



# Associations of postpartum depression symptoms and infant feeding with Hypothalamic Pituitary Adrenal (HPA) axis reactivity

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## Abstract

**Objective:** Both oxytocin and depression have been shown to blunt the HPA axis response to stressors. We aimed to determine whether postpartum depression symptoms, infant feeding, and their interaction are associated with HPA axis dysregulation, indexed by loss of expected associations in adrenocorticotrophic (ACTH)-cortisol (CRT) coupling.

**Study Design:** Women intending to breastfeed were recruited in the 3rd trimester of pregnancy, oversampling for past or current anxiety/depression. At 2 months postpartum, dyads attended a lab visit. Following peripheral IV placement, women chose to breast or bottle-feed their infants, as they would at home. After a 10-minute post-feed rest, women participated in the Trier Social Stress Test (TSST), a standardized social stressor that includes a speech and a math task. Blood samples for ACTH and CRT were collected 10 minutes after feeding, during each task, and at 10, 20, and 30 minutes of recovery. Multilevel models were used to evaluate whether associations between ACTH at time j and CRT at time j+1 differed between women with or without current depression symptoms (Beck Depression Inventory  $\geq 14$  vs.  $<14$ ) and infant feeding type (breast vs. bottle).

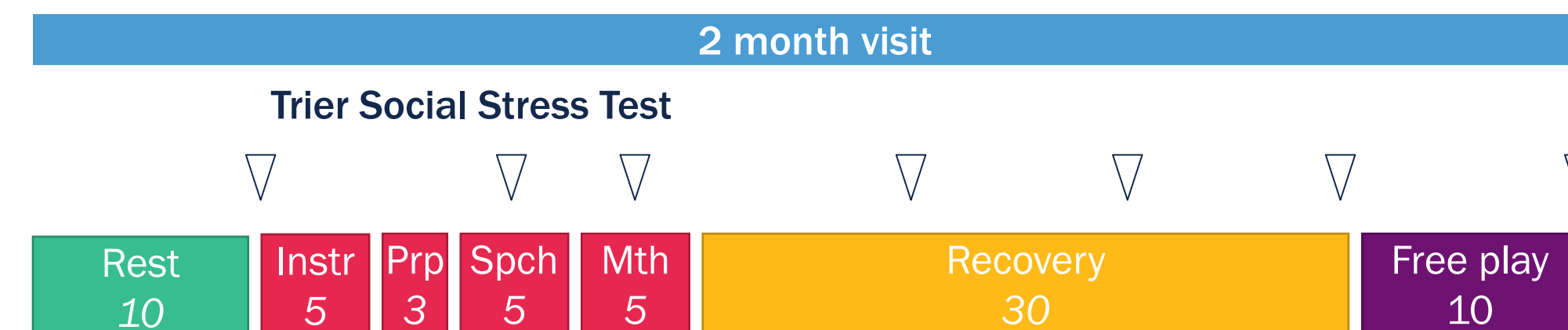
**Results:** A total of 222 women were enrolled; 205 completed the 2 month visit, and 165 breastfed before the TSST (80.5%). Breastfeeding women had lower ACTH ( $p=0.01$ ) and CRT ( $p=0.02$ ) than bottle-feeding women, but no differences in ACTH-CRT coupling ( $p=0.15$ ). ACTH ( $p=0.37$ ), CRT ( $p=0.93$ ), and ACTH-CRT coupling ( $p=0.09$ ) were similar in women with and without depression symptoms. There was a significant interaction ( $p=0.03$ ) between depression symptoms and infant feeding on ACTH-CRT coupling. Symptomatic women who breastfed had lower ACTH-CRT coupling responses compared with those who bottle-fed, but there were no differences by feeding in asymptomatic women.

**Conclusion:** We found that breastfeeding blunted HPA axis response only among women with depression symptoms but not among women without. The influence of breastfeeding and oxytocin on HPA axis reactivity may play a role in the pathophysiology of perinatal mood disorders.

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## Methods

- We performed a secondary analysis of data from participants in the ongoing cohort study Mood, Mother and Infant (MMI): The psychobiology of impaired dyadic development.
- Women intending to breastfeed were recruited in the 3rd trimester of pregnancy, oversampling for women with current or past depression or anxiety as determined by Structured Clinical Interview.
- Recruitment was stratified by parity to include equal numbers of primiparous and multiparous women.
- Dyads attended a lab visit at 2 months postpartum for an observed feeding session and social stressor task.
- Following an infant feeding session, the infant was cared for in a separate room while the mother participated in the Trier Social Stress Test, a standardized social stressor in which participants complete a speech task and a math task. After 30 minutes of recovery, mother and infant engaged in 10 minutes of free play.



ACTH and cortisol collected

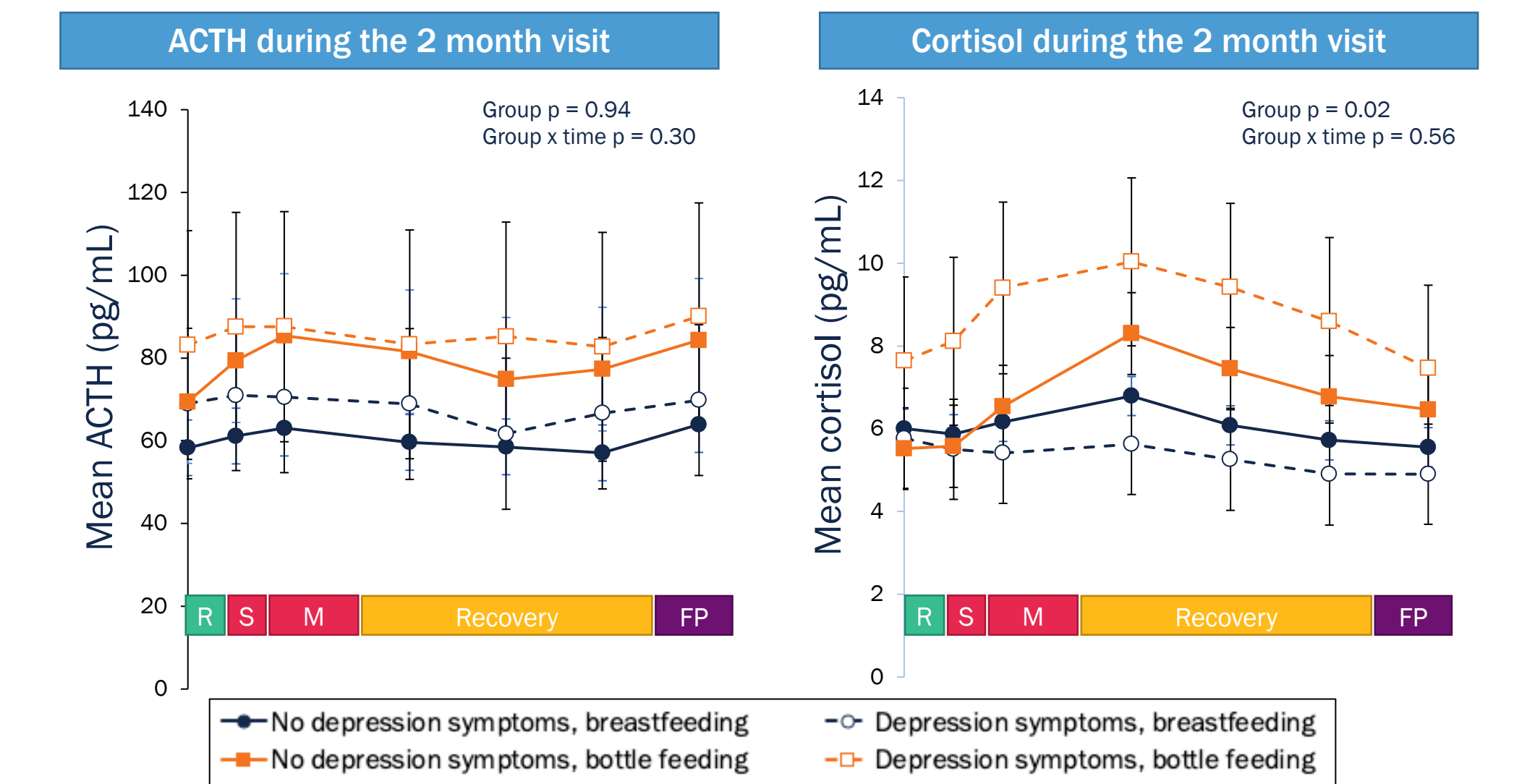
- Maternal blood samples were maternal collected into pre-chilled vacutainer tubes, immediately cold-centrifuged, aliquoted into pre-chilled cryotubes, and stored at  $-80^{\circ}$  Centigrade (C).
- ACTH and cortisol levels were determined by radioimmunoassay
- Women were assessed for active depression or anxiety by structured clinical interview at the baseline prenatal visit.
- Depression symptoms at 2 months postpartum were assessed by the Beck Depression Inventory with a cutoff of 14.
- Repeated measures analyses were used to evaluate ACTH and cortisol levels across the TSST.
- Multilevel modeling was applied to evaluate the coupled relationship between cortisol at time j+1 in response to ACTH at time j.
- Both analyses were stratified by depression symptoms and feeding type.

## Results

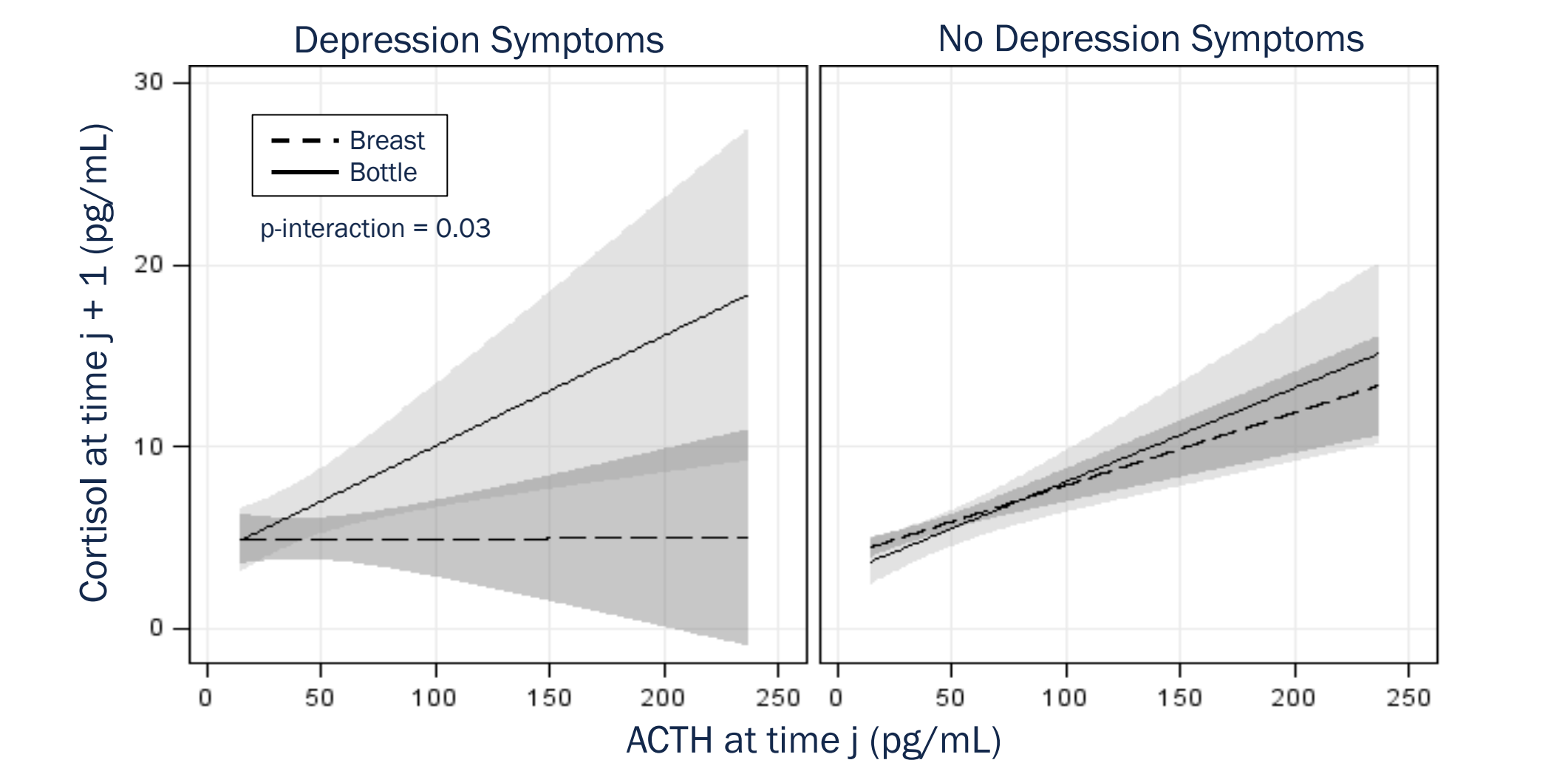
	Depression Symptoms		No Depression Symptoms	
	Breast N (%)	Bottle N (%)	Breast N (%)	Bottle N (%)
<b>Baseline risk for PPD/Anxiety</b>				
Current	15 (58)	5 (56)	48 (35)	11 (36)
History	9 (35)	2 (22)	39 (28)	10 (32)
None	2 (8)	2 (22)	52 (37)	10 (32)
<b>Antidepressant use</b>				
No	17 (65)	5 (56)	112 (81)	24 (77)
Yes	7 (27)	4 (44)	27 (19)	7 (23)
<b>Race/ethnicity</b>				
White	17 (65)	7 (78)	110 (79)	19 (61)
Black	2 (8)	2 (22)	9 (7)	5 (16)
Hispanic	5 (19)	0 (0)	13 (9)	3 (10)
Other/mixed	2 (8)	0 (0)	7 (5)	4 (13)
<b>Marital status</b>				
Married/partnered	18 (69)	4 (44)	121 (87)	23 (74)
Single/divorced	8 (31)	5 (56)	18 (13)	8 (26)
<b>Education</b>				
Some high school/HS grad	2 (8)	2 (22)	7 (5)	3 (10)
Some college/college grad	13 (50)	4 (44)	57 (41)	21 (68)
Post-graduate	11 (42)	3 (33)	75 (54)	7 (23)
<b>Insurance</b>				
None	2 (8)	0 (0)	4 (3)	0 (0)
Medicare/Medicaid	4 (15)	5 (56)	28 (20)	11 (36)
Tricare	1 (4)	0 (0)	3 (2)	0 (0)
Private	19 (73)	4 (44)	104 (75)	20 (65)
<b>Parity</b>				
Primiparous	16 (62)	3 (33)	77 (55)	17 (55)
Multiparous	10 (39)	6 (67)	62 (45)	14 (45)
<b>Mode of delivery</b>				
Spontaneous Vaginal	23 (89)	9 (100)	111 (80)	18 (58)
Operative Vaginal	0 (0)	0 (0)	2 (1)	0 (0)
Cesarean	3 (12)	0 (0)	21 (15)	12 (39)
<b>Infant admission to NICU</b>				
No	24 (92)	9 (100)	135 (97)	29 (94)
Yes	2 (8)	0 (0)	4 (3)	2 (7)
<b>Moderate/severe childhood trauma</b>				
No	14 (54)	4 (44)	102 (73)	21 (68)
Yes	12 (46)	4 (44)	35 (25)	10 (32)

## Results

In women with depression symptoms, the ACTH-cortisol relationship was reduced in breastfeeding women compared to bottle-feeding women.



### ACTH - Cortisol Coupling



## Conclusions

- HPA axis reactivity was blunted in breastfeeding women with depression but similar in women without symptoms.
- Further work should examine the role oxytocin may play in HPA axis dysregulation in maternal depression.

