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Sleep, mood, and development in infants

Jodi A. Mindell[a,b,*], Christina Lee[c]

[a] The Children's Hospital of Philadelphia, United States
[b] Saint Joseph's University, United States
[c] Johnson & Johnson Consumer Inc., United States

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ABSTRACT

Background: The aim of the study was to assess the relationship of sleep with mood and development in infancy.
Methods: Mothers of 1351 mothers of infants (ages 3–13 months) in Brazil completed an internet-based expanded version of the Brief Infant Sleep Questionnaire and the Ages & Stages Questionnaire.
Results: Overall, there were associations among parental ratings of infants' bedtime, morning, and daytime mood with sleep outcomes, especially sleep fragmentation, duration of nighttime sleep, and parental perception of sleep problems. There were no relationships between any sleep variables and developmental outcomes, including communication, fine and gross motor skills, problem-solving, and personal social relationships.
Conclusions: Overall, these results indicate that sleep patterns and sleep problems during infancy are associated with parental ratings of infant mood but not more global developmental outcomes.

Sleep problems, including fragmented sleep, prolonged sleep onset latency, and insufficient sleep, are common in young children (Mindell & Owens, 2015). Studies indicate that approximately 20–30% of parents report that their young child has a sleep problem (Sadeh, Mindell, Luedtke, & Wiegand, 2009). However, little is known about the relationship of sleep with both mood and development in infants and toddlers.

As indicated, very few studies have investigated the relationship between mood and sleep in young children, with the majority of studies looking at mood within the construct of temperament. Several studies have found a relationship between sleep problems and difficult temperament, which includes fussiness, irritability, and increased crying (DeMarcas, Soffer-Dudek, Dollberg, Bar-Haim, & Sadeh, 2015; Ednick et al., 2009; Kelmanson & Adulas, 2004). One study of young infants (ages 4–10 weeks) found that more positive temperament ratings were related to greater sleep duration, however no sleep outcomes were associated with duration of infant crying (Kaley, Reid, & Flynn, 2012). A few studies, however, have found relationships between sleep and mood, including finding that mood mediates the relationship between sleep and parent-reported internalizing and externalizing symptoms, in school-aged children and adolescents (Baum et al., 2014; Kouros & El-Sheikh, 2015).

In terms of development, the majority of studies that have been conducted to date have focused on the relationship between sleep-disordered breathing and cognitive outcomes. For example, a study of 35 infants (ages 7–9 months) found that snoring was associated with lower mental development index scores on the Bayley II (Montgomery-Downs & Gozal,

* Corresponding author at: Department of Psychology, Saint Joseph's University, Philadelphia, PA 19131, United States.
E-mail address: jmindell@sju.edu (J.A. Mindell).

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Table 1
Demographics.

	Total, %	Total, *n*
Sex of child		
Boy	53.3	720
Girl	46.7	631
Age of child		
3–4 months 30 days	20.4	275
5–6 months 30 days	20.8	281
7–8 months 30 days	19.4	262
9–10 months 30 days	19.8	268
11–12 months 30 days	19.6	265
Employment status		
Full-time	32.9	445
Part-time	14.7	199
Home/student	52.5	676
Education		
Elementary school	2.4	33
High school	32.7	442
College	37.6	508
Post-graduate	27.2	368
Age of respondent		
<25	18.3	247
25–29	25.4	345
30–34	33.6	454
35–39	18.0	243
40+	4.6	62

2006). Furthermore, Piteo and colleagues followed 13 infants from one month of age to one year. Persistent snoring since one month of age was associated with lower cognitive development scores on the Bayley III at both 6 months and 12 months of age (Piteo, Kennedy et al., 2011; Piteo, Lushington et al., 2011).

In contrast, very few studies have looked at the relationship between sleep patterns and developmental outcomes. Most of these studies have utilized the Bayley Scale of Development II. Scher and colleagues (Scher, 2005) assessed sleep via actigraphy and development in 50 infants (10 months of age). Overall, fragmented sleep was moderately associated ($r = -.37$) with lower mental development index scores, but no relationship was found with psychomotor development. A similar study of 20 infants (12 months) found no significant relationships between sleep measured via actigraphy and mental or motor developmental outcomes on the Bayley II (Spruyt et al., 2008). Gibson and colleagues also investigated the relationship between sleep and development in 51 one-year-olds (Gibson, Elder, & Gander, 2012). They assessed sleep via actigraphy, parental diaries, and parental report (Brief Infant Sleep Questionnaire; BISQ). Development was measured utilizing the Ages & Stages Questionnaire, a parent-report measure. Sleep efficiency, as measured by actigraphy, was positively associated with better problem solving and fine motor scores. No relationships were found between nighttime or 24-h sleep duration with any of the five developmental domains measured.

Overall, limited studies have found a positive relationship between sleep patterns and temperament with mixed results of whether sleep is associated with developmental outcomes. Thus, the primary aim of this study was to assess the relationship of sleep with mood and development in infancy, to further elucidate the associations amongst these factors.

1. Methods

1.1. Participants

Overall, 1351 mothers of infants (ages 3–13 months; $M = 7.4$ months, SD = 2.89) residing in Brazil participated in this study. The age of the infant was evenly distributed across the sample (see Table 1).

1.2. Procedure

All participants completed the Brief Infant Sleep Questionnaire (BISQ), the Ages & Stages Questionnaire (ASQ), and provided demographics information. The questionnaires were translated into Portuguese and back-translated to check for accuracy. All data were collected online. The questionnaire was set as a pop-up screen at a popular parenting website (BabyCenter) and invited mothers to complete a sleep survey. Completion of the questionnaire was voluntary, there were no exclusionary criteria, and this study was approved by a university-based Institutional Review Board. No identifying information was collected. Participants were asked to provide their email address at the end of the survey if they were interested in being eligible for a drawing for a gift card valued at approximately $100. The complete sample was collected in January 2015.