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Daytime Sleep and Parenting Interactions in Infants Born Preterm

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Abstract

Objective—Following a transactional perspective, this longitudinal study assessed concurrent and time-lagged associations between infant daytime sleep behaviors and maternal play interactions within a sample of infants born preterm.

Method—Data were collected from 134 families recruited from 3 Wisconsin NICUs. Multiple methods were used to collect data at infant NICU discharge and when infants were 4, 9, and 24 months postterm, including parent-report infant sleep logs, family sociodemographic assets and a 15 minute video-taped play session.

Results—Within time points, infants who napped more had mothers who were rated as more positive and communicative or less negative during play interactions at 4, 9 and 24 months compared to infants who napped less. Time-lagged findings indicated that infants who took more naps experienced more optimal maternal interactive behaviors later in development than infants who took fewer naps. Additionally, mothers who expressed more negative affect at 4 months or 9 months predicted more infant daytime sleep later in development.

Conclusion—Previous studies document that nighttime parent-child interactions influence nighttime sleep. This study presents the natural extension that daytime sleep influences daytime interactions. The present study draws attention to the understudied area of daytime naps in young children and provides support for the longitudinal bi-directional processes between sleep and parenting interactions.

Keywords

Preterm; Sleep; Parenting

INTRODUCTION

Infants born preterm are at increased risk for regulatory and interpersonal difficulties.¹ However, the associations between early regulatory behaviors (i.e., sleep) and interpersonal interactions over time are rarely studied in preterm infants. In typically developing young children, problems with daytime sleep regulation have been associated with more negative affect, effortful control difficulties, difficult temperament profiles, and higher afternoon

cortisol levels² (Ward et al., in press); however, associations between infant daytime sleep behaviors and parenting is not commonly assessed. In infants born preterm, elements of the sleep-wake cycle have been linked with infant-mother interaction quality.³ The present study assessed the longitudinal associations between infant/toddler daytime sleep and parenting behaviors in families raising children at risk for regulatory and interpersonal difficulties – infants born preterm.

Theoretical Models

Ecological models^{4,5} and attachment theory⁶ provide the theoretical underpinnings for this work. While emphasizing the importance of proximal processes (e.g., children's day-to-day interactions with caregivers), ecological theory also points to the importance of biological influences (e.g., prematurity) and social-contextual factors for development.⁴ The transactional developmental model, which is an ecologically-based model, suggests that parents actively assist their children in moving from other-regulation to self-regulation in multiple developmental domains, including sleep.⁵ It is thought that early in this process, the parental role is more likely to influence the process than child factors, whereas later, children take a more active role in regulating their own behaviors. However, when a non-normative experience occurs at the outset of the child's life, such as when a child is born preterm, this may initiate a transactional process in which the child's characteristics or behaviors may play a larger role in determining future regulatory outcomes as well as dyadic interaction quality than in situations in which the child's birth is a more normative experience.⁷ It is possible that when preterm infants exhibit less optimal sleep early in development, parenting quality may be affected, which then may feed back into less optimal child sleep.

In contrast, attachment theory emphasizes the importance of parent contributions to quality of dyadic interactions and emerging child regulatory behaviors, although it does not rule out infant contributions.⁶ A large body of research with low and high risk samples has found that parental sensitive responsive interactions facilitate positive aspects of child development, including sleep development.⁸

In the present study, we tested contrasting models driven by attachment and transactional theoretical perspectives to examine the association between child daytime sleep and parenting behaviors over time.

Daytime Sleep and Preterm Infants

Daytime sleep is a characteristic element of development for all young children. However, the exact functions and developmental consequences of daytime sleep patterns are understudied. During infancy, sleep is characterized by approximately 15 hours of sleep per 24-hour period with about 20 to 25% taking place during the day.^{9–11} From birth to two years of age, day-night sleep patterns shift and children gradually sleep less during the day, and lose their morning nap dropping their average daytime sleep percentage to less than 15% of their total sleep. These changes in sleep usually reflect physiological maturation, neurodevelopmental changes, daytime schedules and cultural practices.^{9,12,13}

Previous sleep research in typically developing children demonstrates the importance of adequate sleep for memory, learning, emotion and behavior regulation, and other executive functions.^{14–18} However, sleep studies most often focus on nighttime sleep, with relatively few studies assessing the role(s) of daytime sleep. Daytime naps are a pivotal element of every infant/toddler's day. Trouble napping or a missed nap may have negative consequences for their daytime behaviors and their caregivers' affect and behaviors.

Early sleep studies documented developmental shifts in napping^{19,20} and more recent studies have assessed links between daytime behavior and naps in young children. In typically developing preschool children, Ward and colleagues (in press) reported associations between daytime sleep and social competence as indexed by teachers and parents, and napping problems were associated with more negative affect and higher afternoon cortisol levels.² Moving beyond child behaviors, the present study assesses the roles of infant/toddler daytime sleep patterns and parenting interactions during daytime play episodes.

Parenting Behaviors and Preterm Infants

In addition to infant factors such as prematurity²¹, quality of parenting interactions are important predictors of subsequent developmental problems and competencies for preterm infants, including emerging self-regulation²², cognitive skills^{7,23}, and behavior problems.²⁴

Preterm infants show a more limited range of joint attention and social interaction skills compared to infants born at term.^{25–27} During early infancy, high risk infants are more easily stressed and overstimulated than infants born at term, and they are less active, responsive, and alert.^{28,29} In addition to the challenges experienced by high risk infants, previous research has found that mothers of preterm infants engage in more negative interactions with their infants and are less actively involved with their newborns than mothers of infants born at term.^{30,31}

Because of these difficulties, it is important to examine how parent-child interactions in preterm infants relate to their emerging sleep development, including how parenting behaviors influence children's sleep over time and how early preterm infant sleep influences parenting behaviors in subsequent dyadic interactions.

Research Question and Hypotheses

This longitudinal study assessed three models linking infant sleep with parenting behaviors (Figure 1). First we specified a model that emphasized the role of parenting behaviors in children's developing self-regulatory behaviors (i.e., sleep), consistent with attachment theory. We hypothesized that parenting behaviors would predict concurrent and future infant/toddler sleep behaviors. Infants from mothers who exhibit positive sensitive interactions were expected to present with more optimal daytime sleep patterns. To contrast the attachment perspective, we also specified a model that depicted infant behaviors as the driving force in concurrent and future parenting behaviors. In this model, infants with more difficult, dysregulated daytime sleep were expected to experience in less optimal parenting behaviors over time. In an attempt to apply transactional development theory, in the third model we specified early infant sleep behaviors as predictors of later parenting behaviors, which in turn influenced later toddler sleep. We hypothesized that less optimal sleep behaviors early in development would be associated with concurrent and future parent-child interaction difficulties. In turn, dyadic interactions characterized by more negativity and dysregulation were expected to predict less optimal toddler sleep behaviors.

METHODS

Participants

This sample is part of a larger longitudinal study of infants born preterm.²⁴ For this report, data were collected from 134 families recruited from 3 central Wisconsin NICUs. A research nurse from each hospital invited families to participate in the study if they met the following criteria: (a) infants were born ≤ 35 weeks gestation, (b) infants had no known congenital malformations or significant neurological findings during the NICU stay (e.g.,

Down Syndrome, periventricular leukomalacia, grade IV IVH) or prenatal drug exposures, (c) mothers were at least 17 years of age, (c) mothers could read English, and (d) mothers self-identified as the child's primary caregiver. Because the hospitals would not allow us to be "first contact" for families and they only gave us information about families who signed consent forms for the study, we were unable to calculate a participation rate.

Of the original 134 infants enrolled in the study, 123 completed their 4 month visits, 116 completed their 9 month visits, and 115 completed their 24 month visits. The resulting attrition rates were: 8% from hospital discharge to 4 months, an additional 5% from 4 to 9 months, and an additional 1% from 9 to 24 months, for a total attrition rate of 14% across 2 years. Missing data occurred at a higher rate for maternal report sleep logs than the other measures used in the study, likely reflecting the time-consuming nature of the logs and that in some cases the logs required mailing by the parent. Sample demographic information collected at hospital discharge is provided in Table 1.

Multivariate analysis of variance (MANOVA) was used to examine potential differences between families who continued in the study for 24 months and families lost to attrition. The MANOVA examining infant health variables revealed no significant differences between families lost to attrition and those that continued in the study for 2 years, *multivariate F* (5,128) = 1.19, $p = .32$, for the variables infant gestational age, birthweight, 1- and 5-minute Apgar scores, and days hospitalized in the NICU. In addition, the MANOVA conducted on family SES variables (measured at NICU discharge) was not statistically significant, *multivariate F* (7, 116) = 0.92, $p = .50$, indicating no differences between families who participated in the 24-month assessment and those lost to attrition on maternal and paternal age and education, family income, number of children in the home, and total family sociodemographic risk factors. However, mothers lost to attrition were more likely to be single, $\chi^2(1) = 4.66$, $p < .05$, and slightly more likely to be non-white, $\chi^2(1) = 3.41$, $p = .07$, than mothers who continued in the study for 2 years.

Study Design

Multiple methods were used to collect data at infant NICU discharge and when infants were 4, 9, and 24 months postterm. At NICU discharge, mothers completed demographic forms and collaborating nurses collected information from infant medical records. When infants were 4, 9 and 24 months postterm, mothers completed an infant sleep log and a 15-minute video-taped play session. Parent-child play interactions were coded using the Parent-Child Early Relational Assessment.³²

Measures

Daytime Sleep—Infant daytime sleep parameters were generated via maternal-report infant sleep logs. Sleep logs are commonly used parent report measure of infant sleep-wake status.^{33–35} The infant sleep log instructed parents to shade in the times their infant slept for a minimum of 3 consecutive 24-hour periods and to draw arrows when: (1) the child woke-up in the morning, (2) at the start and end of the child's naps, and (3) when the child went to bed at night. Previous research has established this measure's reliability, with 90% agreement between parental reports and video monitoring and a .70 ($p < .01$) correlation between infant sleep patterns and infant sleep log reports.³³ Infant sleep log data were used to calculate two sleep indices: the total number of hours of infant slept between their morning waking and bedtime (approximately 7 am to 7 pm) and the total number of naps (Table 2).

Parenting Interactions—When infants were 4, 9 and 24 months post-term, 15 minutes of mother-infant play was videotaped. The first five minutes of each play interaction were

coded using the Parent-Child Early Relational Assessment (PCERA).³² The PCERA assesses dyads on 65 (29 parent, 28 infant, and 8 dyadic) interaction quality variables, focusing on frequency, duration and intensity of affect and behavioral characteristics. Previous studies of the PCERA have reported an acceptable range of internal consistency ($r = .75$ to $.96$) and factorial validity³⁶ and it has been used with preterm infants^{37,38} and in sleep research.³⁹ Following training, percent agreement between coders was calculated across 10 to 15 tapes from this sample. PCERA training procedures recommend calculating percent agreement within coding columns for each item. PCERA scores range from 1 to 5 and are coded in columns with scores of 4–5 indicating a good relational quality, scores of 3 indicating intermittent, and scores of 1–2 indicating poor relational quality. Coder reliability was calculated on the basis of these three columns with averages of 87% (4 month), 81% (9 month), and 83% (24 month).

For this study, three established PCERA parenting factors were used, as recommended.^{35,39–41} The three subscales were Parental *Positive Affect, Involvement and Verbalizations* (11 items), *Negative Affect and Behavior* (5 items) and *Intrusiveness, Insensitivity, and Inconsistency* (7 items), as detailed in Table 2. Each subscale item was scored from 5 to 1 and summed (with higher scores indicating better relational quality). The child subscales were not used in the present study.

Family Sociodemographic Assets—Mothers completed a demographic questionnaire at hospital discharge that included information about maternal age, maternal education, and family income. Because maternal age, education and income were highly correlated, these variables were standardized and summed to generate a sociodemographic asset index. Scores were normally distributed and ranged from 4.71 to -5.10 ($M = -.12$, $SD = 2.27$) with a Cronbach's alpha of .74. Higher scores reflected more sociodemographic assets.

Data Analysis

Structural equation modeling (SEM) represents a general class of statistical procedures that combine factor analysis and path analysis.⁴³ The procedures used in SEM generally follow one of three approaches: confirmatory, alternative models, and model development. Working within the sample and measurement limitations of this study, an alternative models approach to path analysis was used.

Three competing path models were specified. In the first model, parenting behaviors at 4 months was expected to predict to child sleep behaviors at 4 and 9 months, and 9-month parenting was expected to predict 9- and 24-month infant sleep behaviors (Figure 1a). In the second model, child sleep behaviors were expected to predict parenting behaviors. Within this model, 4-month infant sleep behaviors were expected to predict 4- and 9-month parenting, and 9-month infant sleep behaviors were expected to predict 9- and 24-month parenting (Figure 1b). The third model predicted that early infant sleep behaviors would predict 4- and 9-month parenting and 9-month parenting would predict 24-month infant sleep behaviors (Figure 1c). Separate models were specified for each of the three parent factors across each sleep indices (i.e., number of naps and daytime sleep duration).

To test the competing models, Mplus 5.0 was used.⁴⁴ To address missing data, a full information maximum likelihood (FIML) procedure was used to address missing data. In the Mplus FIML procedure, individual missing data patterns are assessed and used to inform the observed information matrix.^{43,45} The observed information matrix is used to generate estimates.⁴⁶ Addressing missing data via FIML assumes data missing at random (MAR)⁴⁷ and is preferable to pair-wise or list-wise deletion.⁴⁵

To assess the overall model fit, 3 indices were assessed, including: chi-square (X^2), root mean square error of approximation (RMSEA), and the comparative fit index (CFI). The X^2 index is a model of misspecification; therefore, a significant X^2 means the model does not fit the sample data. Because some scholars claim that the exact fit tested in X^2 is an unrealistic standard, indices of approximate fit like RMSEA were also assessed.⁴³ RMSEA tests whether the model fits the population approximately. In RMSEA, .00 is the best possible fit, with higher values indicating poorer fit. Within this study, the CFI compares the specified model to a null model. The null model posits that there are no associations among the variables. CFI ranges from 0 to 1, with higher values indicating better fit. CFI values above .90 are generally interpreted as acceptable model fit.⁴⁸ Models were interpreted if they had acceptable fit across all three indices.

For the purposes of this study, Bayesian Information Criterion (BIC) was assessed to compare models. The BIC is an index of single sample cross-validation. This cross-validation index is not a hypothesis test, but rather is used to compare the magnitude of uncertainty across models. Lower BIC values are indicative of better cross-validation.

After the model fit indices and the BIC were assessed, individual path coefficients were interpreted. In SEM it is possible to have a good overall model fit with weak associations/correlations among individual variables. Therefore, both path coefficients and model fit indices are reported to aid in assessing the magnitude of the relationships in addition to the fit of the model. When models presented with comparable fit and path coefficients, the results for Model 1 are reported.

RESULTS

Number of Naps

For infant naps (as reported on the sleep log) and parent *Positive Affect, Involvement and Verbalizations*, Model 2 revealed the best model fit (Table 3). Inspection of path coefficients revealed that infants who napped more at 4 and 24 months experienced more maternal positive affect, involvement, and verbalizations at 4 months ($z = 2.75, p < .01$) and 24 months ($z = 3.25, p < .01$) (see Figure 2a). For time-lagged associations, more infant naps at 9 months predicted more positive maternal affect, involvement and verbalizations during daytime play interactions at 24 months ($z = 3.15, p < .01$). Additionally, infants who napped more at 4 months napped more at 9 months ($z = 4.89, p < .01$) and infants who napped more at 9 months also did so at 24 months ($z = 2.47, p = .01$). Likewise, more maternal positive affect, involvement and verbalizations at 4 months predicted more optimal interactions at 9 months ($z = 4.08, p < .01$), and 9-month maternal positive affect, involvement and verbalizations predicted more optimal parenting at 24 months ($z = 4.25, p < .01$).

For number of infant/toddler naps and *Negative Affect and Behavior* each of the specified models had roughly the same fit (Table 3). Inspection of path coefficients revealed only minor differences between the models. In each model, infants who napped more at 4 months napped more at 9 months, and infants who napped more at 9 months did so at 24 months. Similarly, more maternal negative affect and behavior at 9 months predicted more negative affect and behavior at 24 months ($z = 4.15, p < .01$). However, there were no significant associations between number of infant naps and maternal negative affect and behavior.

In models assessing number of naps and *Intrusiveness, Insensitivity, and Inconsistency*, each of the specified models had comparable fit (Table 3). Within each model, maternal intrusiveness, insensitivity and inconsistency was associated with number of infant naps at 4 months ($z = 2.94, p < .01$), see Figure 2b. At 4 months, infants who napped more had mothers who were rated at less intrusive, insensitive and inconsistent. As in the previous

models, infants who took more naps at 4-months, continued to nap more at 9-, and 24-months. Similarly, more maternal intrusiveness, insensitivity and inconsistency at 9 months predicted more intrusiveness, insensitivity and inconsistency at 24 months ($z = 2.79, p < .01$). There were no significant concurrent or time-lagged associations between maternal intrusiveness, insensitivity and inconsistency and number of naps at 9 or 24 months.

Amount of Daytime Sleep

For the models specified with amount of daytime sleep and maternal *Positive Affect, Involvement and Verbalizations* or *Intrusiveness, Insensitivity, and Inconsistency*, none of the models had acceptable fit and therefore were not interpreted (Table 3). For *Negative Affect and Behavior* and daytime sleep duration, only Model 1 had acceptable fit (Figure 2c). At 9 months, more maternal negative affect and behavior (i.e., lower PCERA scores) was associated with more daytime sleep duration ($z = -2.67, p < .01$). However, time-lagged associations revealed different associations. Four-month maternal negative affect predicted 9-month daytime sleep duration ($z = 2.55, p = .01$) and 9-month negative affect and behavior predicted daytime sleep duration at 24 months ($z = 2.49, p = .01$). In each estimate, less maternal negative affect and behavior (i.e., higher PCERA scores) predicted more daytime sleep. Additionally, infants who napped longer at 4 months continued to nap longer at 9 and 24 months. Similarly, more maternal negative affect and behavior at 9 months predicted more parent negative affect and behavior at 24 months ($z = 4.38, p < .01$), although there was no association between maternal negative affect at 4 and 9 months.

To explore a potential explanatory mechanism, post-hoc analyses on the role of family sociodemographic assets were also completed. Within each model, the family SES composite was added and paths were specified to each parenting factor and sleep parameter (at 4, 9 and 24 months). As expected, there was a consistent association between family sociodemographic assets and parenting interactions. More sociodemographic assets were associated with more maternal *Positive Affect, Involvement and Verbalizations* and less *Negative Affect and Behavior* and less *Intrusiveness, Insensitivity, and Inconsistency* at each time point (all $p < .05$). Family sociodemographic assets were sporadically associated with child daytime sleep behaviors. More family SES assets at hospital discharge predicted more naps at 4 months ($z = 2.78, p < .01$) and more daytime sleep (but not more naps) at 24 months ($z = 3.22, p < .01$). The addition of family SES assets did not significantly change any of the relationships between parenting and number of naps or amount of daytime sleep. However, these analyses should be considered exploratory as the number of paths specified exceeds the recommendations for our modest sample size.⁴²

DISCUSSION

In our longitudinal study of preterm infants, we found some support for models examining links between infant sleep and parenting interactions, although results differed somewhat depending on whether we focused on maternal positive or negative affect.

Within two time points, positive associations emerged between more infant naps (i.e., more bouts of daytime sleep) and more positive maternal affect and involvement and less intrusive parenting. Specifically, infants who took more naps at 4 months experienced more positive maternal affect and involvement and less intrusiveness and insensitivity at 4 months compared to infants who took fewer naps. Similarly, there was an association between more toddler naps at 24 months and more maternal positive affect and involvement at 24 months. Across time, similar findings emerged for both parent-to-child and child-to-parent effects. Examination of time-lagged child-to-parent effects revealed that more infant naps at 9 months predicted more positive maternal affect, involvement and verbalizations during daytime play interactions at 24 months, similar to the within time point positive affect

models. Napping more often may give preterm infants and their mothers a break that may result in more positive affect in mothers, concurrently and across time. Mothers who allow their preterm infants to nap frequently may be showing sensitivity to their cues and allowing the infants (and themselves) time to reorganize and thus become better interactional partners. These processes are consistent with transactional models of development, suggesting that infants and parents affect each other in complex ways over time.

Within this sleep field, these findings may seem contradictory; more daytime sleep episodes are associated concurrently and longitudinally with more optimal parenting. Previous sleep studies have reported that more sleep episodes at night are associated with motor and cognitive delays in 3- to 6-month old infants with Down Syndrome⁴⁹ and 10-month old infants born at term.⁵⁰ In contrast, an observational study of 3- to 4-month old infants conducted by Fouts, Roopnarine, and Lamb (2007) reported more positive interpersonal interactions and more infant naps among higher SES families.⁵¹ Although Fouts and associates (2007) did not directly assess the connection between naps and interpersonal interactions, they highlighted a potential third variable (i.e., SES) that could account for the association between naps and interaction quality. This alternative explanation was explored, and when SES was added to the models in the present study, no substantive differences in the findings emerged. The present findings provide support for parents to maintain more daytime rest periods in young children born preterm.

Examination of time-lagged parent-to-child effects revealed that more maternal negative affect at earlier time points predicted less infant/toddler daytime sleep at later time points. Specifically, at 4-month more maternal negative affect predicted shorter 9-month daytime sleep duration and at 9-month more maternal negative affect predicted shorter 24-month daytime sleep duration. However, within the 9-month time point, infants who slept longer during the day had mothers who exhibited more negative affect and behavior. It is possible that early expressions of maternal anger during play interactions may dysregulate preterm infant sleep patterns, so that they spend less time sleeping during the day at some development periods (4 and 24 months) but more time sleeping at other periods in development (9 months). Preterm infants may be easily dysregulated by such expressions of anger (Poehlmann et al., in press). Attachment theory suggests that maternal angry affect or engaging in behaviors that dismiss the infant's needs may result in development of infant insecure attachment strategies. Future research should examine the potential link between duration of infant sleep during the day, maternal expressions of anger, and subsequent attachment relationships in preterm infants. The clear finding from these models is that duration of daytime sleep and number of naps follow different developmental patterns and are influenced by different elements of parenting interactions.

Within each model, the associations between daytime sleep and parenting appear different at 9 months (correct age) or roughly 12 months chronologically than at 4 or 24 months of age. Nine months (corrected for gestation) appears to be a point of transition. For many infants, this age is a time of new found locomotion (crawling or walking) and an understanding that the 'world' is out there even when they cannot see it. These developmental milestones have been associated with increased sleep resistance as children (and parents) attempt to balance desires for autonomy and exploration with the need for sleep. The distinctly different pattern at 9 months of age adds support to a transactional model of development; wherein, the influence of parenting behaviors varies as a function of the child's development.

LIMITATIONS

The limitations of our study should be noted when interpreting our findings. Although attrition was relatively low, mothers lost to attrition were more likely to be single and non-

white than those who remained in the study. The increased attrition among single mothers likely reflects the time consuming nature of the study and potentially lower levels of social support. The trend for non-white mothers to leave the study may reflect numerous factors not assessed including number of moves, changes in family membership, and distance from the research center. A higher percentage of non-white mothers were recruited from a hospital that was over an hour away from the research center and therefore may have affected their participation.

Because we focused on infants born preterm, our results are not generalizable to infants born at term. We did not include a control group of infants born at term because we were examining within-group processes in preterm infants. Finally, we did not include fathers, who may impact a child's sleep development. When interpreting the daytime sleep results it is important to note the sleep logs represent parent perceptions of infant sleep and are not as accurate as more objective measures of sleep (i.e., actigraphy or polysomnography). However, previous studies highlight that parental perceptions of sleep are influential.^{8,52,53} Daytime sleep patterns and nighttime sleep patterns are intricately linked and looking at only daytime sleep behaviors is limiting and does not capture the significant effect multiple night awakenings may have parent and child daytime behaviors. However, daytime sleep is proximal to daytime parenting interactions and previous studies highlight that parent-child interactions that occur most proximal to sleep are influential.^{8,34}

IMPLICATIONS FOR INTERVENTION

Previous studies document that nighttime parent-child interactions influence nighttime sleep. This study presents the natural extension that daytime sleep influences daytime interactions.^{8,34} The current study draws attention to the understudied area of daytime naps in young children and provides support for the longitudinal bi-directional processes between sleep and parenting interactions. Clinicians should recognize the cyclical patterns present between infant/toddler daytime sleep and parent-child daytime interactions. Infants born preterm may require frequent naps to achieve affectively positive social interactions early in life. Perhaps mothers who receive more breaks during the day are better interactive partners with their premature infants as well. From an attachment perspective, more responsive, sensitive parents may be better skilled at reading their child's cues and are therefore more likely to set a slightly tired child down for a nap and to engage in more optimal social interactions when the child awakes. Developmental pediatricians and other clinicians may wish to assess preterm infant daytime sleep patterns during developmental follow-up visits. When engaging in anticipatory guidance, clinicians may wish to instruct parents about how to read the infant's cues regarding the need for daytime naps and to encourage parents to allow preterm infants to take "breaks" from interactions as needed. Daytime sleep problems may be indicative of dyadic dysregulation not just infant medical or physiologic difficulties. In addition, when parents exhibit signs of angry affect toward their preterm infants, clinicians may consider working with these parents so that they can engage in more optimal interaction strategies.

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Figure 1.
Conceptual models for parenting interactions and infant/toddler daytime sleep.

Figure 2. Significant standardized path coefficients for: (a) number of infant naps and maternal positive affect, involvement and verbalizations, (b) number of naps and maternal intrusiveness, insensitivity, and inconsistency and (c) daytime sleep duration and maternal negative affect and behavior.

Table 1

Sample Demographic Characteristics

	N	Range or Frequency	M or %	SD
Maternal				
Age (years)	134	17 – 42	29.37	6.17
Education (years)	134	8 – 21	14.21	2.66
Paternal				
Age (years)	133	17 – 44	30.97	6.63
Education (years)	132	6 – 21	13.62	2.73
Infant				
Gestational Age (weeks)	134	25.00 – 35.86	31.46	2.99
Birthweight (grams)	134	654 – 3328	1744.04	584.67
Gender (% Female)	134	61	45.5%	
Racial Heritage				
Caucasian		92	68.7%	
African American		13	9.7%	
Latina		3	2.2%	
Asian		1	0.7%	
Middle Eastern		1	0.7%	
More than one Racial Heritage		24	17.9%	
Family				
Income	134	0 – \$210,000	\$57,276.72	41,002.11
Children in Home	134	1 – 11	1.93	1.24
Marital Status (% Married)	134	92	68.7%	

Table 2
Descriptive Statistics for Number of Naps, Daytime Sleep Duration, and Parenting Interaction Subscales at Each Time Point

	<i>N</i>	Range	<i>M</i>	<i>SD</i>	<i>α</i>
Number of Naps					
4 Months	111	0 – 5	2.84	.89	
9 Months	104	.33 – 3.33	1.94	.54	
24 Months	102	.40–1.80	1.02	.24	
Daytime Sleep Duration ^a					
4 Months	111	0 – 430	227	77	
9 Months	103	10 – 255	154	46	
24 Months	102	26 – 201	111	32	
Positive Affect, Involvement and Verbalizations					
4 Months	123	20 – 55	43.09	7.02	.92
9 Months	108	22 – 54	41.11	7.98	.93
24 Months	94	28 – 54	42.16	6.37	.87
Negative Affect and Behavior					
4 Months	123	14 – 25	22.50	2.73	.84
9 Months	108	7 – 25	20.29	3.61	.89
24 Months	94	10 – 25	19.37	3.74	.88
Intrusiveness, Insensitivity, and Inconsistency					
4 Months	123	19 – 40	32.07	4.91	.86
9 Months	108	18 – 40	30.06	4.73	.83
24 Months	94	18 – 40	31.90	4.10	.79

Note.

^a reported in minutes

Table 3

Model Fit and Comparison Indices for Number of Naps and Daytime Sleep Duration

	$\chi^2(df)$	CFI	RMSEA	BIC
Number of Naps				
Positive Affect, Involvement and Verbalizations				
Model 1	9.47 (6)	.94	.07	2672.233
Model 2	1.28 (6)	1.00	.00	2663.428
Model 3	9.80 (7)	.95	.06	2667.299
Negative Affect and Behavior				
Model 1	8.63 (6)	.94	.06	2193.984
Model 2	6.59 (6)	.99	.03	2192.945
Model 3	6.83 (7)	1.00	.00	2188.046
Intrusiveness, Insensitivity, and Inconsistency				
Model 1	6.06 (6)	1.00	.01	2413.990
Model 2	5.81 (6)	1.00	.00	2413.868
Model 3	6.80 (7)	1.00	.00	2409.662
Daytime Sleep Duration				
Positive Affect, Involvement and Verbalizations				
Model 1	19.43 (6)*	.78	.13	5590.333
Model 2	14.65 (6)*	.86	.11	5585.675
Model 3	20.67 (7)*	.78	.13	5587.780
Negative Affect and Behavior				
Model 1	4.37 (6)	1.00	.00	5088.738
Model 2	16.18 (6)*	.81	.12	5098.667
Model 3	19.39 (7)*	.77	.12	5096.285
Intrusiveness, Insensitivity, and Inconsistency				
Model 1	13.75 (6)*	.82	.10	5322.376
Model 2	21.12 (6)*	.64	.14	5329.767
Model 3	23.24 (7)*	.62	.14	5327.997

Note.

*
 $p < .05$