014	.000
Transportation Activity	–.031	.021	–.024	.055	.155*	–.097
Sedentary Behavior	–.017	–.222**	–.103	.076	.224**	–.266**

Table 3 Sociodemographic Factors Most Associated with Beliefs and Behaviors During Pregnancy.

† Data are two-tailed point-biserial correlation (r_{pb}) coefficients.

†† Data are two-tailed Spearman's correlation (r_s) coefficients.

* p < 0.05, ** p < 0.01.

The adjusted multiple linear regression analyses reiterated that sociodemographic factors had a larger association with beliefs and behaviors regarding PA during pregnancy than provider counseling (Table 4).

Prepregnancy exercise was the strongest predictor of beliefs in the adjusted regression models, including fewer perceived barriers to PA (p < .001), more perceived benefits (p < .001), and higher self-efficacy for exercise (p = .004). Provider advice on PA was associated with sedentary behavior (p = .025); however, neither sociodemographic factors nor provider counseling significantly affected PA.

PREDICTORS	BARRIERS	BENEFITS	SUSCEPTIBILITY	SELF-EFFICACY	PHYSICAL ACTIVITY	SEDENTARY
Constant	2.806 (2.27–3.34)	3.236 (2.71–3.76)	1.523 (0.80–2.25)	2.373 (1.70–3.05)	5.768 (5.22–6.32)	3.151 (2.22–4.08)
Provider cue	0.021 (–0.04–0.08)	**0.080**** (0.02–0.14)	–0.031 (–0.11–0.05)	0.033 (–0.04–0.11)	–0.035 (–0.10–0.03)	0.019 (–0.08–0.12)
Provider support	0.024 (–0.04–0.08)	0.003 (–0.06–0.06)	–0.043 (–0.12–0.04)	–0.006 (–0.08–0.07)	0.018 (–0.04–0.08)	0.034 (–0.07–0.14)
Provider advice	–0.029 (–0.18–0.012)	0.084 (–0.06–0.23)	0.137 (–0.07–0.34)	–0.113 (–0.30–0.07)	0.083 (–0.07–0.24)	**0.299**** (0.04–0.56)
Age	–0.009 (–0.02–0.00)	–0.004 (–0.02–0.01)	0.006 (–0.01–0.02)	0.015 (0.00–0.03)	–0.005 (–0.02–0.01)	–0.008 (–0.03–0.02)
BMI	0.004 (–0.01–0.02)	0.005 (–0.01–0.02)	**0.038**** (0.02–0.05)	–0.001 (–0.01–0.01)	–0.003 (–0.01–0.01)	0.007 (–0.01–0.10)
Asian or Pacific Islander†	–0.169 (–0.53–0.20)	0.127 (–0.23–0.48)	–0.274 (–0.77–0.22)	0.168 (–0.29–0.62)	–0.117 (–0.49–0.26)	–0.059 (–0.70–0.57)
Black†	–0.243 (–0.53–0.04)	0.119 (–0.16–0.40)	**–0.608**** (–1.00–-0.22)	0.011 (–0.35–0.37)	–0.170 (–0.46–0.13)	0.255 (–0.25–0.75)
Hispanic	–0.194 (–0.31–0.16)	0.007 (–0.27–0.28)	–0.329 (–0.71–0.05)	–0.169 (–0.52–0.18)	0.136 (–0.15–0.42)	–0.107 (–0.60–0.38)
White†	–0.071 (–0.09–0.03)	0.013 (–0.22–0.24)	–0.091 (–0.41–0.23)	–0.121 (–0.42–0.17)	–0.218 (–0.46–0.02)	–0.238 (–0.65–0.17)
Marital status	0.154 (–0.03–0.34)	–0.140 (–0.32–0.04)	0.070 (–0.19–0.33)	–0.031 (–0.27–0.21)	–0.070 (–0.26–0.12)	0.035 (–0.29–0.36)
Education	–0.031 (–0.09–0.03)	**0.072*** (0.01–0.13)	–0.010 (–0.09–0.07)	0.048 (–0.03–0.13)	–0.023 (–0.09–0.04)	0.011 (–0.10–0.12)
Income	–0.016 (–0.04–0.01)	–0.010 (–0.04–0.02)	–0.025 (–0.06–0.01)	–0.024 (–0.06–0.01)	0.003 (–0.02–0.03)	**–0.051**** (–0.10–-0.01)
Parity	–0.015 (–0.09–0.06)	0.043 (–0.03–-0.12)	**0.155**** (0.05–0.26)	–0.033 (–0.13–0.07)	0.048 (–0.03–0.13)	–0.115 (–0.25–0.02)
Prepregnancy exercise	**–0.294**** (–0.044–0.15)	**0.308**** (0.17–0.45)	–0.109 (–0.31–0.09)	**0.270**** (0.09–0.45)	–0.084 (–0.23–0.07)	–0.030 (–0.28–0.22)
Health status	**0.124**** (0.05–0.19)	–0.057 (–0.16–0.01)	**0.177**** (0.08–0.27)	–0.061 (–0.15–0.03)	–0.005 (–0.08–0.07)	–0.043 (–0.17–0.08)
Model statistics						
ΔR^2	0.15	0.13	0.21	0.04	0.02	0.08
F	**4.45****	**3.94****	**6.19****	**1.78***	1.40	**2.75****

Table 4 Adjusted Regression Models.

Data are B coefficient (95% Confidence interval) unless noted otherwise.

* $p < 0.05$, ** $p < 0.01$; bolded.

† non-Hispanic.

DISCUSSION

The initial study concluded that individual health beliefs did not predict PA during pregnancy within a predictive linear regression model; however, the overall model significantly predicted PA when considering sociodemographic factors (Rebelle, 2022). In this secondary analysis, we conducted an in-depth examination to uncover the impact of sociodemographic factors on salient beliefs and behaviors regarding PA during pregnancy among women in the South and the association of provider counseling.

The descriptive statistics showed that there was large agreement among participants. Women in the study perceived a broad range of general benefits of PA and agreed on two prominent barriers: feeling too tired and unmotivated. This finding aligns with many studies that have shown fatigue to be a prevalent barrier to PA during pregnancy (Chang et al., 2015, Downs et al., 2015, Grenier et al., 2021, Nagourney et al., 2019, Swift et al., 2017, Sytsma et al., 2018, Kirkwood, 2019). Though PA increases energy during pregnancy, patients are often unaware of this benefit and believe exercise will increase their fatigue (Melton et al., 2016, Tinius et al., 2020).

Participants perceived themselves as most susceptible to mental health threats and lacked specific knowledge about their susceptibility to other chronic health conditions such as diabetes and heart disease. These conditions are leading causes of pregnancy-related morbidity and mortality (CDC, 2018, CDC, 2019) in the United States, with overweight, obesity, and inactivity as common antecedents. Most women perceived themselves as susceptible to anxiety and depression and viewed PA as a way to release tension and feel better psychologically. This finding aligns with recent studies that have described anxiety and depression as growing concerns among pregnant women (Basu et al., 2021, Liu et al., 2021). Additionally, providers in the South have reported an increase in pregnant patients' anxiety and negative mental

health outcomes (Nagpal et al., 2021). To address patients' primary perceived barriers and susceptibility, providers should encourage moderate-intensity exercise to decrease fatigue and improve mental health during pregnancy.

Sociodemographic factors were most associated with beliefs and behaviors, with exercise before pregnancy informing beliefs more than any other variable. Women who exercised before and during pregnancy reported feeling less tired and more motivated to exercise, highlighting the value of beginning exercise before pregnancy. Although, most participants obtained light PA from the daily necessities of household and caregiving. This finding is concerning because household and caregiving activities do not offer the same health benefits as exercise during pregnancy and can contribute to adverse health effects such as poor sleep quality (Hawkins et al., 2019), while even low levels of exercise can offer improved sleep and health benefits during pregnancy (Baker et al., 2018, Rodriguez-Blanque et al., 2018).

The examination of provider counseling's association with participants' beliefs and behaviors regarding PA during pregnancy revealed that providers were participants' main source of support, and counseling was positively perceived; however, provider counseling was not associated with increased PA. Conversely, provider advice was predictive of a slight increase in sedentary behavior in the regression models. This finding suggests that patients either did not follow provider advice to engage in PA or were advised to decrease activity during pregnancy. Studies report that women are often advised to restrict activity or go on bed rest even though it is not a recommended practice (McGee et al., 2018, Whitaker et al., 2019).

Our findings also align with previous studies that found pregnant patients positively perceive provider counseling on PA (Harrison et al., 2019, Heim et al., 2019, Whitaker et al., 2016) and often initiate it (Whitaker et al., 2019); however, provider communication regarding PA and behavior change is often ineffective (Blankenship et al., 2020, Chana, 2019). The Covid-19 pandemic has further decreased the time and energy providers have available for counseling patients, with many providers stretched to burnout (Bradford and Glaser, 2021).

This study has many strengths, including a diverse, well-powered sample of participants, which provided a broad representation of recently pregnant women and generalizability to pregnant women in the South. Moreover, the multifaceted quantitative analysis allowed for an in-depth examination of participants' beliefs and behaviors and the impact of provider counseling.

The study also had limitations. The online survey of self-reported retrospective data may have been prone to recall bias. Data collection occurred during the Covid-19 pandemic when depression and anxiety symptoms may have been higher among participants, potentially influencing perceptions of their recent pregnancy. Additionally, the length of the survey may have resulted in quality issues, and the sample provided by Qualtrics may not be truly representative of women in the South, as it excluded those without reliable internet access. Lastly, beyond the scope of this study was a consideration of how the trends identified by race are likely connected to a range of racism-related exposures in everyday life and healthcare spaces (Ford and Airhihenbuwa, 2010). The results echo patterns found in the existing literature on prenatal PA and provider counseling.

IMPLICATIONS FOR PRACTICE

The results of this study revealed that patients across sociodemographic factors face similar barriers to PA during pregnancy and lack knowledge of the specific benefits of PA and their susceptibility to chronic disease. Moreover, provider counseling was ineffective at increasing PA during pregnancy. Evidence-based patient counseling methods should be prioritized in early medical training. Adopting established methods of behavior change communication, such as motivational interviewing, also called motivational counseling (Syed et al., 2021), could offer efficient techniques that improve provider counseling while preserving providers' energy and well-being (Endrejat, 2021), resulting in better health outcomes and patient-provider experiences (Haverfield et al., 2020). Additionally, provider counseling should be performed in the context of factors that shape prenatal exercise practices (Jette et al., 2017). For instance, Jette and colleagues' embodied conceptual framework facilitates an evaluation of how social and structural (dis)advantages accumulate during the life course and across generations and are expressed in health-related behaviors and outcomes. This framework could work with

motivational interviewing to promote competent care (Avruch and Shaia, 2022) and inform larger-scale prenatal exercise interventions. Future research should examine the effectiveness of evidence-based counseling methods in increasing PA during pregnancy.

CONCLUSION

This study examined the sociodemographic factors related to women's beliefs and behaviors regarding PA during pregnancy in the South and whether women's beliefs and behaviors were associated with provider counseling. The results showed that participants viewed PA as beneficial; however, they had specific barriers to exercise during pregnancy and did not perceive themselves as susceptible to common health conditions. Participants looked to providers as their primary support for PA, although current methods of provider counseling appear ineffective. Providers should encourage patients to be physically active using evidence-based counseling to increase PA during pregnancy. Given the paucity of physical activity in the South and high levels of obesity-related chronic disease among expecting patients, improved provider counseling is essential to prenatal health.

ADDITIONAL FILE

The additional file for this article can be found as follows:

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REFERENCES

Alemu, B. T., Cramer, R. J., Carlisle, K. L., & **Akpinar-Elci, M.** (2017). A theoretical analysis of health beliefs of physical activity among women with previous gestational diabetes: A commentary. *American Journal of Health Education, 48*, 351–354. DOI: https://doi.org/10.1080/19325037.2017.1335627

Avruch, D. O., & **Shaia, W. E.** (2022). Macro MI: Using Motivational Interviewing to Address Socially-engineered Trauma. *Journal of Progressive Human Services, 33*, 176–204. DOI: https://doi.org/10.1080/10428232.2022.2063622

Baker, J. H., Rothenberger, S. D., Kline, C. E., & **Okun, M. L.** (2018). Exercise during early pregnancy is associated with greater sleep continuity. *Behav Sleep Med, 16*, 482–493. DOI: https://doi.org/10.1080/15402002.2016.1228649

Basu, A., Kim, H. H., Basaldua, R., Choi, K. W., Charron, L., Kelsall, N., Hernandez-Diaz, S., Wyszynski, D. F., & **Koenen, K. C.** (2021). A cross-national study of factors associated with women's perinatal mental health and well-being during the COVID-19 pandemic. *PLoS One, 16*, e0249780. DOI: https://doi.org/10.1371/journal.pone.0249780

Blankenship, M. M., Link, K. A., Henry, S. J., & **Tinius, R. A.** (2020). Patient and Provider Communication Regarding Exercise during Pregnancy in a Rural Setting. *Int J Exerc Sci, 13*, 1228–1241.

Boas, T., Christenson, D., & **Glick, D.** (2020). Recruiting large online samples in the United States and India: Facebook, Mechanical Turk, and Qualtrics. *Political Science Research and Science, 8*, 232–250. DOI: https://doi.org/10.1017/psrm.2018.28

Borodulin, K. M., Evenson, K. R., Wen, F., Herring, A. H., & **Benson, A. M.** (2008). Physical activity patterns during pregnancy. *Med Sci Sports Exerc, 40*, 1901–8. DOI: https://doi.org/10.1249/MSS.0b013e31817f1957

Bradford, L., & **Glaser, G.** (2021). Addressing Physician Burnout and Ensuring High-Quality Care of the Physician Workforce. *Obstet Gynecol, 137*, 3–11. DOI: https://doi.org/10.1097/AOG.0000000000004197

Carter, E. B., Stuart, J. J., Farland, L. V., Rich-Edwards, J. W., Zera, C. A., Mcelrath, T. F., & **Seely, E. W.** (2015). Pregnancy Complications as Markers for Subsequent Maternal Cardiovascular Disease: Validation of a Maternal Recall Questionnaire. *J Womens Health (Larchmt), 24*, 702–12. DOI: https://doi.org/10.1089/jwh.2014.4953

CDC. (2018). *Pregnancy Complications* [Online]. Available: https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-complications.html [Accessed].

CDC. (2019). *Pregnancy mortality surveillance system* [Online]. Available: https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm [Accessed].

CDC. (2021). *Nutrition, Physical Activity, and Obesity: Data, Trends, and Maps.* [Online]. Available: https://www.cdc.gov/nccdphp/dnpao/data-trends-maps/index.html [Accessed].

Chana, R., & **Haith-Cooper, M.** (2019). Diet and physical activity in pregnancy: a study exploring women's beliefs and behaviours. *British Journal of Midwifery, 27*, 297–304. DOI: https://doi.org/10.12968/bjom.2019.27.5.297

Chang, M. W., Nitzke, S., Buist, D., Cain, D., Horning, S., & **Eghtedary, K.** (2015). I am pregnant and want to do better but I can't: focus groups with low-income overweight and obese pregnant women. *Matern Child Health J, 19*, 1060–70. DOI: https://doi.org/10.1007/s10995-014-1605-x

Chasan-Taber, L., Schmidt, M. D., Roberts, D. E., Hosmer, D., Markenson, G., & **Freedson, P. S.** (2004). Development and validation of a Pregnancy Physical Activity Questionnaire. *Med Sci Sports Exerc, 36*, 1750–60. DOI: https://doi.org/10.1249/01.MSS.0000142303.49306.0D

Chin, H. B., Baird, D. D., Mcconnaughey, D. R., Weinberg, C. R., Wilcox, A. J., & **Jukic, A. M.** (2017). Long-term Recall of Pregnancy-related Events. *Epidemiology, 28*, 575–579. DOI: https://doi.org/10.1097/EDE.0000000000000660

Downs, D. S., Devlin, C. A., & **Rhodes, R. E.** (2015). The Power of Believing: Salient Belief Predictors of Exercise Behavior in Normal Weight, Overweight, and Obese Pregnant Women. *J Phys Act Health, 12*, 1168–76. DOI: https://doi.org/10.1123/jpah.2014-0262

Endrejat, P., & **Kauffeld, S. A.** (2021). Learning motivational interviewing: prospects to preserve practitioners' well-being. *International Journal of Workplace Health Management, 14*, 1–11. DOI: https://doi.org/10.1108/IJWHM-03-2020-0041

Faul, F., Erdfelder, E., Buchner, A., & **Lang, A. G.** (2009). Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods, 41*, 1149–60. DOI: https://doi.org/10.3758/BRM.41.4.1149

Ford, C. L., & **Airhihenbuwa, C. O.** (2010). Critical Race Theory, race equity, and public health: toward antiracism praxis. *Am J Public Health, 100*(Suppl 1), S30–5. DOI: https://doi.org/10.2105/AJPH.2009.171058

Grenier, L. N., Atkinson, S. A., Mottola, M. F., Wahoush, O., Thabane, L., Xie, F., Vickers-Manzin, J., Moore, C., Hutton, E. K., & **Murray-Davis, B.** (2021). Be Healthy in Pregnancy: Exploring factors that impact pregnant women's nutrition and exercise behaviours. *Matern Child Nutr, 17*, e13068. DOI: https://doi.org/10.1111/mcn.13068

Harrison, A. L., Taylor, N. F., Frawley, H. C., & **Shields, N.** (2019). Women with gestational diabetes mellitus want clear and practical messages from credible sources about physical activity during pregnancy: a qualitative study. *J Physiother, 65*, 37–42. DOI: https://doi.org/10.1016/j.jphys.2018.11.007

Haverfield, M. C., Tierney, A., Schwartz, R., Bass, M. B., Brown-Johnson, C., Zionts, D. L., Safaeinili, N., Fischer, M., Shaw, J. G., Thadaney, S., Piccininni, G., Lorenz, K. A., Asch, S. M., Verghese, A., & **Zulman, D. M.** (2020). Can Patient-Provider Interpersonal Interventions Achieve the Quadruple Aim of Healthcare? A Systematic Review. *J Gen Intern Med, 35*, 2107–2117. DOI: https://doi.org/10.1007/s11606-019-05525-2

Hawkins, M., Marcus, B., Pekow, P., Rosal, M. C., Tucker, K. L., Spencer, R. M. C., & **Chasan-Taber, L.** (2019). Physical Activity and Sleep Quality and Duration During Pregnancy Among Hispanic Women: Estudio PARTO. *Behav Sleep Med, 17*, 804–817. DOI: https://doi.org/10.1080/15402002.2018.1518225

Hayslip, B., Weigand, D., Weinberg, R., Richardson, P., & **Jackson, A.** (1996). The development of new scales for assessing health belief model constructs in adulthood. *Journal of Aging and Physical Activity, 4*, 307–323. DOI: https://doi.org/10.1123/japa.4.4.307

Headen, I., Cohen, A. K., Mujahid, M., & **Abrams, B.** (2017). The accuracy of self-reported pregnancy-related weight: a systematic review. *Obes Rev, 18*, 350–369. DOI: https://doi.org/10.1111/obr.12486

Heim, M. A., Miquelutti, M. A., & **Makuch, M. Y.** (2019). Perspective of pregnant women regarding antenatal preparation: A qualitative study. *Women Birth, 32*, 558–563. DOI: https://doi.org/10.1016/j.wombi.2018.11.016

Jette, S., Maier, J., Esmonde, K., & **Davis, C.** (2017). Promoting Prenatal Exercise From a Sociocultural and Life-Course Perspective: An "Embodied" Conceptual Framework. *Res Q Exerc Sport, 88*, 269–281. DOI: https://doi.org/10.1080/02701367.2017.1336662

Kirkwood, L., & **Leicht, A.** (2019). Relationship between physical activity participation and body image in pregnant and post-natal women. *Journal of Science and Medicine in Sport, 22*. DOI: https://doi.org/10.1016/j.jsams.2019.08.247

Liu, J., Hung, P., Alberg, A. J., Hair, N. L., Whitaker, K. M., Simon, J., & **Taylor, S. K.** (2021). Mental health among pregnant women with COVID-19-related stressors and worries in the United States. *Birth, 48*, 470–479. DOI: https://doi.org/10.1111/birt.12554

Lott, M. L., Power, M. L., Reed, E. G., Schulkin, J., & **Mackeen, A. D.** (2019). Patient Attitudes toward Gestational Weight Gain and Exercise during Pregnancy. *J Pregnancy, 2019*, 4176303. DOI: https://doi.org/10.1155/2019/4176303

Mcgee, L. D., Cignetti, C. A., Sutton, A., Harper, L., Dubose, C., & **Gould, S.** (2018). Exercise During Pregnancy: Obstetricians' Beliefs and Recommendations Compared to American Congress of Obstetricians and Gynecologists' 2015 Guidelines. *Cureus, 10*, e3204. DOI: https://doi.org/10.7759/cureus.3204

Mcparlin, C., Bell, R., Robson, S. C., Muirhead, C. R., & **Araujo-Soares, V.** (2017). What helps or hinders midwives to implement physical activity guidelines for obese pregnant women? A questionnaire survey using the Theoretical Domains Framework. *Midwifery, 49*, 110–116. DOI: https://doi.org/10.1016/j.midw.2016.09.015

Melton, B. F., Bland, H. W., Marshall, E. S., & **Bigham, L. E.** (2016). The Effectiveness of a Physical Activity Educational Campaign in a Rural Obstetrics and Gynecology Office. *Matern Child Health J, 20*, 2112–20. DOI: https://doi.org/10.1007/s10995-016-2039-4

Meyers, L. S., Gamst, G., & **Guarino, A. J.** (2016). *Applied multivariate research: Design and interpretation*, Sage Publications.

Murray-Davis, B., Berger, H., Melamed, N., Mawjee, K., Syed, M., Barrett, J., Ray, J. G., Geary, M., Mcdonald, S. D., For, D.-N., & **Investigators, S.** (2020). Gestational weight gain counselling practices among different antenatal health care providers: a qualitative grounded theory study. *BMC Pregnancy Childbirth, 20*, 102. DOI: https://doi.org/10.1186/s12884-020-2791-8

Nagourney, E. M., Goodman, D., Lam, Y., Hurley, K. M., Henderson, J., & **Surkan, P. J.** (2019). Obese women's perceptions of weight gain during pregnancy: a theory-based analysis. *Public Health Nutr, 22*, 2228–2236. DOI: https://doi.org/10.1017/S1368980019000703

Nagpal, T. S., Maples, J. M., Duchette, C., Altizer, E. A., & **Tinius, R.** (2021). Physical Activity during Pregnancy may Mitigate Adverse Outcomes Resulting from COVID-19 and Distancing Regulations: Perspectives of Prenatal Healthcare Providers in the Southern Region of the United States. *Int J Exerc Sci, 14*, 1138–1150.

Newton, E. R., & **May, L.** (2017). Adaptation of Maternal-Fetal Physiology to Exercise in Pregnancy: The Basis of Guidelines for Physical Activity in Pregnancy. *Clin Med Insights Womens Health, 10*. DOI: https://doi.org/10.1177/1179562X17693224

Organization, W. H. (2020). *Physical Activity.* [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/physical-activity [Accessed].

Rebelle, C. C. (2022). *Health Beliefs as Predictors of Physical Activity During Pregnancy in the South.* PhD, Grand Canyon University.

Rodriguez-Blanque, R., Sanchez-Garcia, J. C., Sanchez-Lopez, A. M., Mur-Villar, N., & **Aguilar-Cordero, M. J.** (2018). The influence of physical activity in water on sleep quality in pregnant women: A randomised trial. *Women Birth, 31*, e51–e58. DOI: https://doi.org/10.1016/j.wombi.2017.06.018

Santo, E. C., Forbes, P. W., Oken, E., & **Belfort, M. B.** (2017). Determinants of physical activity frequency and provider advice during pregnancy. *BMC Pregnancy Childbirth, 17*, 286. DOI: https://doi.org/10.1186/s12884-017-1460-z

Schwarzer, R., & **Renner, B.** (2005). *Health-specific self-efficacy scales.* [Online]. Freie Universität Berlin, Berlin, Germany. Available: http://userpage.fu-berlin.de/~health/healself.pdf [Accessed].

Swift, J. A., Langley-Evans, S. C., Pearce, J., Jethwa, P. H., Taylor, M. A., Avery, A., Ellis, S., Mcmullen, S., & **Elliott-Sale, K. J.** (2017). Antenatal weight management: Diet, physical activity, and gestational weight gain in early pregnancy. *Midwifery, 49*, 40–46. DOI: https://doi.org/10.1016/j.midw.2017.01.016

Syed, H., Slayman, T., & **Duchene Thoma, K.** (2021). ACOG Committee Opinion No. 804: Physical Activity and Exercise During Pregnancy and the Postpartum Period. *Obstet Gynecol, 137*, 375–376. DOI: https://doi.org/10.1097/AOG.0000000000004266

Sytsma, T. T., Zimmerman, K. P., Manning, J. B., Jenkins, S. M., Nelson, N. C., Clark, M. M., Boldt, K., & **Borowski, K. S.** (2018). Perceived Barriers to Exercise in the First Trimester of Pregnancy. *J Perinat Educ, 27*, 198–206. DOI: https://doi.org/10.1891/1058-1243.27.4.198

Tinius, R. A., Lopez, J. D., Cade, W. T., Stein, R. I., Haire-Joshu, D., & **Cahill, A. G.** (2020). Patient and obstetric provider communication regarding weight gain management among socioeconomically disadvantaged African American women who are overweight/obese. *Women Health, 60*, 156–167. DOI: https://doi.org/10.1080/03630242.2019.1616044

United States Census Bereau. (1995). *Statistical Abstract of the United States: 1995 (115th Edition)* [Online]. Available: https://www.census.gov/library/publications/1995/compendia/statab/115ed.html [Accessed].

Whitaker, K. M., Baruth, M., Schlaff, R. A., Talbot, H., Connolly, C. P., Liu, J., & **Wilcox, S.** (2019). Provider advice on physical activity and nutrition in twin pregnancies: a cross-sectional electronic survey. *BMC Pregnancy Childbirth, 19*, 418. DOI: https://doi.org/10.1186/s12884-019-2574-2

Whitaker, K. M., Wilcox, S., Liu, J., Blair, S. N., & **Pate, R. R.** (2016). Patient and Provider Perceptions of Weight Gain, Physical Activity, and Nutrition Counseling during Pregnancy: A Qualitative Study. *Womens Health Issues, 26*, 116–22. DOI: https://doi.org/10.1016/j.whi.2015.10.007

Zack, E. S., Kennedy, J., & **Long, J. S.** (2019). Can nonprobability samples be used for social science research? A cautionary tale. *Survey Research Methods, 13*, 215–227.

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