

BACKGROUND

- Pregnant and postpartum women have disrupted sleep compared to age-matched, non-perinatal controls.¹
- Poor sleep is associated with medical and psychological issues, e.g., obesity, increased cardiovascular risk, anxiety, depression, and decreased cognitive performance.^{2,3}
- Animal studies show links between pregnant mothers' sleep and offspring's sleep times & circadian rhythms,⁴ and there are associations in humans between postpartum maternal sleep and infant sleep.⁵
 - However, there is a lack of research on sleep and circadian rhythms in the mother-infant dyad, and few studies have examined this relationship using objective measures of children's sleep.
 - DNA modulation (methylation) of certain genes occurs in young adults with chronic sleep deprivation, but has not been studied in children.⁶
- If mothers' sleep during pregnancy impacts children's sleep/circadian rhythms/affect/behavior, maternal sleep could be targeted to prevent vulnerabilities to sleep-related issues.

METHODS

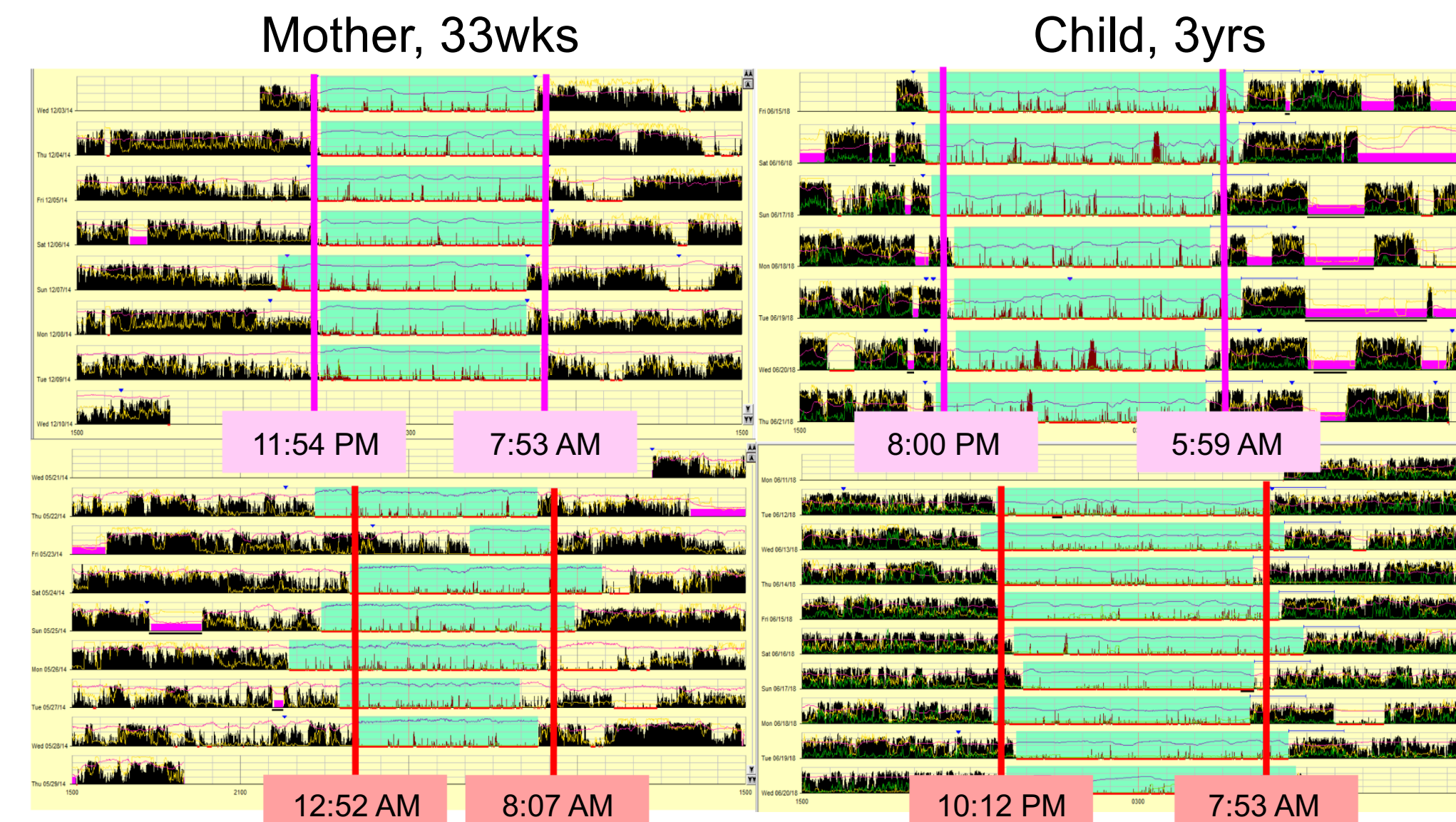
- We recruit children over 18 months of age whose mothers' sleep and circadian rhythms were measured during pregnancy in a previous perinatal study.
- The mothers complete 3 questionnaires:
 - *Child Sleep Habits Questionnaire* (CSHQ): 33 item scale to screen for sleep problems in children⁷
 - *Children's Behavior Questionnaire – Short Form* (CBQ): 97 item scale that assesses child temperament on 15 subscales⁸
 - *Children's Chronotype Questionnaire* (CCTQ): 27-item scale that assesses morningness-eveningness in children⁹
- The children wear an actigraph wristwatch for 1 week that measures activity levels, light exposure, and skin temperature (see photo).
- Two trained researchers score¹⁰ raw actigraphy data to estimate sleep onset time, sleep offset-time, sleep duration, sleep efficiency (see examples next panel).
- We take a blood sample from children to later analyze genome-wide DNA methylation.⁶
- Data were analyzed with SPSS Version 19 and Prism 7.0a.



actigraph

RESULTS

Examples of wrist actigraphy in 2 mothers and their respective children. The top dyad (pink) shows a mother and child with earlier sleep timing and the bottom panel (red) shows a pair with later sleep timing.

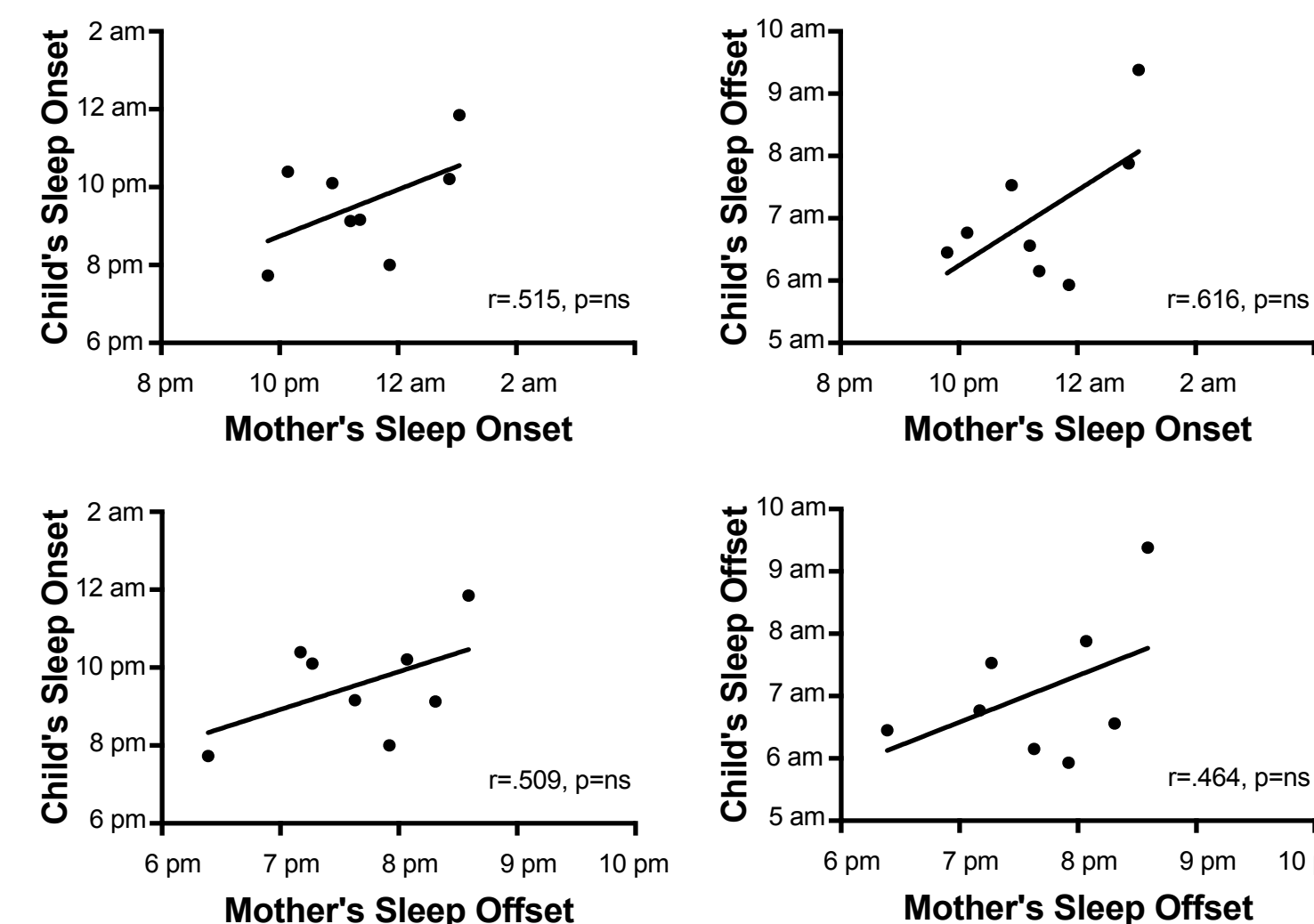


*Teal highlight = time in bed. Times in shaded colored boxes are mean estimated sleep onset and sleep offset for the week.

Mother and Child Sleep: Means and standard deviations of sleep measures are shown in the table below for mothers at 33 weeks of pregnancy and children 3-4 years old.

Sleep Measures in Mothers During 3 rd Trimester and Children 3-4 Years Old			
Measure	Mother Actigraphy Data	Child Actigraphy Data	Mother's Report of Child's Sleep
Sleep Onset	11:25PM ± 62min	9:34PM ± 81min	8:25PM ± 66min
Sleep Offset	7:30AM ± 44min	7:05AM ± 68min	6:52AM ± 43min
Total Minutes Asleep	380 ± 60	474 ± 61	
Sleep Efficiency (%)	79.3 ± 14.1	82.9 ± 7.3	

- Pearson correlations between maternal and child sleep showed moderate associations between mother's sleep timing at 3rd trimester and actigraphic sleep onset and sleep offset in children.
- Estimated total sleep time and sleep efficiencies were not strongly correlated between mother and child.

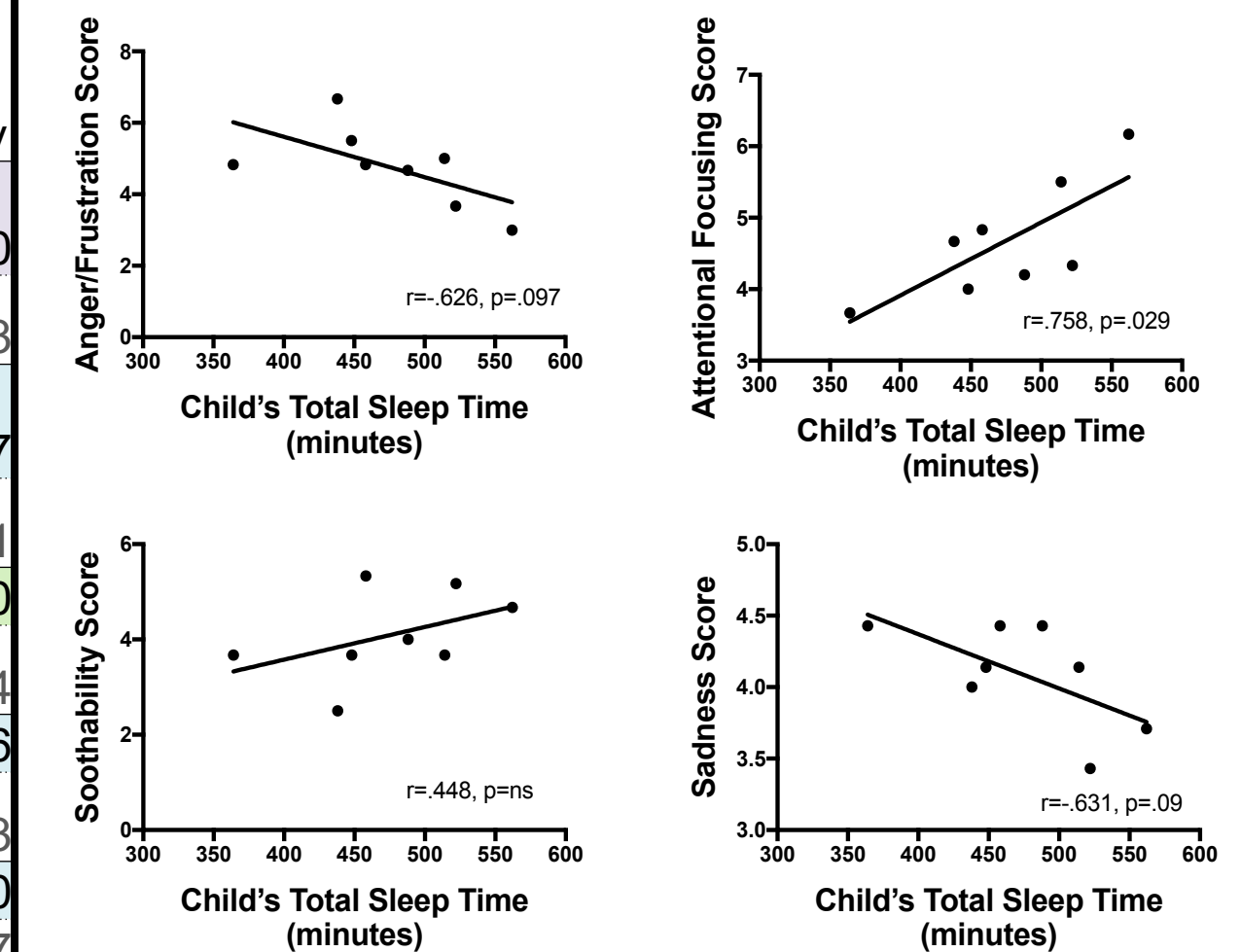


RESULTS

Child sleep and maternal report of child behavior:

- Pearson correlations were moderate-to-high between multiple sleep measures and 5 pre-selected child behavior subscales

	Child Sleep Onset	Child Sleep Offset	Child Minutes Asleep	Child Sleep Efficiency
Anger & Frustration Higher = More Angry & Frustrated	$r = 0.151$	0.031	-0.630	-0.680
Attentional Focusing Higher = More Attentive & Focused	$r = 0.721$	0.941	0.097	0.063
Soothability Higher = More Soothable	$r = -0.593$	-0.238	0.758	0.487
Fear Higher = More Fearful	$r = 0.122$	0.570	0.029	0.221
Sadness Higher = More Sad	$r = -0.006$	-0.046	0.448	0.720
	$p = 0.989$	0.915	0.265	0.044
	$r = -0.580$	-0.630	-0.256	-0.426
	$p = 0.132$	0.094	0.540	0.293
	$r = 0.182$	-0.130	-0.630	-0.450
	$p = 0.666$	0.753	0.093	0.267



DISCUSSION

- Sleep timing in 3-4 year old children was correlated with mothers' sleep timing during 3rd trimester in this small sample.
- More disrupted sleep in children was associated with higher levels of mother-reported behavior problems and sad mood.
- Mothers overestimated children's time in bed.
- **Limitations:** This study design does not allow us to determine whether associations between maternal-child sleep are environmental and/or biological.
- **Future directions:** When we have acquired a larger sample, we will analyze the children's blood samples and will be able to control for confounding variables, such as mothers' work schedules, other siblings, etc.

ACKNOWLEDGMENTS & REFERENCES

The authors gratefully acknowledge support from a Karen T. Romer Undergraduate Teaching & Research Award to Bailey Driscoll.

This work was supported by K23 MH086689 and R23 MH104377 to KMS.

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