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# The Psychobiology of Stress and its relationship to Maternal Sleep during Pregnancy

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## BACKGROUND

Recent studies show that sleep is tethered to both physiological and psychological processes. (e.g., Smyth et al., 2008; Okun, 2009; Benca et al., 1997; Mindell & Jacobson, 2000)

- Few existing studies have documented the biobehavioural coherence between sleep, mood, and physiology during pregnancy and even fewer studies have examined the role of sleep and stress independently in their influence on biology.
- Here we examine how sleep during pregnancy correlates with the psychobiology of stress.

## RESEARCH AIM & QUESTIONS

**Aim:** To investigate whether there is an association between sleep and the psychobiology of stress during pregnancy and examine how this association changes as a function of pregnancy progression.

### Questions:

1. Are sleep parameters correlated with the psychobiology of stress?
2. How does sleep during pregnancy correlate with biology and maternal self-reported distress?
3. Do the associations between sleep patterns and the psychobiology of stress change over the course of pregnancy progression?

## METHOD

### PARTICIPANTS

82 women recruited during pregnancy. Participants were aged 25.3-43.0 years; 89% Caucasian; gestational age range 8-37 weeks; gravida 1-6.

**DESIGN:** Cross-sectional

### MEASURES

Predictor Variables: 1. Sleep Parameters (Interruptions; WASO; Sleep Quality; Time in Bed; Duration; Efficiency; Latency)

Outcome Variable: 1. Salivary Cortisol 2. Salivary alpha-amylase 3. Profile of Mood States  
4. Peak Daily Stress Event (PDSE)

**PROCEDURE** – Ecological Momentary Assessment

Participants were instructed to answer questions pertaining to sleep and mood on a PDA and concurrently collect saliva samples 5 times/day for 3 consecutive days during pregnancy.

### DATA ANALYSIS

Separate correlation analyses were conducted between sleep parameters and stress measures for women in 1<sup>st</sup> (T1), 2<sup>nd</sup> (T2) and 3<sup>rd</sup> (T3) trimesters. Correlations above  $r = .25$  were considered of interest.

## RESULTS

**Table 1.** Associations between sleep and stress parameters (N = 82)

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		Interruptions	Wake after Sleep Onset	Sleep Quality	Time in Bed	Sleep Duration	Sleep Efficiency	Latency
Total Cortisol	T1	-.14	<b>-.31</b>	<b>.30</b>	-.03	-.03	.01	<b>.34</b>
	T2	-.17	-.25	-.11	-.03	.03	.13	.05
	T3	-.20	-.21	-.11	-.04	-.04	.04	<b>.29</b>
Total sAA	T1	.02	.11	<b>-.31</b>	-.23	<b>-.30</b>	-.24	.08
	T2	<b>-.47</b>	-.25	-.03	-.02	.05	.13	.00
	T3	-.22	-.05	-.01	.11	-.11	.00	.05
CAR	T1	<b>-.33</b>	-.12	<b>-.71</b>	<b>-.42</b>	<b>-.39</b>	-.05	.03
	T2	<b>.30</b>	.07	.08	-.19	-.23	-.23	<b>.26</b>
	T3	-.07	.03	.10	-.18	-.14	.04	<b>-.27</b>
sAA-AR	T1	<b>.26</b>	.14	.01	.20	<b>.30</b>	<b>.28</b>	<b>-.47</b>
	T2	.04	.17	.14	-.10	-.11	-.10	-.06
	T3	-.16	-.10	-.02	-.17	-.15	.03	.02
PDSE	T1	.05	<b>.26</b>	-.23	.06	.07	-.00	<b>-.28</b>
	T2	.05	.10	-.13	-.07	-.12	-.15	.16
	T3	.11	<b>.34</b>	-.01	-.02	-.03	.01	<b>-.42</b>
POMS	T1	<b>.45</b>	<b>.36</b>	<b>.42</b>	.24	.13	-.16	-.02
	T2	.01	.16	.13	.08	-.04	-.17	.24
	T3	.18	.10	-.05	.01	-.01	-.03	-.10

## SUMMARY & CONCLUSION

- Sleep parameters were associated with cortisol, sAA, negative mood and peak daily stress during pregnancy.
- More robust associations were observed between sleep parameters and the psychobiology of stress in trimester 1 compared to trimesters 2 and 3, suggesting that these processes are more strongly tethered in early pregnancy than later pregnancy. Furthermore, the association between sleep parameters and physiological parameters were more similar and less significant for Trimester 2 and 3, compared to Trimester 1.
- Overall, the cortisol awakening response had the most consistent association with sleep parameters suggesting that it is a valuable indicator of sleep disruption and therefore may serve as a useful marker of sleep-related HPA-axis effects on maternal mental health and the developing fetus.
- The separate yet related effects of mood and sleep on the psychobiology of stress suggests that our understanding of the consequences of maternal stress for fetal development is enhanced by measuring both mood and sleep.

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