



Original Research

Educational Brochures Influence Beliefs and Knowledge Regarding Exercise during Pregnancy: A Pilot Study

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ABSTRACT

International Journal of Exercise Science 12(3): 581-589, 2019. Women who are pregnant report receiving little or no advice about physical activity during pregnancy from their obstetric provider. The purpose of this study was to assess the effectiveness of an evidence-based educational brochure on both immediate and two-week retention of knowledge about exercise during pregnancy. Thirty-two women of childbearing age (age: 25.0 ± 4.0 years, body mass index: 29.5 ± 6.5 kg/m², 93.7% Caucasian, 83.4% had at least some college) completed a survey before exposure to an evidence-based educational brochure regarding exercise during pregnancy. Post surveys were taken immediately after viewing the educational brochure and again 2-weeks later. After exposure to educational brochures, survey scores on both surveys were significantly higher immediately-post and two-weeks post compared to baseline survey scores (Survey 1 (assessing beliefs) – pre: 79.2 ± 8.9%, post: 92.6 ± 7.4%, 2-weeks post: 92.0 ± 6.5%, $p < 0.001$; Survey 2 (assessing knowledge) – pre: 65.3 ± 16.4%, post: 81.3 ± 14.9%, 2-weeks post: 78.8 ± 12.4%, $p < 0.001$). No significant differences detected between immediate post and 2-weeks post for either Survey 1 ($p = 0.72$) or Survey 2 ($p = 0.52$); suggesting the information was retained. An evidence-based educational brochure is effective for improving and retaining information 2-weeks later regarding exercise during pregnancy. However, replication studies in more diverse populations are needed to confirm the results of this pilot study. The long-term goal for this line of research is to urge health care providers to consider providing patients with educational information in order to improve knowledge and patient-provider communication on this topic.

KEY WORDS: Maternal exercise, knowledge retention, educational intervention

INTRODUCTION

Unhealthy lifestyles and obesity are issues continuing to increase in prevalence among women of childbearing age (15). Women tend to become less active during pregnancy (3). This can lead to an increase in complications (9) such as excessive weight gain, gestational diabetes, joint pain, and a potentially more difficult labor/delivery (19). All can have short (25) and long-term consequences, such as increased likelihood of developing diabetes or coronary heart disease (20). Further, exercising for 30 minutes per day, at least three times a week, can have substantial

benefits, similar to those observed from exercise in non-pregnant populations (1, 16), and these benefits may also have a positive influence in infant health (14, 17).

Currently, there is insufficient education on the importance of exercise during pregnancy being provided to women of childbearing age, leading to misconceptions about the topic (7). Some authors have emphasized the effect that self-perceived physical restrictions and limitations had on a mother's lack of exercise; thus, misconceptions can have a significant influence on whether or not a woman chooses to participate in exercise during pregnancy (22). Pregnant women are not only unaware of the benefits of exercise during the prenatal period, but many women believe that exercise is not safe (7). In addition, many physicians are failing to properly educate women on the guidelines and precautions related to exercise during pregnancy (18, 21, 22, 26); thus further contributing to the problem.

The means to motivate women to exercise during pregnancy need to be further explored. Currently, women are lacking proper knowledge on the importance of exercise both during pregnancy and postpartum. Women of childbearing age, especially those who are in the process of considering have children, need to be properly informed of the evidence-based benefits and guidelines regarding exercise during pregnancy. A previous study demonstrated that the educational brochure can influence beliefs and increase knowledge (27); however, whether or not this information would be retained over time is still unknown. Two-weeks was chosen as previous studies have used this time interval to assess retention, as well as the fact that the process of forgetting slows down after 2 weeks (2, 11); thus, we suspect that the 2-week retention may represent longer term retention as women become pregnant in the months and years following exposure to educational materials. Additionally, the retention of this information, if the educational brochures are used clinically early in pregnancy (a future direction of this project), it is reasonable to believe the impact of the brochures would be sustained throughout a pregnancy, or at least between visits with a health care provider. The ability to read the brochure and allow the material to alter beliefs and knowledge is critically and clinically important. Thus, the purpose of this pilot study is to assess the effectiveness of an evidence-based educational brochure on both immediate and 2-week retention of knowledge about exercise during pregnancy among women of childbearing age.

METHODS

Participants

Thirty-two women of childbearing age (18-40 years old) participated in the study ($n = 32$, age = 25 ± 4.0 years). Demographic characteristics can be found in Table 1. Women were mostly educated (83.4% had at least some college) and Caucasian (93.7%), with a mean age of 25.1 ± 4.0 years and a mean BMI of 29.9 ± 6.7 kg/m². Women who were currently pregnant and women who were personal trainers or Exercise Science majors were excluded to avoid biasing data. Recruitment of these women was conducted through emails, personal contacts, and various forms of social media. All participants read and signed the University's Institutional Review Board approved informed consent.

Table 1. Participant demographic characteristics.

Variable	Mean \pm SD or # of women (%)
Age	25.1 \pm 4.0
Body Mass Index (BMI) (kg/m ²)	29.9 \pm 6.7
Number of children	0.6 \pm 0.9
Education	
High school diploma	2 (6.3%)
Technical/Trade/Vocational	2 (6.3%)
Some college	11 (34.4%)
College degree	10 (31.3%)
Post-graduate degree	7 (21.9%)
Ethnicity	
Caucasian	30 (93.7%)
Two or more ethnicities	2 (6.3%)
Physical Activity Level	
None	7 (21.9%)
Once a week	9 (28.1%)
2-3 times/week	10 (31.3%)
4-5 times/week	4 (12.5%)
7 times/week	2 (6.3%)

Protocol

Via email, participants were sent the online demographic survey through Qualtrics (Provo, UT). This online demographic survey was given to provide a basis of information regarding the participants' age, profession/major, exercise habits, number of children (if any), and their current level of exercise.

Then, two multiple choice online surveys were administered to evaluate viewpoints and knowledge related to exercise during pregnancy among a sample of the population. Survey 1 was perception-based, consisting of 19 questions measuring level of agreement with a 1-5 Likert scale (assessing beliefs, strongly disagree to strongly agree). Survey 2 contained fact-based, multiple-choice questions with only one of the four options being the correct response. Survey 2 only covered information presented in the brochure (assessing knowledge). Survey questions were adapted from previous studies (6, 8, 24). Once these were completed, the participants were emailed an evidence-based, educational brochure and post-surveys. The evidence-based educational brochure is adopted from Gaston and Prapavessis (8) who demonstrated educational materials motivate pregnant women to exercise as well as alter their beliefs about physical activity during pregnancy (8) and is included in Figure 1. Post-surveys consisted of the exact same surveys taken prior to exposure to the educational brochure. Brochures and surveys were adapted from previous studies to reflect the most recent American College of Obstetrics and Gynecology guidelines (7).

The participants were prompted to review and complete the attached materials in the order previously described. The email asked the participants to be focused during the educational portion of the study to allow for honest answers on the post-surveys. Looking up answers and referring back to material was strongly discouraged. Two weeks later, all participants were emailed the same surveys. The brochure was made unavailable for review at that time in order

to prevent participants from using it to complete post- surveys. Participants were made aware that they would be surveyed a 2-weeks after exposure to educational materials, and participants were never informed of their “scores” on the surveys.



When you are active, your baby benefits too!

- Physical activity during pregnancy:
- Reduces risk of acute stress and low Apgar scores at delivery
 - Helps keep your baby's birthweight within a healthy range
 - Reduces the risk for childhood obesity later in life
 - Improves neurodevelopment

Resources and References

American College of Obstetricians and Gynecologists. Committee Opinion 2018.

Barakat R, Pelaez M, Montelajo R, Ruffolo J, O'Leary J. Exercise throughout pregnancy does not cause preterm delivery: a randomized, controlled trial. *J Phys Act Health*. 2014;11(10):1012-1017.

Clapp JF, 3rd. The course of labor after endurance exercise during pregnancy. *Am J Obstet Gynecol*. 1996;163(6 Pt 1):1799-1806.

Clapp JF, 3rd, Caplesse EL. Neonatal morphometrics after endurance exercise during pregnancy. *Am J Obstet Gynecol*. 1996;163(6 Pt 1):1806-1811.

Dawes J. The role of exercise in the prevention and treatment of gestational diabetes mellitus. *Strength and Conditioning Journal*. 2006;28: 66-68.

Dominguez MR, Manjasevich A, Barros AJ, Santos IS, Horta BL, Mattar EC. Physical activity during pregnancy and offspring neurodevelopment and IQ in the first 4 years of life. *PLoS One*. 2014;9(10):e110650.

Although pregnancy can be a wonderful and exciting time, there are several health conditions that can affect you and your baby during this period. Understanding these risks and the steps that you can take to prevent and treat these conditions can lead to a healthier and more fulfilling pregnancy.

Reduce the Risks. Become Active.

Research has shown that regular exercise during pregnancy has many benefits for mother and baby by helping treat and prevent several potential serious conditions, including:

- Gestational Diabetes
- Preeclampsia
- Labor and Delivery
- Gestational Weight Gain
- Self-Image and Depression

Gestational Diabetes

Gestational diabetes affects ~ 7-18% of pregnant women. Risks to the mother include increased risk of Cesarean delivery, development of pregnancy-related high blood pressure, as well as type 2 diabetes later in life. Risks to the baby include respiratory distress syndrome, low blood calcium, and low blood sugar.

Exercise decreases your risk of developing gestational diabetes.

Preeclampsia

Potentially fatal, this condition affects ~ 10% of pregnant women and is characterized by high blood pressure and elevated levels of protein in urine. Apart from abortion, induced labor or Cesarean delivery, there is no known cure for preeclampsia. It can have very serious long-term complications for both mother and baby.

Exercise decreases your risk of developing pre-eclampsia.

Labor and Delivery

Exercise can lead to a shorter labor and fewer childbirth complications, including a reduced risk for Cesarean delivery.

Gestational Weight Gain

Excessive weight gain during pregnancy is associated with adverse outcomes such as miscarriage, congenital anomalies, high blood pressure, diabetes and postpartum weight retention.

Exercise during pregnancy helps keep weight gain within a healthy range and accelerates the return to pre-pregnancy weight.

Mouratiou SS, Tambalis KD, Panagiotidou DB, et al. Maternal lifestyle characteristics during pregnancy, and the risk of obesity in the offspring: a study of 6,126 children. *BMC Pregnancy Childbirth*. 2015;15:66.

Pastori L, Belli R, Croker H, et al. Effect of a behavioral intervention in obese pregnant women (the UPBEAT study): a multicentre, randomised controlled trial. *Lancet Diabetes Endocrinol*. 2015;3(10):767-777.

Practice ACCO. ACOG Committee opinion. Number 267, January 2002: exercise during pregnancy and the postpartum period. *Obstet Gynecol*. 2002;99(1):171-173.

Pfizer BR, Aminah SM, Kappeler K. Exercise in pregnancy: effect on fitness and obstetric outcomes—a randomized trial. *Med Sci Sports Exerc*. 2012;44(12):2262-2269.

Sui Z, Turnbull D, Dodd J. Enablers of and barriers to making healthy change during pregnancy in overweight and obese women. *Australian Med J*. 2012;36(11):666-677.

Szymanski LM, Satin AJ. Strenuous exercise during pregnancy: is there a limit? *Am J Obstet Gynecol*. 2012;207(3):179 e171-176.

Weingerter T, Welle L, Dawes J, Mottola M. Exercise in the prevention and treatment of maternal fetal disease: a review of the literature. *Applied physiology, nutrition and metabolism*. 2006; 31, 661-674.

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Self-image and Depression

Women who exercise during pregnancy tend to have a more positive self-image and fewer depressive symptoms compared to inactive women.

Exercise during pregnancy improves mental health.

Exercise Guidelines for You

Getting Started

Even if you were previously inactive, pregnancy is a great time to make healthy lifestyle changes, including beginning an exercise routine.



Exercise Suggestions

The following activities are ideal for pregnant women as they do not rely heavily on balance and do not place excessive strain on the joints.

- Brisk walking
- Stationary cycling
- Jogging
- Swimming or water aerobics
- Yoga
- Strength training

A warm-up and cool-down should be included in any exercise program. Always check with your doctor before beginning any type of exercise program.

Exercise Intensity

According to the *Talk Test*, a woman is exercising at an appropriate intensity if she is able to maintain a conversation during exercise, and should reduce the exercise intensity if this is not possible.

Setting Goals

Begin with 15 minutes of continuous aerobic exercise three times a week, increasing gradually to 30-minute sessions on all or most days a week.

Turn your goals into reality

Setting goals is great, but you need to start thinking about how YOU can turn your goals into reality. The following is one strategy that can help you get active!

“Reasonable goals of aerobic conditioning in pregnancy should be to maintain a good fitness level throughout pregnancy without trying to reach peak fitness or train for an athletic competition.”

-Society of Obstetricians and Gynecologists of Canada

“Women with uncomplicated pregnancies should be encouraged to engage in aerobic and strength-conditioning exercises before, during, and after pregnancy.”

-The American College of Obstetricians and Gynecologists

Myth Debunking

The strongest barrier to women participating in physical activity during pregnancy is concerns about the safety of their unborn baby.

- Exercise during pregnancy does not increase the incidence of miscarriages or preterm deliveries.
- Exercise during pregnancy, even at high-intensities, does not negatively affect the baby's heart rate or nutrient supply.
- Exercise during pregnancy does not cause high body temperatures that could harm the mother or the baby.



Figure 1. Educational brochure.

Statistical Analysis

A repeated-measures ANOVA (RM-ANOVA) was used to compare pre-survey scores with both post-survey and two-week post survey results. Post-hoc testing was used to compare multiple performances for both surveys from baseline to both immediate and two-week post survey. All

analyses were conducted using SPSS software (Version 24, SPSS, Inc., Chicago, IL). Statistical significance was defined as a *p*-level less than 0.05 and partial eta squared was calculated to determine effect size.

RESULTS

Table 2 displays the average performance for both Surveys 1 and 2 at all time points. Figure 2 displays the average scores (as a percent) for Survey 1. Figure 3 displays the average percent of scores for the results of Survey 2. When employing a repeated-measures ANOVA (RM-ANOVA) pre-survey scores were significantly lower than both post-survey and two-week post survey scores ($F_{2,30} = 19.71, p < 0.001$) for Survey 1, as well as Survey 2 ($F_{2,30} = 8.853, p < 0.001$). Post-hoc testing for multiple comparisons showed that performance was significantly improved for both Surveys from Baseline to immediate post ($p < 0.05$). However, no significant differences were found between Immediate Post to 2-weeks Post for either Survey 1 ($p = 0.72$) or Survey 2 ($p = 0.52$), suggesting the information was retained after the 2-week hiatus.

Table 2. Performance on surveys.

	Survey 1 (Beliefs)	Survey 2 (Knowledge)
Baseline (% correct)	79.2 ± 8.9	66.3 ± 16.4
Immediate-Post (% correct)	92.6 ± 7.4 ^a	81.3 ± 14.9 ^b
2-Weeks Post (% correct)	92.0 ± 6.5 ^a	78.8 ± 12.4 ^b

^arepresents significant difference from baseline Survey 1

^brepresents significant difference from baseline Survey 2

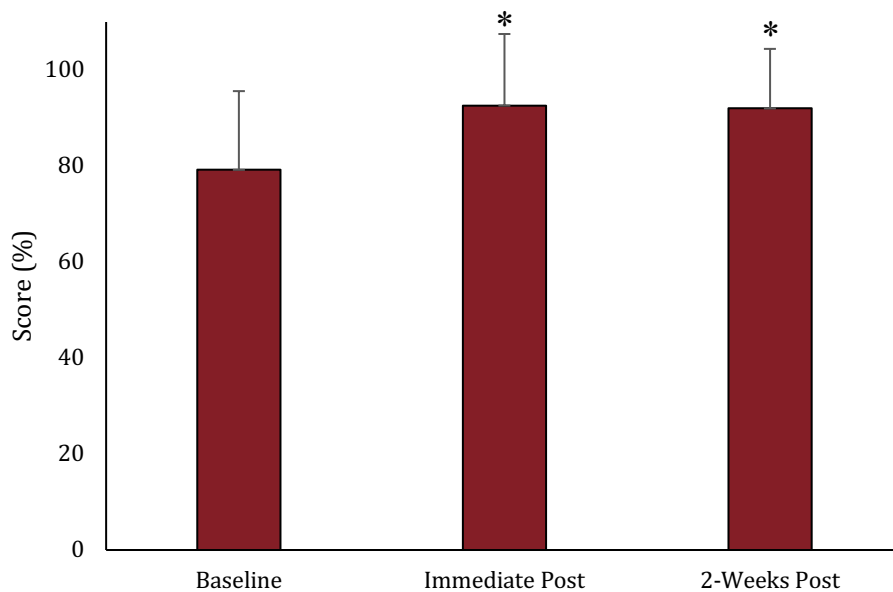


Figure 2. Average percent of scores for Survey 1 (Beliefs).

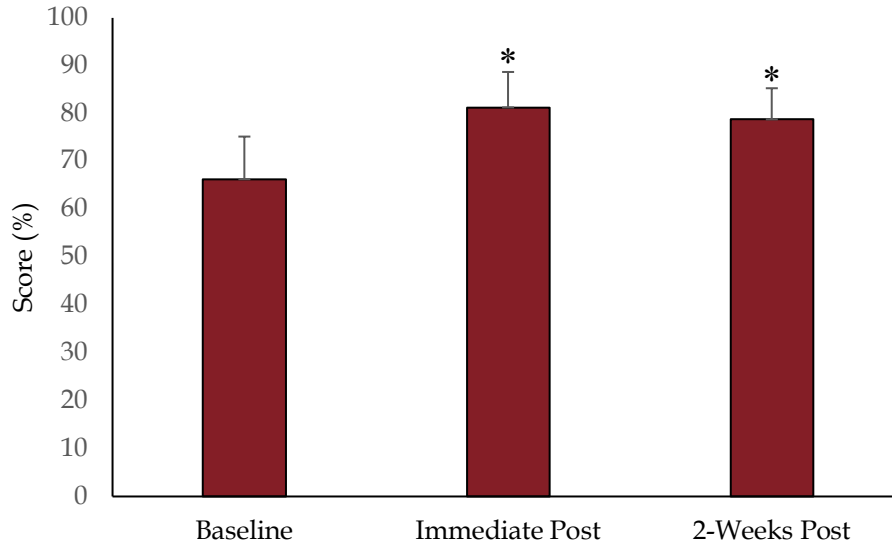


Figure 3. Average percent of scores for Survey 2 (Knowledge).

DISCUSSION

The results of the current study demonstrate significant increases in knowledge after exposure to an evidence-based educational brochure regarding exercise during pregnancy. Not only was an increase in knowledge shown, but also the retention of the material held 2-weeks after initial exposure to the material. These results support the hypothesis that two weeks after exposure to educational materials, women of childbearing age will have increased knowledge and altered beliefs about exercise during pregnancy. These results demonstrate that not only did the educational brochures influence beliefs and increase knowledge, but these changes remained two weeks later, as the 2-week scores were almost identical to the post-survey scores.

To the best of the authors' knowledge, this is the first study to test the effectiveness of evidence-based brochures on knowledge and beliefs of exercise during pregnancy including retention 2-weeks later. Many women have misconceptions about exercising while pregnant (7), and are misinformed by believing the risks outweigh the benefits. Exercising while pregnant prevents many serious health conditions (9, 19, 20, 25), while also improving self-image and confidence. A previous study demonstrated that educational brochures may increase knowledge and influence beliefs about exercise during pregnancy (20). However, it is unknown whether women retain the information and whether beliefs are truly altered over time after simply exposing women to educational brochures. The findings of the current study clearly demonstrate that after being provided with a brochure containing evidence-based information on benefits of exercise, participants retained the knowledge over a short-term period. These results suggest that brochures may be a clinically useful tool to influence beliefs and improve knowledge as women in the study were easily able to obtain this information over a 2-week time period. Because exercise habits rely heavily on motivation to exercise (5), and enhanced knowledge about the benefits of exercise during pregnancy could provide additional motivation to be active, it is plausible that educational brochures may influence exercise habits among pregnant

women. In addition, the Health Belief Model suggests that attitudes and beliefs (and thus, changes in these) are strong predictors of behavior (10). The Health Belief Model suggests that increasing perceived benefits and decreasing perceived threats to health can alter behavior (10), which is what this study attempts to do by educating women on the benefits of exercise during pregnancy while debunking some common fears about exercise during pregnancy.

Based on our findings, it could be beneficial for doctors' offices and pregnancy clinics to consider making these brochures available to their patients. Making this information easily accessible to women in waiting rooms, restrooms, nursing rooms, or anywhere women frequently visit could give the chance to change exercising habits before having a child. Making the choice to continue to exercise during pregnancy can lead to less medical complications down the road for both the mother and the child (12). The reduction in risks could also contribute to a reduction in health care costs, which is certainly of great importance.

A potential limitation is that testing after exposure to maternal not only enhances learning but also increases retention of the material (13) and that the more that people are tested or evaluated on material they have presented, an improvement in retention is exhibited (4). Therefore, the immediate post-testing may have had an impact on the 2-week retention of survey scores. If our brochure were to be used in a clinical setting, immediate post testing would not be performed; therefore, it is plausible the 2-week retention would not be as strong when used in the 'real world'. In addition, the time period in which these participants were studied was very short (2 weeks), so it is difficult to generalize to a longer period of time. However, it is important to note that the information the participants were exposed to was retained over a 2-week period and that it is reasonable to believe that retention at two weeks may predict longer-term retention as forgetting slows down after 2 weeks and similar models have been used in other retention studies (2,11). An additional limitation is that during the immediate post-testing, there was no way to ensure participants did not look back at the educational brochures; however, participants were strongly encouraged not to. For the 2-week post-testing, participants were no longer able to access the brochure. A final limitation is that the women who participated in the study were mostly young, educated, Caucasian women; thus, our results should not be generalized to the general population. Further, our cohort was more active than the general population, so it is possible baseline surveys were higher among our cohort. Additional studies in less-active cohorts are warranted as this population may have more to gain from an educational brochure on physical activity during pregnancy. However, we feel confident our results are meaningful as this exercise during pregnancy myths pervade our culture. If we can influence beliefs and increase knowledge among an educated group, we feel that these results would likely be even more pronounced among other, less educated women. This pilot study sets the groundwork for other researchers to do replication studies in other populations.

Therefore, the immediate post-testing may have had an impact on the 2-week retention of survey scores. Educational interventions, via brochures, do appear to influence beliefs and provide knowledge. The results of this pilot study should encourage further studies to test the impact of evidence-based educational information on exercising while pregnant. Thus, an

important future direction is to not only assess the influence of the educational information on knowledge and beliefs, but also on exercise-related behaviors before and/or during pregnancy.

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REFERENCES

1. ACOG Committee Opinion No. 650: Physical activity and exercise during pregnancy and the postpartum period. *Obstet Gynecol* 126(6): e135-142, 2015.
2. Bacon DR, Stewart KA. How fast do students forget what they learn in consumer behavior? A longitudinal study. *J Market Educ* 28(3): 181-192, 2006.
3. Borodulin K, Evenson KR, Wen F, Herring AH, Benson A. Physical activity patterns during pregnancy. *Med Sci Sport Exerc* 40(11): 1901, 2008.
4. Butler AC, Roediger HL. Testing improves long-term retention in a simulated classroom setting. *Eur J Cogn Psychol* 19(4-5): 514-527, 2007.
5. Conroy DE, Elavsky S, Hyde AL, Doerksen SE. The dynamic nature of physical activity intentions: A within-person perspective on intention-behavior coupling. *J Sport Exerc Psychol* 33(6): 807-827, 2011.
6. Evenson KR, Bradley CB. Beliefs about exercise and physical activity among pregnant women. *Patient Educ Couns* 79(1): 124-129, 2010.
7. Ferrari RM, Siega-Riz AM, Evenson KR, Moos MK, Carrier KS. A qualitative study of women's perceptions of provider advice about diet and physical activity during pregnancy. *Patient Educ Couns* 91(3): 372-377, 2013.
8. Gaston A, Prapavessis H. Using a combined protection motivation theory and health action process approach intervention to promote exercise during pregnancy. *J Behav Med* 37(2): 173-184, 2014.
9. Hawkins M, Kim Y, Gabriel KP, Rockette-Wagner BJ, Chasan-Taber L. Sedentary behavior patterns in non-pregnant and pregnant women. *Prev Med Rep* 6: 97-103, 2017.
10. Jones CL, Jensen JD, Scherr CL, Brown NR, Christy K, Weaver J. The health belief model as an explanatory framework in communication research: Exploring parallel, serial, and moderated mediation. *Health Commun* 30(6): 566-576, 2015.
11. Logsdon MC, Davis DW, Stikes R, Ratterman R, Ryan L, Myers J. Acceptability and initial efficacy of education for teen mothers. *MCN Am J Matern Child Nurs* 40(3): 186-192, 2015.
12. Lotgering FK. 30(+) years of exercise in pregnancy. *Advances in fetal and neonatal physiology* 814: 109-116, 2014.
13. Mcdaniel MA, Masson MEJ. Altering memory representations through retrieval. *J Exp Psychol Learn Mem Cogn* 11(2): 371-385, 1985.

14. Moyer C, Reoyo OR, May L. The influence of prenatal exercise on offspring health: A review. *Clin Med Insights Womens Health* 9: 37-42, 2016.
15. Nho JH. Lifestyle intervention for obese women. *J Lifestyle Med* 7(2): 51-54, 2017.
16. Olson D, Sikka RS, Hayman J, Novak M, Stavig C. Exercise in pregnancy. *Curr Sports Med Rep* 8(3): 147-153, 2009.
17. Phelan S, Hart C, Phipps M, Abrams B, Schaffner A, Adams A, Wing R. Maternal behaviors during pregnancy impact offspring obesity risk. *Exp Diabetes Res* 985139, 2011.
18. Phelan S, Phipps MG, Abrams B, Darroch F, Schaffner A, Wing RR. Practitioner advice and gestational weight gain. *J Womens Health (Larchmt)* 20(4): 585-591, 2011.
19. Prather H, Spitznagle T, Hunt D. Benefits of exercise during pregnancy. *PM R* 4(11): 845-850, 2012.
20. Rooney BL, Schauburger CW, Mathiason MA. Impact of perinatal weight change on long-term obesity and obesity-related illnesses. *Obstet Gynecol* 106(6): 1349-1356, 2005.
21. Stengel MR, Kraschnewski JL, Hwang SW, Kjerulff KH, Chuang CH. "What my doctor didn't tell me": Examining health care provider advice to overweight and obese pregnant women on gestational weight gain and physical activity. *Womens Health Issues* 22(6): e535-540, 2012.
22. Stotland NE, Gilbert P, Bogetz A, Harper CC, Abrams B, Gerbert B. Preventing excessive weight gain in pregnancy: How do prenatal care providers approach counseling? *J Womens Health (Larchmt)* 19(4): 807-814, 2010.
23. Symons Downs, D, Hausenblas HA. Women's exercise beliefs and behaviors during their pregnancy and postpartum. *J Midwifery Womens Health* 49(2): 138-144, 2004.
24. Symons Downs, D, Ulbrecht JS. Understanding exercise beliefs and behaviors in women with gestational diabetes mellitus. *Diabetes Care* 29(2): 236-240, 2006.
25. Villamor E, Cnattingius S. Interpregnancy weight change and risk of adverse pregnancy outcomes: A population-based study. *Lancet* 368(9542): 1164-1170, 2006.
26. Whitaker KM, Wilcox S, Liu J, Blair SN, Pate RR. Pregnant women's perceptions of weight gain, physical activity, and nutrition using Theory of Planned Behavior constructs. *J Behav Med* 39(1): 41-54, 2016.
27. Williams K, Brown A, Crandall J, Tinius R. Educational information improves knowledge about physical activity during pregnancy. *Kentucky Assoc Health Phys Act Rec Dance J* 54(1): 36-46, 2016.