Physiological Predictors of Postpartum Depression and Anxiety

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Background: Perinatal affective disorders

- DSM-5 definition of postpartum (peripartum) depression: **Depressive episodes lasting longer than 2 weeks that occur during pregnancy or within 4 weeks after childbirth**
- Estimated **10-20% of women** suffer from from postpartum affective disorders
- Associated with long-term health risks for both mother and child

Background: Screening for PPD

- In a Swedish study, only 70% of women offered screening for depressive symptoms (Bränn et al., 2021)
- A systematic review of clinical recognition, treatment and treatment response in perinatal depression shows that only 30.8% of women with postpartum depression are identified in clinical settings; and very few, about 6-7%, receive adequate treatment (Cox et al., 2016)

Background: Barriers to care

- Difficulty recognizing when to seek help
- Stigmatization of mental illness: Main use of self-report measures could hinder the ability for clinicians to detect PPD.

Why measure physiological responses?

- We can objectively measure the body's reaction to stress
- Pregnancy constitutes a significant mental and physical stressor
- Stress increases risk of affective disorders

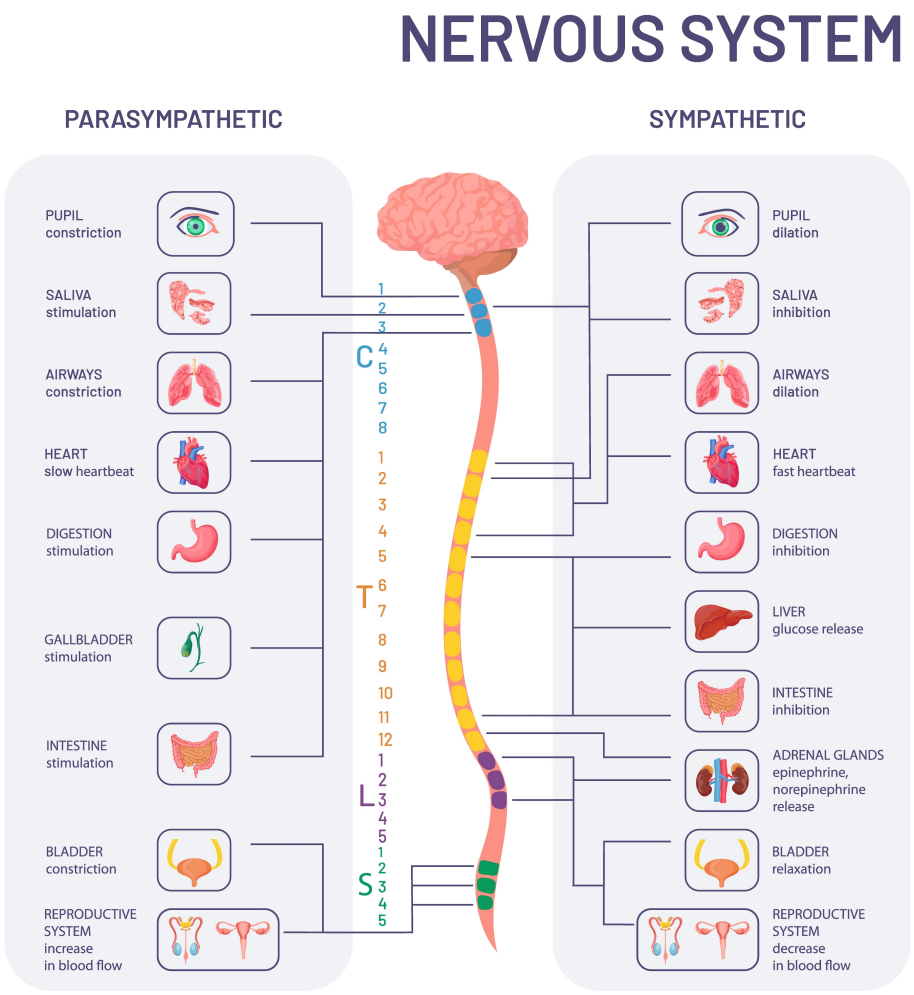
Physiological measures: Heart rate variability (HRV)

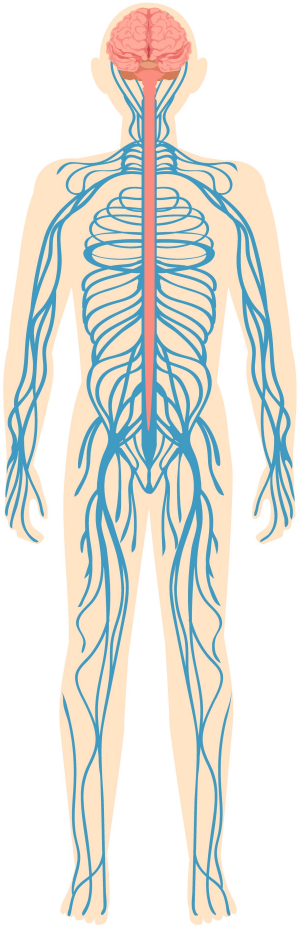
HRV is the measurement of beat-to-beat changes in heartrate using an ECG, and is thought to reflect emotional regulation and dysregulation and act as a proxy for the **autonomic nervous system (ANS)**

→ Parasympathetic (Vagus) : slows HR

→ Sympathetic : increases HR

Higher variability reflects the body's ability to respond and adapt to changes (regulation). Lower variability reflects poor adaptation to stressors (dysregulation).





HRV and Depression/Anxiety

- HRV indices were found to exhibit screening sensitivity of 80% for Major Depressive Disorder compared to the subjective patient-reported screening method in non-pregnant sample (Sun et al., 2016)
- Previous studies have shown lower HRV to be associated with symptoms of affective disorders in non-pregnant samples (Choi et al., 2019) and vice versa (Jandackova et al., 2016)
- HRV during pregnancy is altered in association with past or current anxiety disorders as well as with greater trait anxiety, or greater exposure to past traumatic events (Kimmel et al., 2021)

→ However, the **predicitive** value of HRV for affective disorders has not been studied in pregnant women.

Project Purpose

- Early identification is crucial.

- This study investigates if an **objective** measure (i.e. **heart rate variability (HRV)**) during pregnancy is related to later development of postpartum affective disorders

Methods

Data from Uppsala University's **BASIC (Biology, Affect, Stress, Imaging and Cognition)** cohort

- 115 women
- Predictor: **HRV measurements** before and after a mild stressor at **gestational week 38**
- Outcome: Depressive and anxiety symptoms from 6 weeks postpartum measured using web surveys, including the Edinburgh Postnatal Depression Scale (EPDS)

Purpose: To test the predictive power of HRV in **late pregnancy** for PPD and anxiety, establishing important design and analysis parameters for subsequent studies.

HRV Indices

Time-Domain

- SDNN (standard deviation of normal-normal intervals)
- RMSSD (Root mean square of successive differences)

Frequency-Domain

- Low frequency (LF: 0.04 ~ 0.15 Hz)
- High frequency (HF: 0.15 ~ 0.4 Hz)
- Total power
- LF/HF ratio

● = Reflects sympathetic activity

● = Reflects parasympathetic activity

Clinical measures

Depression:

- Edinburgh Postnatal Depression Scale (EPDS)(pregnancy w. 38, pp w. 6)

Anxiety:

- Spielberger State Trait Anxiety Inventory (STAI) (preg w.38)
- Beck Anxiety Inventory (pp w.6)

Study timeline

Statistics

Preliminary analyses: Chi-square and independent samples t-tests

Planned: Linear and logistic regression modeling

Preliminary Results: Background variables

Background Variables	Healthy n *(%)*	Depressed n *(%)*	p-value
Place of birth			
Scandinavia	79 (95.2)	25 (92.6)	
Other	4 (4.8)	2 (7.4)	.607
Maternal age at time of birth			
21-29	29 (33.3)	10 (37)	
30-34	33 (37.9)	14 (51.9)	
35-42	25 (28.7)	3 (11.1)	.161
Education			
University	65 (76.5)	23 (85.2)	
Less	20 (23.5)	4 (14.8)	.336
BMI*	82	26	
Mean *(sd)*	28.16 *(3.9)*	28.65 *(4.4)*	.610
Illness combined*			
No	62 (81.6)	20 (83.3)	
Yes	14 (18.4)	4 (16.7)	.845
Previous depression			
Depression history	57 (67.9)	23 (85.2)	
No depression history	27 (32.1)	4 (14.8)	.081

Preliminary Results: Pregnancy variables

Pregnancy Variables	Healthy n *(%)*	Depressed n *(%)*	p-value
Sleeping habits week 32			
Less than 6 hours	6 (6.9)	4 (14.3)	
6 -8 hours	63 (72.4)	14 (50)	
More than 8 hours	18 (20.7)	10 (35.7)	.087
Fear of delivery week 32			
No	84 (96.6)	23 (82.1)	
Yes	3 (3.4)	5 (17.9)	.009*
SSRI use at week 32			
No	73 (98.4)	23 (88.5)	
Yes	4 (5.2)	3 (11.5)	.266
Depressive symptoms week 38			
0 - 11	66 (85.7)	12 (50)	
12 - 30	11 (14.3)	12 (50)	<.001*
State anxiety week 38			
STAI-S 6 - 11	75 (89.3)	15 (57.5)	
STAI-S 12 -24	9 (10.7)	11 (42.3)	<.001*
Trait anxiety week 38			
STAI-T 20 -39	67 (79.8)	8 (32)	
STAI-T 40 -80	17 (20.2)	17 (68)	<.001*

Preliminary Results: Postpartum variables

Postpartum Variables	Healthy n *(%)*	Depressed n *(%)*	p-value
Baby to neonatal unit			
No	73 (94.8)	22 (88)	
Yes	4 (5.2)	3 (12)	.242
Problems after delivery (mother)*			
No	54 (62.1)	9 (32.1)	
Yes	33 (37.9)	19 (67.9)	.006*
Breastfeeding			
No	4 (4.6)	4 (14.3)	
Yes	83 (95.4)	24 (87.5)	.080

Preliminary Results: HRV indices

HRV Category	Type of scale	Healthy n	Healthy M (SD)	Depressed/Anxious n	Depressed/Anxious M (SD)	p -value
RMSSD 1	Depression	87	32.7 *(27)*	28	23.0 *(11)*	.068
	Anxiety	95	29.2 *(15.8)*	14	36.1 *(55.3)*	.328
RMSSD 2	Depression	86	33.7 *(19.2)*	26	28.1 *(13.9)*	.171
	Anxiety	94	32.8 *(17.6)*	12	24.8 *(14.1)*	.135
SDNN 1	Depression	87	56.2 *(22)*	28	47.2 *(21)*	.060
	Anxiety	95	53.9 *(20.1)*	14	51.8 *(32.6)*	.740
SDNN 2	**Depression**	**86**	**55.7 *(21)***	**26**	**46.6 *(17)***	**.050***
	Anxiety	**94**	**54.3 *(20.6)***	**12**	**41.5 *(13.4)***	**.039***
HF power 1	**Depression**	**87**	**5.93 *(1.2)***	**28**	**5.25 *(1.3)***	**.013***
	Anxiety	95	5.8 *(1.6)*	14	5.44 (1.6)	.284
HF power 2	Depression	86	6.09 *(1.1)*	26	5.64 *(1.1)*	.071
	Anxiety	94	6.04 *(1.0)*	12	5.45 (1.3)	.071
LF power 1	**Depression**	**87**	**6.03 *(.8)***	**28**	**5.57 *(1.0)***	**.018***
	Anxiety	95	5.94 *(.86)*	14	5.75 (1.1)	.455
LF power 2	Depression	86	6.1 *(.74)*	26	5.9 *(.92)*	.377
	Anxiety	94	6.07 *(.76)*	12	5.9 *(.82)*	.463
Total power 1	**Depression**	**87**	**7.89 *(.7)***	**28**	**7.53 *(.8)***	**.023***
	Anxiety	95	7.83 (.7)	14	7.57 (.8)	.212
Total power 2	Depression	86	7.88 *(.7)*	26	7.53 *(0.7)*	.051
	Anxiety	**94**	**7.83 (.7)**	**12**	**7.35 (.65)**	**.034***
LF/HF ratio 1	Depression	87	1.6 (1.6)	28	1.7 (1.5)	.625
	Anxiety	95	1.62 (1.6)	14	1.88 (1.7)	.569
LF/HF ratio 2	Depression	86	1.45 (1.3)	26	1.97 (2.2)	.144
	Anxiety	94	1.52 (1.6)	12	2.09 (1.7)	.252

● = Reflects sympathetic activity

● = Reflects parasympathetic activity

Conclusions

- Preliminary data show a relationship between HRV indices measured at pregnancy week 38 and later development of depressive symptoms during the postpartum period.

Moving forward, we would like to use this data to:

- create a multivariate model adjusting also for pregnancy symptoms, and using stricter criteria for depressive outcomes
- test the predictive power of HRV together with self reports

Clinical Relevance:

- Can HRV improve a model for predicition of affective disorders in the postpartum period?

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