Learning to Roll Over Changes Infants' Sleep

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Introduction

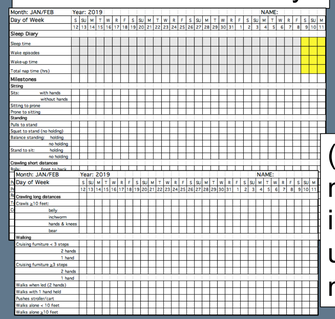
- Sleep becomes less fragmented with fewer wake episodes (WEPs) and longer nightly sleep durations over infancy (Galland et al., 2012; Liu et al., 2019)
- As motor skills such as crawling, pulling-to-stand, and cruising are acquired, sleep becomes momentarily disrupted (Berger & Moore, under review; Scher, 2005; Scher & Cohen, 2015; Atun-Einy & Scher, 2016)
- An increase in movement at night may underly this relationship (DeMasi & Berger, 2020)

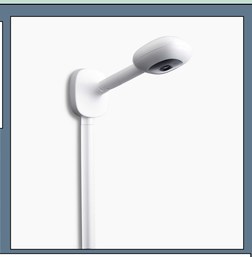
Research Questions

- Does rolling elicit the same increase in WEPs that other motor milestones do?
- Is rolling onset related to a change in movement during night sleep?

Method

(1) Parents recorded infants' milestones using a motor milestone diary.





(2) We collected nightly video of infants' crib activity using the Nanit crib monitor.

(3) Nanit's computer vision algorithm coded maximum minutes infants spent in one location (MAX). See figure 1 for examples

Participants

- Infants'' sleep was recorded for 7 consecutive nights (3 nights before rolling onset, the night of rolling onset, and 3 nights after

Table 1. Participant Characteristics

Infant	Sex	Rolling onset age	Race/Ethnicity
1	M	3.98	White
2	F	4.21	White
3	F	4.50	Black, Asian/Pacific Islander, White
4	M	4.60	Jewish
5	M	4.73	White
6	M	4.90	White
7	F	5.13	White
8	F	5.98	White
9	M	7.07	White
10	F	8.05	Hispanic

Results

- Trend analysis showed a significant 5th order effect of night on MAX, $F(1,9) = 11.51$, $p < .01$
- There was no effect of night on WEPs, $F(1,9) = 0.12$, $p = .74$
- Age at rolling onset was unrelated to MAX (rs = -.40-.14, ps = .25-.83) or WEPs at any timepoint (rs = -.47-.08, ps = .20-.85)

Figure 1. Infants' location in the crib

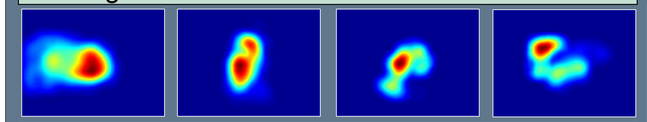


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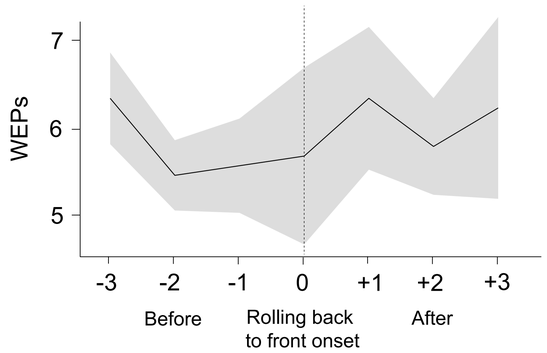
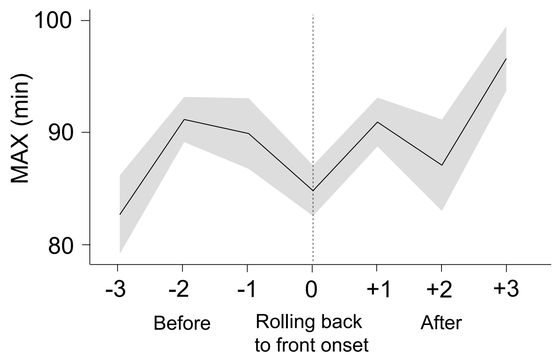
Figure 2. WEPs and MAX over rolling acquisition



- WEPs remained approximately the same over the rolling acquisition period



- MAX changed five times over the rolling acquisition period.

Discussion

- The lack of change in WEPs may reflect the fact that infants in the current study are very young and are already experiencing naturally disrupted sleep
- Increased activity surround rolling onset may reflect skill mastery or "practice" during sleep
- Because we showed that rolling over led to an increase in movement around the crib, motor milestones may be a relevant variable to study in atypical populations with heightened risk for sudden infant death syndrome or obstructive sleep apnea
- While the relation between movement during the night and brain activity in human infants remains uninvestigated, sleep movement may be involved in memory consolidation relevant for motor skill acquisition

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