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Enhanced Curriculum Intervention Did Not Result in Increased Postnatal Physical Activity in Rural, Southern, Primarily African American Women

Jessica L. Thomson, PhD[1], Lisa M. Tussing-Humphreys, PhD, RD, LDN[2], Melissa H. Goodman, PhD[1], and Alicia S. Landry, PhD, RD, LDN, SNS[3]

Abstract

Purpose: To test the impact of an enhanced home visiting curriculum on postnatal physical activity in rural, southern, primarily African American mothers.

Design: Randomized controlled trial.

Setting: Three rural counties in Mississippi.

Participants: Between September 2013 and May 2016, 54 postpartum women randomized to standard home visiting curriculum (n = 30 control) or lifestyle enhanced home visiting curriculum (n = 24 experimental) were followed for 12 months.

Intervention: The experimental arm of the intervention built upon the Parents as Teachers curriculum (control arm) by adding culturally tailored, maternal weight management and early childhood obesity prevention components.

Measures: Physical activity behavior and related psychosocial constructs including attitudes, expectations, self-efficacy, social support, and barriers.

Analysis: Generalized linear mixed models were applied to test for treatment and time effects on physical activity and related psychosocial constructs.

Results: Postnatal retention rates were 83% and 88% for control and experimental arms, respectively. Mean weekly minutes of moderate-to-vigorous physical activity were 28 and 50 minutes at postnatal months 1 and 12 in the control arm and 40 minutes for both time points in the experimental arm. Although a significant time effect was found, pairwise comparisons failed to reach statistical significance.

Conclusion: The enhanced treatment was not effective at increasing postnatal physical activity nor improving related psychosocial construct measures in this cohort of rural, southern women.

Keywords

postnatal, physical activity, African American, women, home visiting

Purpose

Performing recommended amounts of daily physical activity is difficult for all individuals, but perhaps more so for women who have recently given birth. This is troublesome given the known benefits of postnatal physical activity for women including strengthening and toning abdominal muscles, boosting energy, promoting better sleep, relieving stress, improving fitness, and supporting return to prepregnancy body weight.[1,2] Women who have recently given birth have common barriers to physical activity (eg, lack of time or access to facilities) coupled with unique barriers such as added responsibilities involving the care of their infant which may result in fatigue from lack of sleep as well as feelings of social isolation (ie, no one to exercise with).[3] Hence, interventions designed to positively impact physical activity in women during the

[1] United States Department of Agriculture, Agricultural Research Service, Stoneville, MS, USA
[2] Department of Medicine and Cancer Center, University of Illinois at Chicago, Chicago, IL, USA
[3] Department of Family and Consumer Sciences, University of Central Arkansas, Conway, AR, USA

Corresponding Author:
Jessica L. Thomson, United States Department of Agriculture, Agricultural Research Service, 141 Experiment Station Road, Stoneville, MS 38776, USA.
Email: jessica.thomson@ars.usda.gov

postnatal period must address commonly reported barriers as well as the unique challenges caring for a new infant entail.

To overcome barriers related to performing regular physical activity, confidence in one's ability to make and maintain behavior changes in nonsupportive situations (eg, sedentary behavior settings or opportunities) is required.[4] This confidence or self-efficacy is a psychosocial construct that has been strongly linked to performing physical activity. Positive associations between physical activity and self-efficacy for engaging in physical activity have been reported in African American women[5] and women who have recently given birth.[6] Other psychosocial constructs related to physical activity include attitudes toward and expectations about physical activity. The attitude that it is important to be physically active for health, a belief held by postpartum women,[7] was positively associated with physical activity participation in African American women.[8] Likewise, outcome expectations for physical activity were significantly associated with participation in lifestyle physical activity in African American women.[9] Thus, perceived barriers, self-efficacy, attitudes, and expectations should be considered when designing physical activity interventions targeting African American women in the postnatal period. Social support from family and friends is another construct positively associated with physical activity behaviors in African American and postpartum women.[3,9] Consequently, while the study was not specifically designed to affect social support, it was measured due to its importance in the target population.

The Delta Healthy Sprouts Project was designed to test the comparative impact of 2 maternal, infant, and early childhood home visiting curricula on weight status, dietary intake, physical activity, and other health behaviors of women and their infants residing in the rural Lower Mississippi Delta region of the United States.[10] Results of the gestational period have been reported elsewhere.[11-13] Descriptions and comparisons of longitudinal physical activity outcomes of Delta Healthy Sprouts participants during the postnatal period are presented in this article. Specifically, longitudinal changes in maternal physical activity and related psychosocial construct measures were assessed within and between the control and intervention arms. Psychosocial constructs included physical activity related attitudes, expectations, self-efficacy, social support (family and friends), and barriers. Additionally, associations among maternal physical activity and related psychosocial constructs were explored.

Methods

Design

Delta Healthy Sprouts was a randomized 2-arm parallel controlled trial. It was designed to evaluate the impact of the Parents as Teachers (PAT, control) curriculum as compared with a nutrition and physical activity enhanced PAT curriculum (PATE, experimental) on maternal gestational weight gain, postpartum weight control, and childhood obesity prevention. Participants were randomly assigned to 1 of 2 treatment arms, PAT control or PATE experimental and subsequently followed for 18 months (6 months gestation through 12 months postnatal). At the baseline (gestational month 4) visit, informed written consent was obtained from study participants, demographic data and anthropometric measures were collected, 24-hour dietary recalls were conducted, and physical activity as well as other questionnaires were administered. Both arms of the intervention were delivered in the home to women beginning early in their second trimester of pregnancy by trained parent educators. Parent educators were African American, college educated women residing in the target communities. Home visits occurred monthly and were approximately 60 to 90 minutes in length for the PAT lessons and approximately 90 to 120 minutes for the PATE lessons. The project was approved by the institutional review board of the Delta State University (IRB protocol number 12-024) and is registered at clinicaltrials.gov (NCT01746394).

Sample

Recruitment occurred via passive (distribution of flyers and brochures) and active (study staff on-site) methods at local health clinics and medical facilities serving pregnant women and at local health fairs. Women were also referred to the study by health clinic/department staff, Special Supplemental Nutrition Assistance Program (SNAP) for Women, Infants, and Children (WIC) nutritionists, social service agencies, and enrolled study participants. Inclusion criteria were as follows: at least 18 years of age; less than 19 weeks pregnant with first, second, or third child; singleton pregnancy; and resident of Washington, Bolivar, or Humphreys County in Mississippi. Recruitment efforts were focused on African American women. However, race was not an inclusion criterion because community stakeholders expressed concern about excluding women of other races who also could benefit from study participation. Participant enrollment occurred on a rolling basis; hence, baseline data were collected from 82 pregnant women ($n = 43$ PAT and $n = 39$ PATE participants) between March 2013 and December 2014.

The target enrollment was 75 women in each of the 2 arms (control and experimental). The sample size of 150 women was based on the following assumptions: 20% attrition rate, mean 12-month postnatal weight loss of 1.5 kg in the control arm, and a 3.8-kg difference between treatment arms for 12-month postnatal weight loss.[14] Power and sample size calculations for gestational weight gain within the Institute of Medicine recommendations and child obesity at 1 year of age also were performed.[10] However, recruitment was stopped by the study's principal investigator prior to reaching these numbers due to unexpected difficulties recruiting pregnant women meeting study criteria. Recruitment was extended as long as possible, but fiscal issues eventually necessitated the closing of this period. Data collection was completed in May 2016.

Because maternal postnatal physical activity was the primary focus of this article, analyses were conducted only for the postnatal cohort (participants who completed the gestational period

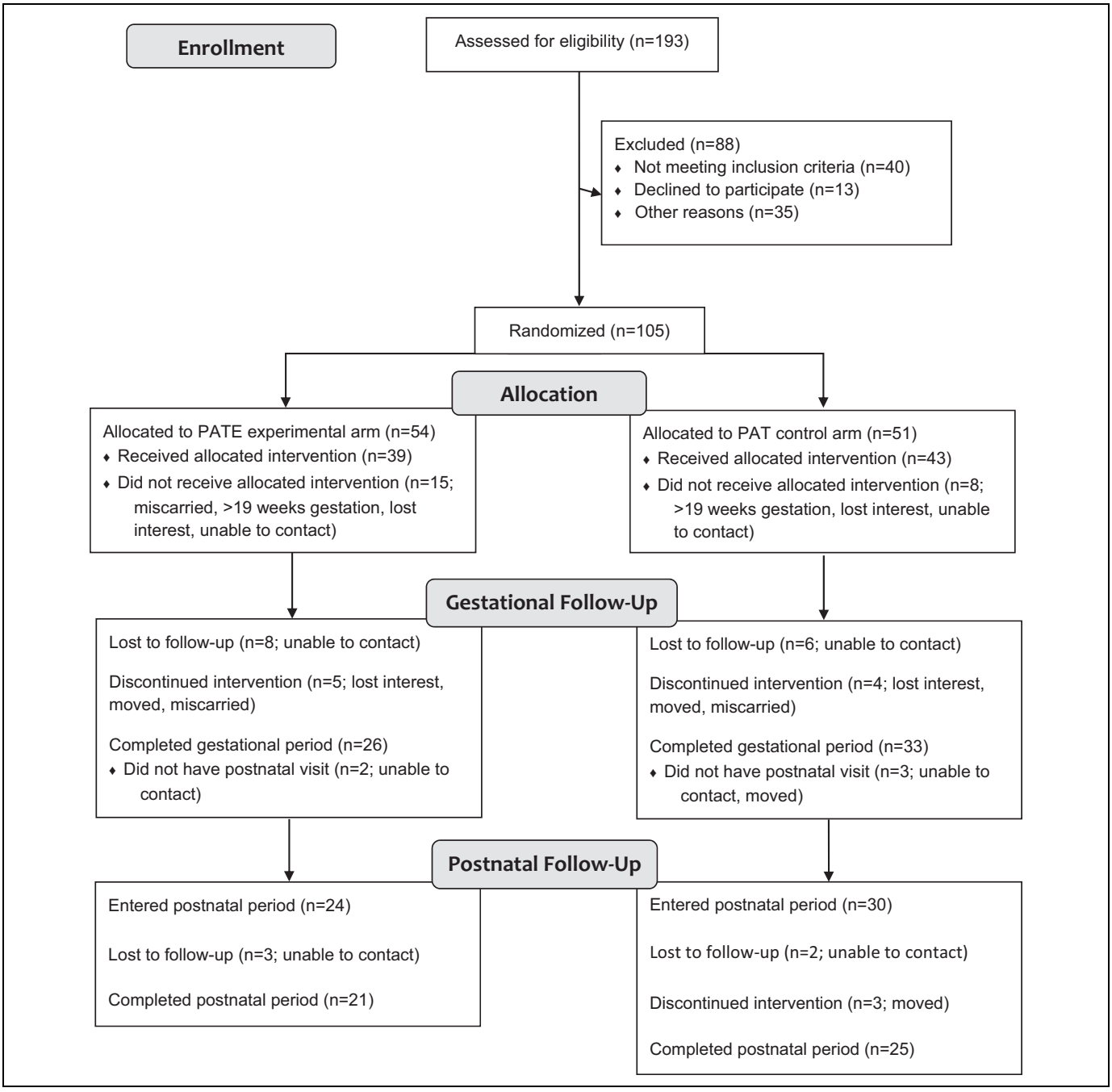

Figure 1. CONSORT flow diagram of recruitment, assignment, enrollment, and completion of gestational and postnatal periods.

and had at least 1 visit in the postnatal period; n = 54). Five participants who completed the gestational period but dropped out of the study prior to the postnatal month (PM) 1 visit were excluded from the postnatal cohort. Additionally, visits occurring after conception for 1 PAT and 4 PATE participants who became pregnant again between the PM 2 and PM 10 visits were excluded from the analyses. Conception dates were determined by inputting participants' reported due dates into an online pregnancy calculator (http://www.calculator.net/pregnancy-calculator.html.). Figure 1 illustrates the CONSORT diagram.

Measures

Postnatal physical activity data were collected from participants at the PM 1, 6, and 12 visits using a modified version of the Pregnancy and Physical Activity Questionnaire (PPAQ).[15] Modifications included small wording changes (eg, driving or riding in a car vs driving or riding in a car or bus) and time frame adjustment (during this month vs during this trimester) to make the instrument more relevant to this population of rural, southern women and the Delta Healthy Sprouts study design. This 26-item instrument allows for the

calculation of physical activity duration, intensity, specific type (ie, sedentary, light intensity, moderate intensity, vigorous intensity, household/caregiving, occupational, and sports/exercise), and total activity. Test–retest reliability (intraclass correlation coefficients) ranged from 0.78 for total activity to 0.93 for occupational activity, while correlations between PPAQ total activity and actigraph cut points ranged from 0.08 to 0.43.[15] The duration of time spent in each activity was multiplied by its intensity to arrive at a measure of average weekly energy expenditure attributable to each activity.[15] Moderate and vigorous intensity physical activity responses were combined into a single category, moderate-to-vigorous physical activity (MVPA), because so few women reported time spent in vigorous activity and minutes of MVPA is a commonly reported measure of physical activity. Additionally, participants' physical activity level was classified as low, moderate, or high using the algorithm given in the 2005 Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire.[16]

Psychosocial constructs related to physical activity, including attitudes, expectations, self-efficacy, social support (family and friends), and barriers,[17-20] were measured at the PM 1 and 12 visits. Attitude was composed of 5 survey items that included a mix of health topics including diet, physical activity, weight gain, and chronic disease. Because not all items were specific to physical activity, the item "How important is it for you to be physically active/exercise daily?" was analyzed separately. Responses for the attitude items included not at all important, somewhat important, and very important (1, 2, and 3 points, respectively); higher scores reflected more positive attitudes. Internal consistency was 0.82 for the total scale.[18] Physical activity expectations (5 items) and barriers (7 items) were assessed using 6 agreement responses ranging from strongly disagree (1 point) to strongly agree (6 points). Higher expectation scores reflected higher expectations about the benefits of physical activity, while higher barrier scores reflected more perceived barriers to performing physical activity. Internal consistency for expectations and barriers ranged from 0.55 to 0.73.[17] Self-efficacy for physical activity (5 items) was assessed using 5 confidence statements ranging from not confident (1 point) to extremely confident (5 points); higher scores reflected higher self-efficacy. Test–retest and internal consistency values were 0.68 and 0.83, respectively, while correlations with reported health habits ranged from 0.32 to 0.40.[20] Social support for physical activity from family and friends (6 items each) was assessed using 5 frequency responses ranging from almost never (1 point) to almost always (5 points); higher scores reflected more social support. Test–retest values ranged from 0.77 to 0.79, internal consistency values ranged from 0.84 to 0.91, and correlations with reported health habits ranged from 0.35 to 0.46.[19] Although these items were taken from validated instruments, internal consistency of the 5 scales was assessed in this study as well. Scale scores were computed by summing the numeric response values for the individual items composing the scale. Negatively worded items were reverse coded prior to summing.

Anthropometric measures obtained on the participants at the baseline visit included height, which was measured in duplicate using a portable stadiometer (model Seca 217; Seca, Birmingham, United Kingdom), and weight, which was measured using a digital scale (model SR241; SR Instruments, Tonawanda, New York). Both measures were performed without shoes or heavy clothing. Prepregnancy body weight was self-reported. Body mass index (BMI) was calculated as weight (kg) divided by height (m^2), where height was averaged if the 2 measurements differed.

Participants provided self-reported information regarding demographic characteristics (eg, age, marital status, household size, education, employment, household income, insurance, prenatal care), SNAP and WIC participation, health history, current health conditions, breastfeeding intent and duration, and psychosocial constructs of diet.[19-23] Details regarding other measures and questionnaire data that were collected, but are not relevant to the present paper, have been published elsewhere.[10] All measures and questionnaires were collected or administered by trained research staff (Parent Educators) using laptop computers loaded with relevant software (ie, Snap Surveys).

Intervention

The PAT control arm of the intervention followed the nationally recognized, evidence-based, Parents as Teachers® curriculum which included one-on-one home visits, optional monthly group meetings, developmental screenings, and a resource network for families. The program seeks to increase parental knowledge of child development, improve parenting practices, provide early detection of developmental delays, prevent child abuse, and increase school readiness.[24] Using the PAT model, parent educators provided parents with research-based information and activities during home visits. Examples of research-based information included ways to build attachment with their infant, the importance of immunizations, recommended amounts of sleep based on their infant's age, and how to introduce solid foods to their infant. Examples of activities included proper methods for holding and soothing their infant, teaching their infant to reach for and push objects, tummy time for their infants, and using small snacks or objects to build their infant's fine motor control. Materials were responsive to parental information requests and were tailored to the age of the child (or gestational age of the fetus).

The PATE experimental arm of the intervention built upon the PAT curriculum by adding culturally tailored, maternal weight management and early childhood obesity prevention components. Emphasis was placed on educating mothers about the ways in which they can facilitate the development of appropriate eating, physical activity, and other health behaviors in their children, including modeling these behaviors themselves. The PATE curriculum was guided by the theoretical underpinnings of the social cognitive theory[25] (eg, maternal modeling of positive health behaviors) and the transtheoretical model of behavior change[4] (eg, provision of information regarding the importance of daily physical activity to positively affect

decisional balance and discussions about overcoming personal barriers to physical activity to improve self-efficacy). Foundational elements from the Diabetes Prevention Program were also incorporated and included a flexible, culturally sensitive, individualized educational curriculum taught on a one-to-one basis.[26] Flexibility was characterized by the ability of participants to request and receive specific nutrition and physical activity information of interest to them. The use of recruitment flyers, monthly newsletters, and instructional digital video disks that contained pictures of African American women and infants and the provision of cookbooks containing regional/local recipes that were modified to include healthier preparations or ingredient substitutions embodied cultural sensitivity. The use of US Department of Agriculture MyPlate daily eating plans for gestational or postnatal periods, weight gain and loss charts, and personal goal setting for diet and physical activity represented the individualized aspect of the curriculum. Finally, anticipatory guidance and parenting support principles, elements from the Infant Feeding Activity and Nutrition Trial,[27] were integrated into the experimental curriculum. Anticipatory guidance involves providing practical, developmentally appropriate, child health information to parents in anticipation of significant physical, emotional, and psychological milestones.[28] Parenting support emphasizes children's psychological and behavioral goals, logical and natural consequences, mutual respect, and encouragement techniques.[29]

The PATE intervention components included appropriate weight gain during pregnancy and weight management after pregnancy, nutrition and physical activity in the gestational (mother) and postnatal (mother and infant) periods, breastfeeding, appropriate introduction of solid foods, and parental modeling of positive health behaviors. Postnatal maternal physical activity was one of the topics of the PM 6, 9, and 11 visits. Additionally, participants set exercise goals at each of the postnatal visits. Parent educators were trained to discuss barriers to performing physical activity as well as ways to overcome these barriers. Further details regarding parent educator training, lesson plan outlines, schedules, and study methodology have been published elsewhere.[10]

Analysis

Statistical analyses were performed using SAS software, version 9.4 (SAS Institute Inc, Cary, North Carolina). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize participants' sociodemographic characteristics and anthropometric measures. Chi-square tests of association or Fisher exact tests (categorical measures) and 2-sample t tests (continuous measures) were used to assess differences between PAT and PATE participants' baseline, gestational, and some postnatal characteristics and measures.

Reliability (consistency) of the psychosocial construct scales of physical activity was computed using Cronbach coefficient α. Reliability was assessed because the scales represented modified versions of the original validated instruments. A Cronbach α value of 0.7 or above was considered acceptable reliability.[30] Associations between physical activity and psychosocial constructs of physical activity measured at the PM 1 and 12 visits were computed using Pearson correlation coefficients.

Generalized linear mixed models, using maximum likelihood estimation, were used to test for significant treatment, time, and treatment $\times$ time (interaction) effects on postnatal physical activity outcomes. Maximum likelihood estimation is an approach for handling missing data in repeated measures. Distributions of the postnatal psychosocial construct and MVPA variables were checked for approximate normality based on both goodness-of-fit tests (Cramer-von Mises and Anderson-Darling) and visual inspection. All distributions either passed the goodness-of-fit tests or failed the tests but appeared sufficiently normal for the underlying assumptions of normality to be reasonable for practical purposes of analysis. Hence, postnatal psychosocial constructs and MVPA were modeled using a Gaussian (normal) distribution with an identity link function for which expected values of outcome variables are linear functions of the explanatory variables. Treatment (PAT vs PATE) was modeled as a fixed effect for all outcomes. Time (PM 1, 6, and 12 visits) was modeled as a repeated measure using a variance covariance structure. Least squares means with 95% confidence limits were computed using these models. Importance of daily physical activity was modeled using a binomial distribution with a logit link function and time was modeled as a repeated measure using an independent correlation matrix. Least squares means (log odds) with 95% confidence limits were computed using these models. The first set of models included treatment, time, and treatment $\times$ time as fixed (explanatory) effects. A second MVPA model included the importance of daily physical activity and postnatal BMI (continuous form) both at PM 1 as additional explanatory variables. The significance level of the tests was set at 0.05.

Results

Postnatal period retention rates for the PAT and PATE treatment arms were 83% (25/30) and 88% (21/24) and did not differ significantly between treatment arms ($P = .668$). Mean number of postnatal visits was 10.2 and 9.9 ($P = .717$) for PAT and PATE participants, respectively. Table 1 presents comparisons between treatment arms for baseline sociodemographic and anthropometric characteristics of the postnatal cohort. Significant differences between PAT and PATE participant characteristics at baseline were not found, with the exception of percentages receiving SNAP benefits (ie, food and nutrition assistance for low-income individuals and families). Significantly more PAT participants (87%) received SNAP benefits as compared to PATE participants (63%). The majority of both PAT and PATE participants were African American (97% and 96%), single (87% and 92%), receiving WIC (93% and 83%), and young (mean age = 24 and 23 years). Additionally, mean postpregnancy BMI was in the obese category for both PAT (30 kg/m^2) and PATE (32 kg/m^2) participants.

Table 1. Baseline Sociodemographic and Anthropometric Characteristics of Delta Healthy Sprouts Participants by Treatment Arm.

	PAT (n = 30)		PATE (n = 24)		
Characteristic	n	%	n	%	*P*
Race					1.000
African American	29	96.7	23	95.8	
White	1	3.3	1	4.2	
Marital status					.682
Single[a]	26	86.7	22	91.7	
Married	4	13.3	2	8.3	
Education level					.462
≤High school graduate	12	40.0	12	50.0	
≥Some college/technical	18	60.0	12	50.0	
Employment status					.608
Full-time/part-time	10	33.3	11	45.8	
Unemployed (looking)	12	40.0	7	29.2	
Homemaker/student	8	26.7	6	25.0	
Smoker in household	7	23.3	9	37.5	.257
Smoker[b]					.620
Current	1	3.3	1	4.2	
Stopped before pregnancy	1	3.3	0	0.0	
Stopped after became pregnant	1	3.3	0	0.0	
Nonsmoker	27	90.0	23	95.8	
Medicaid health insurance	30	100.0	24	100.0	.703
Receiving SNAP	26	86.7	15	62.5	.039
Receiving WIC	28	93.3	20	83.3	.389
	Mean	SD	Mean	SD	*P*
Age, years	24.1	4.76	23.0	4.96	.380
Household size	3.6	1.61	4.2	1.52	.221
Prepregnancy BMI[c]	28.6	8.18	29.2	7.72	.762
Postpregnancy BMI[d]	30.4	7.73	31.6	7.77	.577

Abbreviations: BMI, body mass index; PAT, parents as teachers control treatment; PATE, parents as teachers enhanced experimental treatment; SD, standard deviation; SNAP, supplemental nutrition assistance program; WIC, special SNAP for women, infants, and children.
[a]Includes 1 participant who indicated she is divorced.
[b]Comparison: non versus all other responses.
[c]Based on measured height and self-reported weight.
[d]Based on weight measured at first postnatal visit.

Table 2 presents postnatal physical activity (weekly minutes of MVPA) results. Physical activity was analyzed in continuous form because so few participants were classified as performing a moderate level of physical activity (5 or less participants at each of the 3 time points) and no participants performed at the high level. Mean MVPA for PAT participants was 28, 50, and 50 minutes per week at PM 1, 6, and 12, respectively. Mean MVPA for PATE participants was 40, 42, and 40 minutes per week at PM 1, 6, and 12, respectively. Although a significant time effect was found, pairwise tests failed to reach statistical significance. Similarly, neither the importance of daily physical activity nor postnatal BMI at PM 1 was significant explanatory variables for postnatal MVPA in the second model analyzed.

Reliability was sufficient for physical activity expectations, self-efficacy, social support for family, social support for friends, and barriers scales at PM 1 (Cronbach $\alpha = 0.90$, 0.96, 0.86, 0.86, and 0.86, respectively). Likewise, reliability was sufficient for the attitude scale encompassing diet, physical activity, and chronic disease at PM 1 (Cronbach $\alpha = 0.82$).

Table 2. Weekly Minutes of Moderate to Vigorous Physical Activity Performed by Delta Healthy Sprouts Participants in the Postnatal Period by Treatment Arm and Visit (Time).

	PAT (n = 30)[a,b]			PATE (n = 24)[c,d]			*P*		
Visit	LSM	95% CL		LSM	95% CL		Arm	Time[e]	Int
PM 1	27.8	17.32	38.21	39.8	28.13	51.49	.785	.043	.075
PM 6	49.5	36.52	62.56	42.1	26.78	57.34			
PM 12	50.2	37.5	63.0	40.1	25.08	55.20			

Abbreviations: CL, confidence limit; Int, interaction; LSM, least squares mean; PAT, parents as teachers control treatment; PATE, parents as teachers enhanced experimental treatment; PM, postnatal month.
[a]Excluded postconception visits for 1 PAT participant who became pregnant again in the postnatal period.
[b]One PAT participant completed Pregnancy Physical Activity Questionnaire (PPAQ) at PM 2 due to missed PM 1 visit.
[c]Excluded postconception visits for 4 PATE participants who became pregnant again in postnatal period.
[d]Three PATE participants completed PPAQ at PM 7 due to missed PM 6 visits; 1 PATE participant completed PPAQ at PM 8 due to missed PM 6 and PM 7 visits.
[e]Pairwise time comparisons failed to reach statistical significance.

Results of the correlation analysis for MVPA and psychosocial constructs for physical activity revealed few significant results. Weekly minutes of MVPA at PM 1 were significantly correlated with expectations ($r = 0.29$, $P = .036$) and friend support ($r = 0.28$, $P = .040$) at PM 1. No other associations between MVPA at PM 1, 6, or 12, and psychosocial constructs for physical activity were significant.

Table 3 presents longitudinal comparisons between treatment arms for the psychosocial constructs related to physical activity. Social support for physical activity from friends was significantly higher across time in the PATE as compared to the PAT arm. Additionally, at both time points, PAT participants were as likely to indicate that daily physical activity is very important versus not at all or somewhat important. However, PATE participants were over twice as likely to indicate that daily physical activity is very important versus not at all or somewhat important at PM 1, while they were equally as likely to indicate either response at PM 12. There were no other significant differences or changes in the psychosocial constructs.

Discussion

In this article, descriptions and comparisons of postnatal maternal physical activity behaviors as well as related psychosocial constructs for rural, southern, primarily African American women who participated in the Delta Healthy Sprouts Project are presented. Results indicate that the enhanced PATE curriculum was not effective at increasing physical activity for this cohort of primarily sedentary women during the 12 months following the birth of their infant. Further, the enhanced PATE

Table 3. Postnatal Physical Activity Psychosocial Constructs of Delta Healthy Sprouts Participants by Treatment Arm and Time (Visit).

		PAT (n = 30)						PATE (n = 24)						*P*		
		PM 1			PM 12			PM 1			PM 12					
Measure[a]	Range	LSM	95% CL		LSM	95% CL		LSM	95% CL		LSM	95% CL		Arm	Time	Int
Attitudes[b]	5-15	13.0	12.3	13.7	13.5	12.7	14.3	13.7	12.9	14.5	13.1	12.3	14.0	.744	.962	.202
Expectations	5-30	26.8	25.6	28.0	27.0	25.6	28.4	27.5	26.1	28.8	27.0	25.6	28.5	.606	.878	.656
Self-efficacy	5-25	9.3	7.7	11.0	9.0	7.2	10.8	11.0	9.2	12.8	9.4	7.5	11.4	.240	.285	.509
Social support family	6-30	21.0	19.1	22.9	20.3	18.2	22.3	21.9	19.8	24.0	20.1	17.9	22.4	.696	.240	.601
Social support friends	6-30	18.2	16.8	19.6	18.6	17.1	20.1	20.6	19.0	22.1	19.5	17.9	21.2	.034	.666	.341
Barriers	7-42	20.6	18.1	23.2	22.4	19.6	25.3	20.0	17.1	22.9	19.2	16.1	22.3	.174	.725	.358
Importance[c]		1.00	0.49	2.05	1.78	0.79	4.02	2.43	1.01	5.86	1.10	0.47	2.59	.427	.067	.016

Abbreviations: CL, confidence limit (upper and lower bounds); Int, interaction; LSM, least squares mean; PAT, parents as teachers control treatment; PATE, parents as teachers enhanced experimental treatment; PM, postnatal month.
[a]Higher scores indicate more positive outcomes with exception of barriers.
[b]Overall attitude toward healthy behavior including physical activity, diet, weight, and chronic disease.
[c]Single item taken from attitudes scale (importance of daily physical activity); very important versus not at all/somewhat important. LSM = odds ratio.

curriculum did not result in positive changes in physical activity related to attitudes, expectations, self-efficacy, social support from family and from friends, or barriers at the end of 12 months. The lack of intervention effect observed in this study is troublesome given that these women were generally performing less than one-third of the recommended 150 minutes of weekly MVPA. Clearly, the sedentary behavior of this population of rural, southern, low-income, primarily African American women is a significant public health concern.

Possible explanations for the lack of intervention effect may be found in the psychosocial constructs related to physical activity. Physical activity expectations have been positively correlated with performed physical activity in African American women.[9] However, PATE participants' physical activity expectations and attitudes toward healthy behaviors, including the single item addressing daily physical activity, were high in the early postnatal period leaving little room for improvement. However, the decrease in likelihood that PATE participants believed daily physical activity to be very important at PM 12 as compared to PM 1 was surprising and concerning given the PATE curriculum's emphasis on performing recommended amount of physical activity. It is possible that this negative change was the result of the PATE participants' reactance to the intervention.[31] That is, PATE participants may have felt pressured by the Parent Educators (eg, setting monthly physical activity goals or discussing why goals were not met) to accept the importance of daily physical activity which resulted in its unintended devaluing. If this adverse reaction occurred, it may help explain why weekly minutes of MVPA did not change in the postnatal period for PATE participants.

Supporting the reactance to the intervention explanation is the significant time effect found for weekly minutes of MVPA that was arguably driven by the PAT participants. The PAT curriculum did not include any physical activity intervention other than child-related materials and activities (eg, suggestions for active play with young children). Thus, the increase in physical activity observed in the PAT arm likely represents the change one would expect to occur as women recover from the stress of birth and fatigue associated with the care of an infant. Conversely, the added information and discussions about the importance of daily physical activity that were part of the PATE curriculum may have caused reactance to this behavior resulting in the lack of any apparent increase in activity for the PATE arm.

Another possible explanation for the lack of intervention effect may be related to self-efficacy. Higher levels of self-efficacy for physical activity as well as self-efficacy for overcoming perceived barriers to physical activity have been associated with higher levels of physical activity in postnatal women.[6] The low levels of self-efficacy apparent in PATE participants throughout the postnatal period coupled with the lack of reduction in perceived barriers suggest that the intervention was not effective at empowering these women to make positive changes in their physical activity. A look at the percentages of PATE participants setting and meeting their physical activity goals lends support to this hypothesis. All but 1 PATE participant consistently set physical activity goals (defined as setting goals for more than 70% of the visits). However, only 30% of participants met their goals more than 50% of the time, implying that while these participants were willing to set goals, they were unable to achieve them the majority of the time.

Despite the lack of intervention effect found in the current study, other researchers have been successful in their efforts to increase the amount of physical activity performed by postnatal women. However, we would argue that the target population for the current study presented challenges that were not all present in participants of the successful interventions, including relatively young age, predominantly African American and of low socioeconomic status, majority obese, single parent household, sedentary, and rural county residency. In a tailored telephone counseling plus web site intervention study, participants were older (mean age of 32 years), married (>77%), more highly educated, primarily Asian or Pacific Islander, and had a

mean BMI in the overweight category.[32] In a telephone-based pilot study, participants were older (mean age of 31 years), predominantly white (94%), and performed higher amounts of exercise at baseline (69 minutes/week as compared to <40 minutes/week in our study).[33] Further, the contact frequency for the pilot study was higher (weekly) than in our study (biweekly). Hence, researchers planning to conduct home visiting interventions should consider increasing the frequency of home visits or adding telephone contacts between home visits.

The longitudinal design of this study is one of its greatest strengths because women were followed for 1 year after the birth of their infant. Additionally, the population studied is a strength because rural, southern, African American, and postpartum female populations are at high risk of physical inactivity.[32,34-36] Nonetheless, data collection was not blinded and therefore a potential source of bias. However, it was not practically, logistically, or financially feasible to have a second set of blinded research staff whose purpose was solely to collect data. Moreover, it is unlikely that bias occurred on the part of the parent educator or the participant (eg, provision of socially desirable responses), given the lack of effect observed in this study. Additionally, the study would have benefited from the use of an objective measure of physical activity, such as a pedometer or an accelerometer. Finally, arguably the most concerning limitation of this study is the small sample size which may have limited the ability to detect statistically significant changes in the PATE arm as well as differences between the 2 treatment arms.

In conclusion, interventions designed to address the predominantly sedentary behavior of rural, southern, African American women in the early postnatal period are sorely needed as these women are at high risk of physical inactivity. Suggestions for future research interventions targeting this population of women include the formation of participant walking groups initially led by parent educators, provision of physical activity tracking devices that also may serve as objective measures of physical activity, and provision of incentives such as coupons or discounts on membership fees for local fitness clubs and associated child care. Additionally, the examination of town or neighborhood environmental characteristics such as the location and condition of parks and neighborhood walkability will likely provide useful information that can be incorporated in the design of future physical activity interventions in these communities.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Women who have recently given birth are at high risk of physical inactivity due to the added responsibilities and associated fatigue caring for a new infant entails. Few physical activity interventions targeting postpartum women have been conducted in rural, southern, African American populations.

What does this article add?

This article suggests that the provision of information about the importance of physical activity, discussions about overcoming barriers to physical activity, and setting monthly physical activity goals are insufficient to empower postpartum women to increase their physical activity level. Further, it reinforces the need for physical activity interventions targeting rural, southern, African American women in the early postnatal period.

What are the implications for health promotion practice or research?

Determining intervention components that positively impact intended health behaviors and components with no impact on intended health behaviors is important for informing future research.

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