



# Enhancing Prenatal Attachment to Reduce Maternal Health Behavior Risks Associated with Unintended Pregnancies



Human Development and Family Science

**Karina M. Shreffler, Ph.D.**  
karina.shreffler@okstate.edu

**Stacy Tiemeyer, Ph.D.**  
stacy.tiemeyer@okstate.edu

**Lucia Ciciolla, Ph.D.**  
lucia.ciciolla@okstate.edu

**Julie Croff, Ph.D. MPH**  
julie.croff@okstate.edu

## Abstract

This pilot study explored the effects of a 2-week mindfulness-based intervention designed to enhance maternal-fetal bonding among a sample of 34 pregnant girls and women. Participants who listened to their baby's heartbeat every day for two weeks and received four texts per week with mindfulness-based activities to do from home reported a significant increase in reported maternal-fetal attachment scores (MFAS) across the study period. Enhancing maternal-fetal bonding through this low-cost intervention has important implications for reducing adverse birth outcomes.

## Introduction

Maternal-fetal bonding refers to the affectionate feelings and perceptions a mother develops for her fetus during pregnancy<sup>1</sup> and includes behavioral acts during pregnancy that demonstrate care and commitment to the fetus<sup>2</sup>. Maternal-fetal bonding lays the foundation for post-birth mother-infant bonding and early caregiving, including maternal sensitivity, nurturing behaviors, and infant attachment security<sup>3-4</sup>, which are necessary for infants to reach their developmental potential<sup>5-6</sup>.

Maternal-fetal bonding is also critical for healthy fetal development because it is associated with healthier maternal behaviors during pregnancy<sup>7</sup>. For example, women with high levels of prenatal bonding are more likely to stop or reduce smoking cigarettes, alcohol, and illicit drug use<sup>7-8</sup>. Fortunately, maternal-fetal bonding appears to be modifiable; prior research indicates ultrasounds can increase prenatal attachment and improve maternal health behaviors during pregnancy<sup>9</sup>. Yet the high costs (e.g., equipment, medical personnel, patient time off of work, transportation, etc.) may be prohibitive for the women who would benefit most from intervention.

Mindfulness-based interventions conducted during pregnancy highlight outcomes such as reduced depressive symptoms<sup>10</sup> and postnatal stress<sup>11</sup>. In this study, we hypothesized that women participating in a 2-week mindfulness-based intervention in early pregnancy that offered them the opportunity to listen to their baby's heartbeat each day from home would experience increased feelings of bonding.

## Methods

### Sample

➤ The data for this project, BLOOM (Babies and Moms connected by Love, Openness, and Opportunity) come from a larger IRB-approved study following 177 pregnant girls and women (ages 15-40) from two prenatal clinics serving high proportions of Medicaid patients that examined the effect of maternal adverse childhood experiences and adverse birth outcomes. Participants completed online surveys about their pregnancy, including prenatal bonding and sociodemographic information. The sample for the present study consists of 34 participants in their 2<sup>nd</sup> trimester who volunteered for the BLOOM intervention. The study was conducted in 2018.

### Intervention and Measures

➤ Participants were randomly assigned to a control group or to one of three intervention groups that received either (1) fetal Doppler heartrate monitors; (2) four texts per week with mindfulness exercises designed to enhance feelings of maternal attachment; or (3) both Doppler monitors and mindfulness exercises. The participants who received fetal Doppler monitors were trained on appropriate use and instructed to listen to their baby's heartbeat for at least one minute per day over the two-week period. All participants completed the Maternal-Fetal Attachment Survey (MFAS; 12) prior to and immediately following the intervention.

### Analytic Strategy

➤ A change score analysis was conducted on participants' pre- and post-test MFAS scores to determine the effect of the intervention.

## Results

**Table 1. BLOOM Intervention Pilot Results (N=34).**

	Condition									
	Control (n=9)		Doppler only (n=8)		Doppler+ Mindfulness (n=6)		Mindfulness only (n=11)		Total (n=34)	
	M	SD	M	SD	M	SD	M	SD	M	SD
<b>Pre MFAS</b>	90.4	11.32	94.88	8.46	93	6.1	96.73	8.81	93.86	9.14
<b>Post MFAS</b>	88.22	11.46	96.57	7.21	97.83	9.83	97	7.51	94.67	9.57
<b>Difference MFAS</b>	-1.78	7.31	2.57	5.5	4.83	6.68	0.27	5.9	1.03	6.52
<b>Change Score Analysis<sup>1</sup></b>										
<b>β</b>			.34		.44*		.28			
<b>Adj. R<sup>2</sup></b>									.15	

<sup>1</sup> Change score analysis of difference in MFAS between time 1 and time 2 controlling for baseline MFAS.

\*p<.05.



### Summary of Results:

- Comparing scores before and after the two week period, the control group was the only one to report a decrease in feelings of maternal-fetal bonding.
- All intervention groups reported an increase in scores post-intervention, with the Doppler + Mindfulness group reporting the largest change in pre- and post-test MFAS scores ( $\Delta S = 4.83$ ; Cohen's  $d = .59$ ).
- A change score analysis was conducted to determine if changes in MFAS scores between baseline and time 2 were significant. Controlling for baseline scores, results indicate a **significant increase in MFAS scores for the Doppler + Mindfulness group (p<.05)**.

## Conclusions

Although maternal-fetal bonding typically increases throughout pregnancy, there is considerable variation among pregnant women<sup>1</sup>. **Increasing maternal-fetal bonding is a potential strategy for reducing maternal health risk behaviors during pregnancy.** Intervening to enhance maternal-fetal bonding has the potential to improve birth outcomes and early infant development.

***Our findings suggest that mindfulness skill-building in combination with the use of inexpensive fetal Doppler monitors at home by pregnant women quickly achieves an increase in maternal feelings of bonding.***

- Clinical and public health implications of this intervention may include reductions in costs associated with maternal health behaviors during pregnancy such as smoking and substance use.
- Future studies conducted with more participants and over a longer period of time will demonstrate whether the intervention is associated with improvements in maternal health behaviors, birth outcomes, and early infant development.

## References

- Brandon, A., Pitts, S., Denton, W. Stringer, A., Evans, H. A history of the theory of prenatal attachment. *J Prenat Perinat Psychol Health* 23, 201-222 (2009).
- Salisbury, A., Law, K., LaGasse, L., & Lester, B. Maternal-fetal attachment. *JAMA*, 289, 1701. (2003).
- Shin, H., Park, Y. J., & Kim, M. J. Predictors of maternal sensitivity during the early postpartum period. *J Adv Nurs* 55, 425-434 (2006).
- Siddiqui, A. & Hagglof, B. Does maternal prenatal attachment predict postnatal mother-infant interaction? *Early Hum Dev* 59, 13-25 (2000).
- Black, M. M., Walker, S. P., Fernald, L. C., Andersen, C. T., DiGirolamo, A. M., Lu, C., ... & Devereceili, A. E. Early childhood development coming of age: science through the life course. *The Lancet* 389, 77-90 (2017).
- Shaw, D. S., & Vondra, J. I. Infant attachment security and maternal predictors of early behavior problems: A longitudinal study of low-income families. *J Abnorm Child Psychol* 23, 335-357 (1995).
- Lindgren, K. Relationships among maternal-fetal attachment, prenatal depression, and health practices in pregnancy. *Res Nurs Health* 24, 203-217 (2001).
- Massey, S. H., Bublitz, M. H., Magee, S. R., Salisbury, A., Niaura, R. S., Wakschlag, L. S., & Stroud, L. R. Maternal-fetal attachment differentiates patterns of prenatal smoking and exposure. *Addict Behav* 45, 51-56 (2015).
- Sedgmen, B., McMahon, C., Cairns, D., Benzie, R. J., & Woodfield, R. L. The impact of two-dimensional versus three-dimensional ultrasound exposure on maternal-fetal attachment and maternal health behavior in pregnancy. *Ultrasound Obstet Gynecol* 27, 245-251 (2006).
- Dunn C, Hanieh E, Roberts R, Powrie R (2012). Mindful pregnancy and childbirth: effects of a mindfulness-based intervention on women's psychological distress and well-being in the perinatal period. *Arch Womens Ment Health* 15:139-143.
- Vieten C, Astin J (2008) Effects of a mindfulness-based intervention during pregnancy on post-natal stress and mood: results of a pilot study. *Arch Womens Ment Health* 11:67-74
- Cranley, M. S. Development of a tool for the measurement of maternal attachment during pregnancy. *Nurs Res* 30, 281-284, (1981).