

Prenatal Alcohol Exposure and Sleep

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Presenter Disclosure

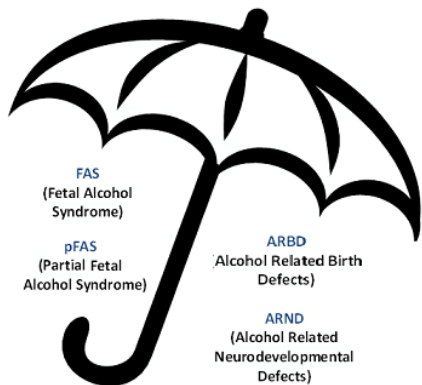
Sarah Inkelis

- I have no current or past relationships with commercial entities.

Learning Objectives

- Identify research methods for studying sleep in humans
- Explore evidence base for sleep disturbance related to prenatal alcohol exposure
- Consider neurobehavioral correlates of sleep disruption, and relationships to the neurobehavioral profile of FASD

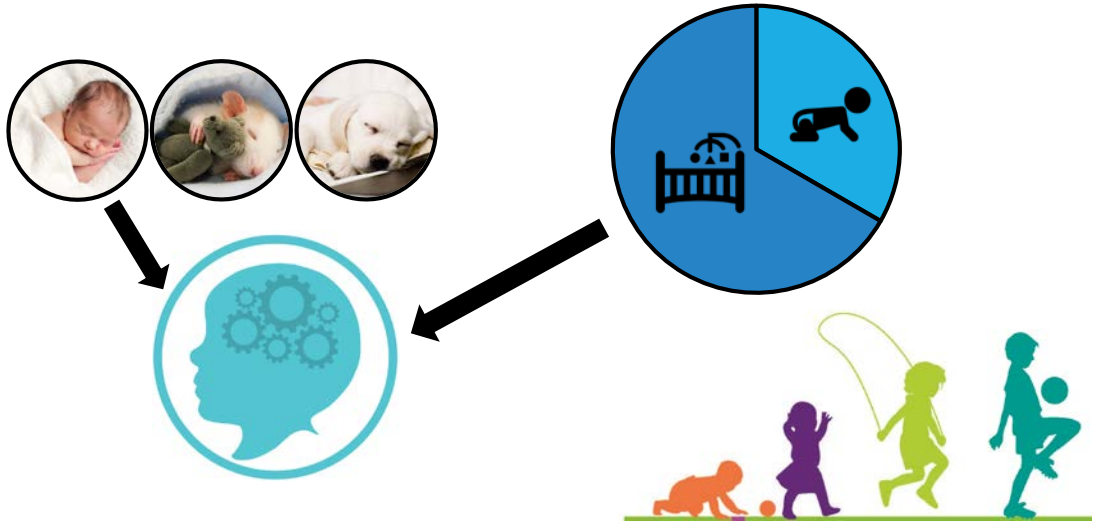
Fetal Alcohol Spectrum Disorders



Prenatal alcohol exposure

- Of all substances of abuse, alcohol produces the most serious neurobehavioral effects in the fetus
- Effects of prenatal alcohol exposure can vary widely
- Sleep disturbance may further exacerbate daytime functioning

Sleep is Crucial to Early Brain Development



Consequences of Impaired Sleep



Daytime Sleepiness



Health Problems



Cognitive & Behavioral
Dysregulation

- Children with neurodevelopmental disorders may be more vulnerable to these consequences
- Disordered sleep may exacerbate long-term cognitive and behavioral consequences of FASD

Sleep Stages

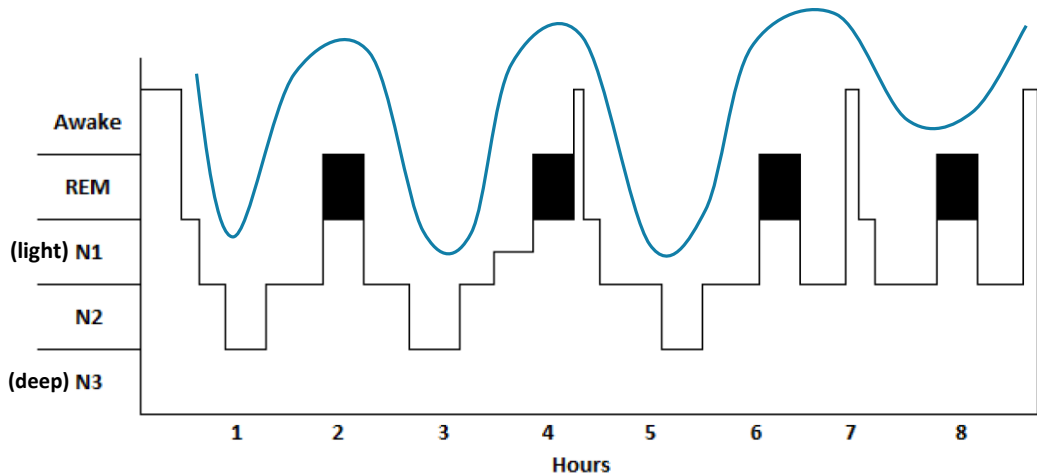
REM

- Rapid eye movements (REM)
- Irregular respiration
- Irregular heart rate
- Low or absent muscle tone
- Involuntary motor behaviors

NREM

- No REM
- Regular respiration
- Regular heart rate
- Chin muscle tone
- Lack of body movements
- 3 substages: N1 (light sleep), N2, N3 (deep sleep)

Hypnogram

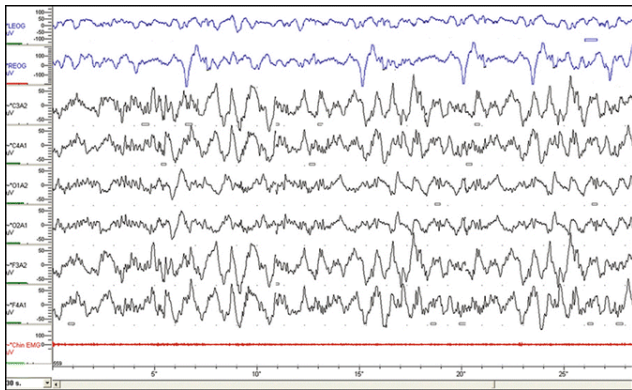
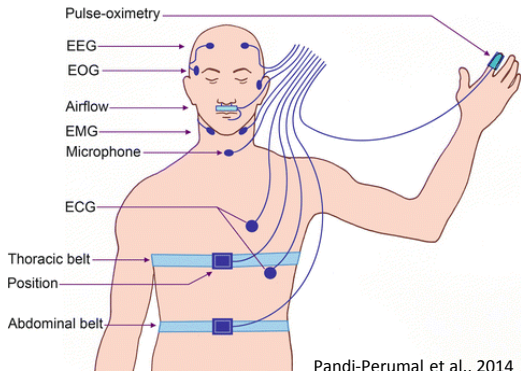


Measuring Sleep

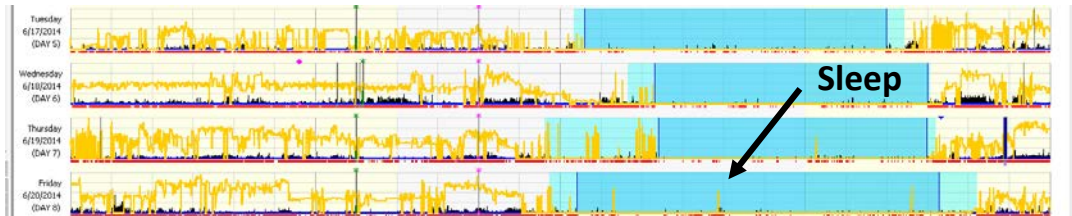


- Polysomnography
- Actigraphy
- Questionnaires, Sleep Diaries

Polysomnography



- Gold standard of sleep measurement
- Provides measures of brain activation, eye movement, muscle tone, and heart rate



Actigraphy

- Less expensive, non-invasive alternative to polysomnography
- Uses movement data as a measure of activity/inactivity, and proxy for sleep/wake
- Good at detecting sleep, but poor specificity for wake



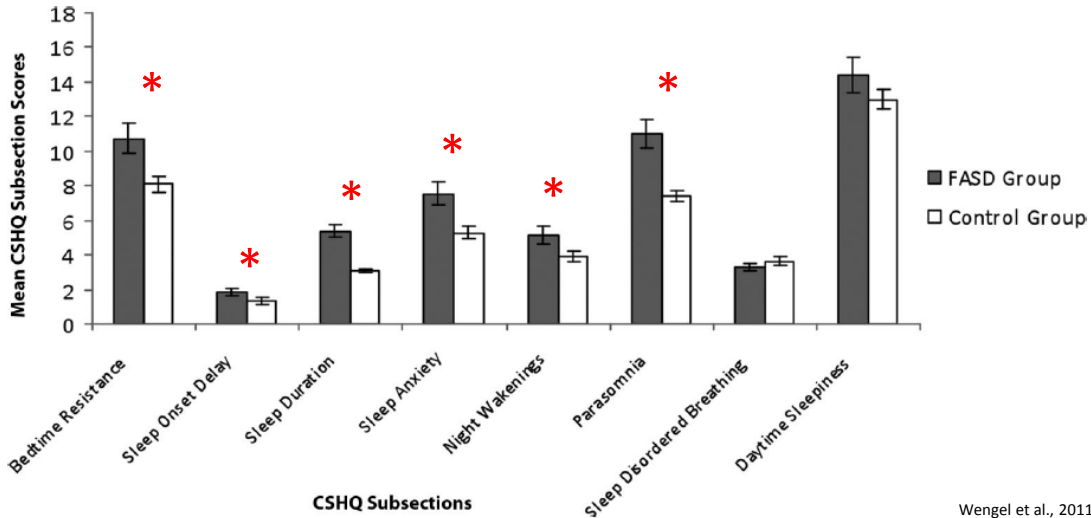
Philips Respironics Actiware

Sleep Questionnaires & Diaries

- Questionnaires and sleep diaries allow patients to self-report on sleep, quality of life, daytime functioning
- Parent-report measures are often used in studies with children
- Subjective data augments objective sleep data collected via polysomnography or actigraphy

Sleep Disturbance in PAE

Parent-Reported Sleep Problems in FASD



Wengel et al., 2011

Sleep Disturbance in Infants



Difficulty reaching NREM sleep



More easily awakened



Fewer intact sleep cycles



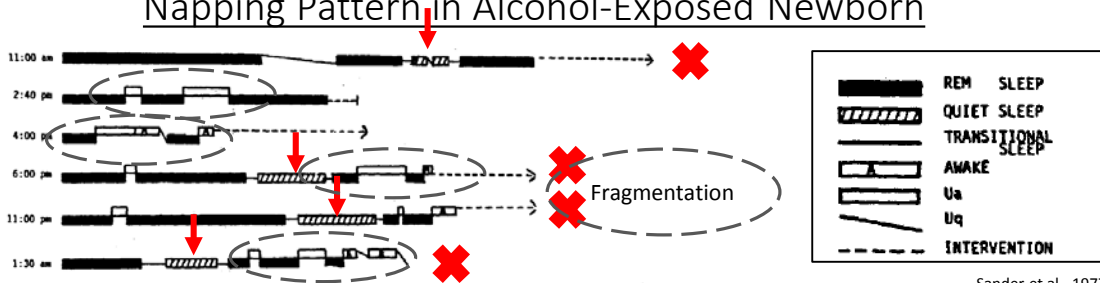
Spent less time asleep

Sander et al., 1977; Havlicek et al., 1977; Rosett et al., 1979; Scher et al., 2000

Napping Pattern in Non-Exposed Newborn

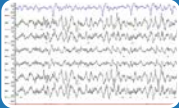


Napping Pattern in Alcohol-Exposed Newborn



Sander et al., 1977

Sleep Disturbance in Infants



Abnormal EEG patterns

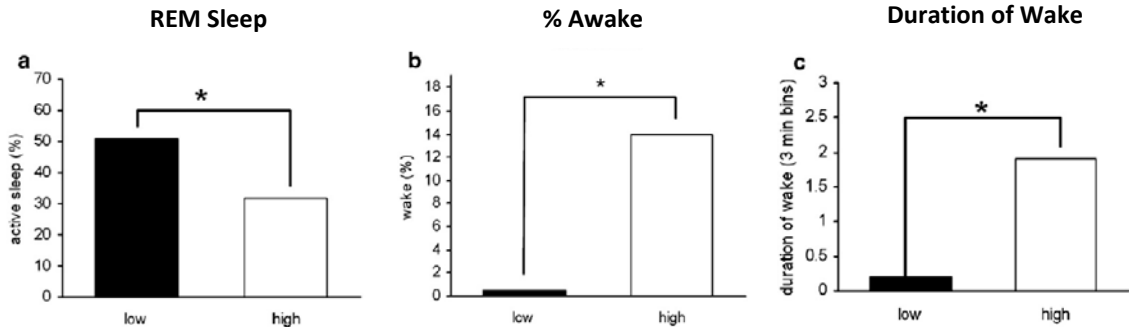


↑ Major body movements,
restlessness



↓ Sleep-related spontaneous motor
movements

Sleep Differences at 6 to 8 weeks

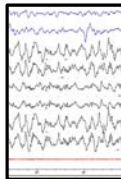


Sleep Disturbance in Children



Actigraphy

- Longer to fall asleep
- Shorter sleep duration
- low sleep efficiency



Polysomnography

- sleep fragmentation
- mild breathing problems
- low sleep efficiency

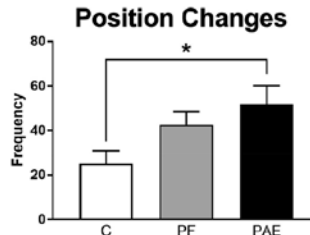
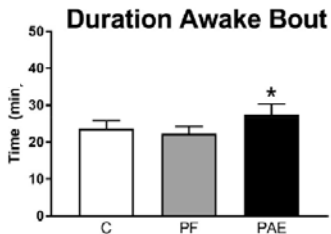
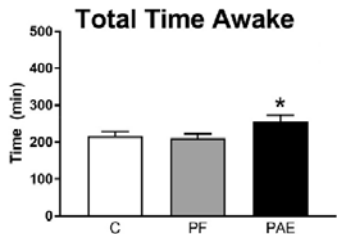


Melatonin

- Abnormal secretion

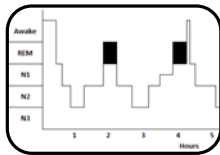
Sleep Disturbance in Preclinical Models

Sleep Disturbance in Preclinical Models

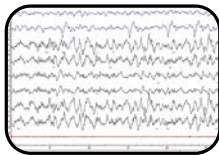


Sleep Disturbance – Summary

- **Sleep fragmentation has been found across studies**
- Effects of prenatal alcohol exposure on sleep are apparent at birth



Sleep Pattern

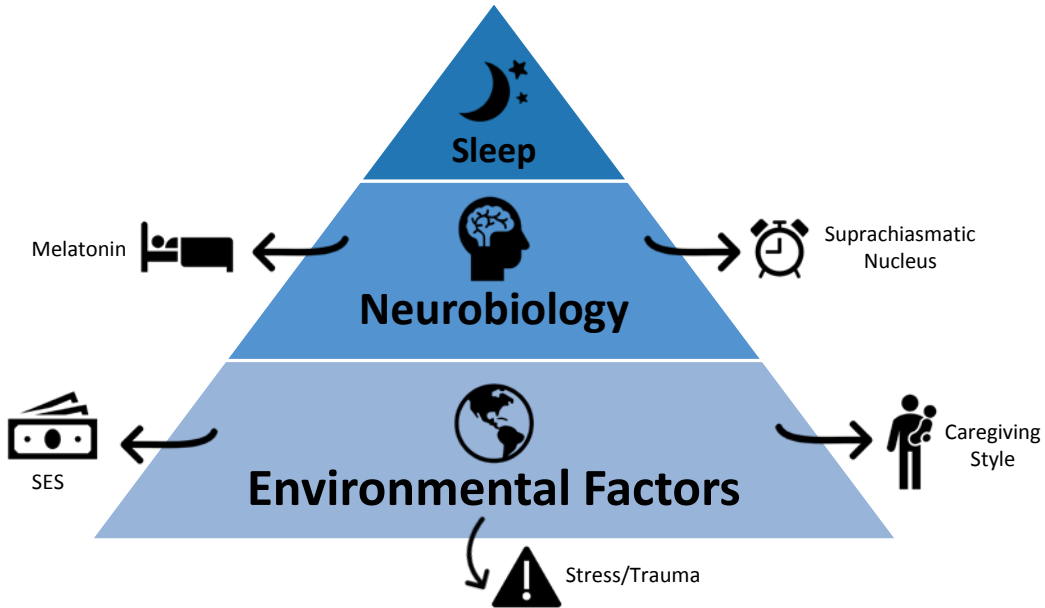


Neural Activity



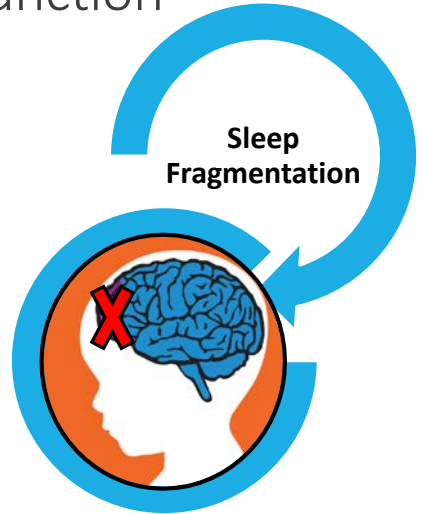
Sleep Movements

- Evidence suggests sleep disturbance persists in childhood



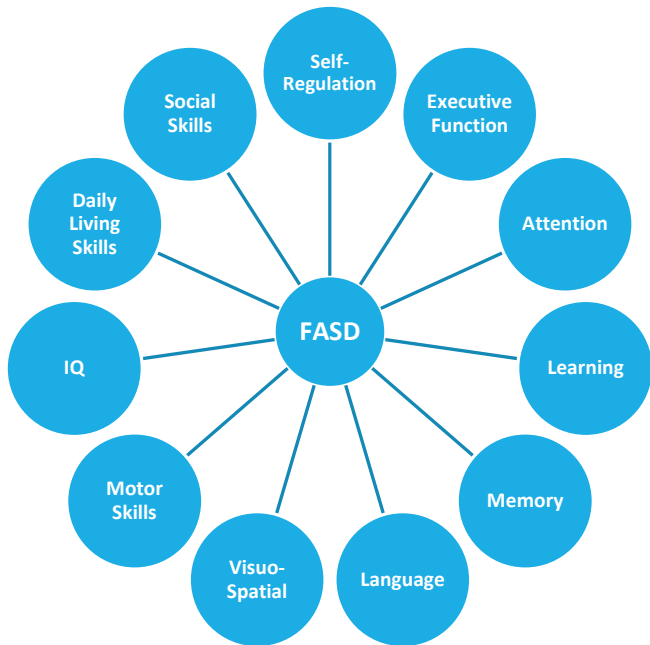
Sleep and Neurobehavioral Function

- hyperactivity
- impulsivity
- inattention
- emotion dysregulation
- depression

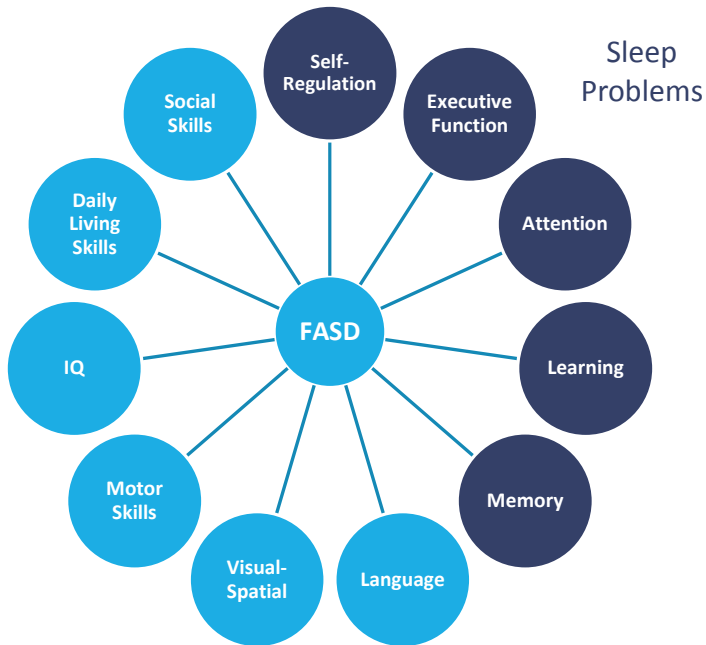


Jan et al., 2010; Kheirandish & Gozal, 2006; Marcus et al., 2012; Maski & Kothare, 2013; Owens et al, 2000; Owens, 2009; Stepanski, 2002

Neurobehavioral Profile of FASD



Neurobehavioral Profile of FASD



Clinical Implications for FASD

- Common behaviors in FASD (e.g., inattentiveness, hyperactivity) overlap with symptoms of sleep disorders
- Assessment is often focused on daytime behaviors
- Information on identifying and mitigating sleep disorders is lacking
 - Over-reliance on pharmaceutical interventions



- Other populations with neurodevelopmental disorders have demonstrated improvement in symptoms after improving sleep quality

Sleep is a modifiable behavior that may serve as a potential avenue for intervention in FASD



Consistent bedtime routine and sleep schedule

Minimize electronics before bed

Use bed only for sleeping

Clinical Implications

Future Directions



- Investigate potential mechanisms of sleep disruption



- Elucidate the characteristics of sleep problems and their relationship to cognition/behavior



- Establish standard-of-care guidelines for sleep assessment and intervention

Acknowledgements

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UC San Diego



National Institute
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Thank you!

