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Chapter X. Developmental Trajectories of Children's Sleep Problems After the Birth of a Sibling

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One of the most important developmental milestones in infancy is the ability to sleep, uninterrupted, throughout the night. From the time the infant is brought home from the hospital, sleep is a major concern for parents and is discussed frequently at visits with health care professionals (Jenni & Carskadon, 2007). The ability to sleep through the night not only provides a respite from intensive childcare for parents, it also represents the normative maturation of children's regulatory processes and the capacity to self-soothe. Fragmented sleep patterns in early childhood have been linked to poorer neurobehavioral functioning and behavior problems (Sadeh, Raviv, & Gruber, 2000).

The transition to siblinghood may be an especially disruptive time for children's sleep, as changes in the family system, less focused parental attention, and irregular infant sleep patterns are factors likely to disturb the quality of the older sibling's sleep, leading to increased night awakenings as well as remaining awake for prolonged periods (Dunn & Kendrick, 1982; Trause et al., 1981). Field and Reite (1984) found that following the transition to siblinghood, older children experienced increases in night awakenings, the time it took to fall asleep, the amount of time slept, and bouts of crying during the night, providing evidence that a new infant may galvanize or increase older sibling's sleep problems.

Development of Sleep Problems in Early Childhood

Although we know the development of sleep regularity is important for normative functioning, few empirical studies exist examining sleep trajectories longitudinally from infancy throughout childhood (Acebo et al., 2005). Jenni and Carskadon (2007) caution against the pursuit of a universal sleep framework, stating that there is much variability in children's sleep across cultures and that sleep patterns should be viewed within a biopsychosocial framework. In other words, what constitutes normative sleep is malleable and is often dependent on extrinsic circumstances.

Studies suggest that infants begin to develop consolidated sleep patterns by 6 to 9 months of age (Anders & Keener, 1985; Jenni, Achermann, & Carskadon, 2005; Löhr & Siegmund, 1999). Once the infant begins to sleep through the night, total sleep hours remain fairly consistent throughout the first year. From ages 3 to 5, children tend to nap less and go to bed later in the evening (Sadeh, Mindell, Luedtke, & Wiegand, 2009). Although sleep patterns are more consistent during this period, toddlers and preschoolers still awaken frequently during the night (Jenni & Carskadon, 2007). Fragmented sleep from age 3 to 5 is thought to be related to several major developmental processes converging—newfound cognitive

abilities producing nightmares, attachment issues generating separation anxiety, and the need to assert independence exercised through bedtime resistance (Jenni, Fuhrer, Iglowstein, Molinari, & Largo, 2005; Jenni & Carskadon, 2007).

Several large-scale studies investigating children's sleep have found comparable trajectories of nighttime sleep consolidation during the first year, with decreases in daytime napping beginning at age 3. Sadeh, Mindell, Luedtke, and Wiegand (2009) sampled North American parents of 5,006 children from birth to 36 months regarding children's sleep patterns, the sleep environment, bedtime routines, and sleep positions. Findings suggested sleep duration does decrease with age, yet there is a wide range of individual variability when it comes to the total amount of hours slept. A cross-cultural study of the sleep patterns of 29,287 infants and toddlers in 17 different countries found that the amount of daytime sleep decreased with age, and nighttime sleep duration was primarily influenced by parental behaviors at bedtime, such as holding, rocking, rubbing/patting, or feeding, as well as how long parents waited to respond (Mindell, Sadeh, Kohyama, & How, 2010). These studies demonstrated that even though there is large individual and cross-cultural variability among children's sleep patterns, predictable overall trends have been found, with decreases in daytime sleep and increases in nighttime sleep as children reach toddlerhood.

Individual Differences in Young Children's Sleep Problems

In a further examination of sleep pattern variability, Weinraub et al. (2012) identified two distinct sleep trajectories present over the first three years of life. Although two-thirds of children followed the normative pattern of increases in night sleep from 6 to 36 months, the remaining group awoke six to seven nights per week at 6 months, and three nights per week at 15 months. The children following this atypical trajectory were described as having a difficult temperament, were from a larger family, and their mothers were significantly more likely to be depressed. Despite early sleep difficulties, these children were sleeping through the night by age 2. Kataria, Swanson, & Trevathan (1987) identified a group of 60 children ranging in age from 15 to 48 months with documented sleep difficulties, and then followed these same children three years later. Eighty-four percent of children who suffered from sleep problems at 15 to 48 months continued to demonstrate these issues three years later. A more recent study by Lam, Hiscock, & Wake (2003) examined 114 mothers of three- and four-year-olds who had sleep difficulties in infancy, with 12% reporting their children's sleep problems had persisted, and 19% stating that their sleep issues had recurred. Children, for whom sleep remained an issue, had higher mean scores on the Child Behavior Checklist subscales for aggressive behavior and somatic complaints. These studies demonstrated that for a minority of children, sleep problems that persist into the preschool years may be indicative of an abnormal sleep trajectory that endures throughout childhood.

Risk and Protective Factors in the Prediction of Early Sleep Problems

Research on the development of sleep patterns in early childhood notes variability in children's sleep trajectories, and the role of both the child as well as the environment in the development of the sleep/wake system. Using the developmental ecological systems theory

as a guiding organizational framework, factors internal to the child, parental variables, and family processes have been found to affect developing sleep patterns.

Temperament is often implicated as a major factor in children diagnosed with sleep problems. Toddlers with sleep difficulties have been described by their parents as being more difficult, having higher levels of reactivity, being distractible, more demanding, and less adaptive (Sadeh, Lavie, & Scher, 1994). Children diagnosed with sleep problems also display more negative emotionality and disruptive behavior during the day (Owens-Stively et al., 1997), indicating that these children may be having difficulties with emotion regulation.

The presence or absence of bedtime routines is also frequently implicated in the development and persistence of sleep problems throughout childhood (Staples, Bates, & Petersen, 2015). Adherence to a bedtime routine reflects a more organized parenting style, and is often conceptualized as consistency of parental responsiveness at three critical moments: sleep onset, episodes of sleep difficulty, and nocturnal awakening. Parents are very likely to facilitate children's development of self-soothing behaviors during these episodes through rubbing/patting, holding, rocking, or feeding. Early bedtimes, reliable routines, and scaffolding of self-regulation skills are all factors important in the development of sleep consolidation (Mindell et al., 2010).

Paradoxically, more attention and responsiveness to children with sleep difficulties may exacerbate the problem rather than improve children's sleep. For example, the more distressed and anxious mothers believed their infants were during night awakenings, the more likely they were to respond to infants' cries by attempting to soothe their children. Repeated involvement by mothers led to poorer infant sleep outcomes over the first 12 months of life (Tikotzky & Sadeh, 2009). As children age, interventions teaching self-soothing behaviors and providing verbal comfort during a nocturnal awakening were more effective at reducing sleep problems than holding or feeding the child during night awakenings (Sadeh et al., 2009).

The findings of these studies, and others, suggest that parents who are overly involved at bedtime may be stymying the development of important self-soothing abilities, resulting in a cycle leading to increased sleep problems (Touchette et al., 2005). Parents learn to respond appropriately, taking into account the developmental abilities of the child (Weinraub et al., 2012). Sensitive parents are able to put the needs of their children before their own, providing the scaffolding necessary for children to learn healthy self-regulation abilities, whereas insensitive parents either respond inappropriately or neglect their children's needs altogether. In this sense the qualities of the parent can be a risk or protective factor in children's sleep difficulties (Bélanger, Bernier, Simard, Bordeleau, & Carrier, 2015).

Family functioning has also been found to contribute to sleep problems during childhood (El-Sheikh & Sadeh, 2015). Researchers have identified detrimental family dynamics that are often associated with childhood sleep difficulties. Family stress is thought to play a key role in the development of sleep problems (Gregory, Eley, O'Connor, Rijdsdijk, & Plomin, 2005; Klackenberg, 1982; Sadeh et al., 2000; Tobia, Wolfson, & Gallagher, 1995). Further, children with sleep problems often have poorer relationships with their parents and have

parents with higher rates of marital dissatisfaction (Quine, 1992). In fact, marital conflict has been found to be a key variable affecting children's sleep (El-Sheikh, Hinnant, & Erath, 2015). Interparental conflict may contribute to sleep problems in multiple ways—parents under the stress of constant disagreement are likely to be dysregulated, lacking the ability to model healthy emotion regulation skills for their children. Additionally, children who are exposed to conflict are more anxious, aggressive, and hypervigilant – physiological arousal and dysregulation that prevent the child from settling (El-Sheikh, Buckhalt, Cummings, & Keller, 2007; Hall, Zubrick, Silburn, Parsons, & Kurinczuk, 2007).

Maternal sleep quality postpartum and maternal depression have also been linked to children's long-term sleep difficulties (Seifer, Sameroff, Dickstein, & Hayden, 1996; Zuckerman et al., 1987). Paternal involvement, however, may mitigate the influence of these factors on children's sleep patterns. Increased involvement of fathers and more equitable sharing of caregiving responsibilities during the postpartum period predicted greater quality maternal sleep which, in turn, predicted increased consolidation of infant sleep patterns (Tikotzky et al., 2015). It has been hypothesized that the relationship between sleep problems and family functioning are by-products of family stress and parenting deficiencies, which also contribute more broadly to the development of childhood behavioral problems (Deater-Deckard, Dodge, Bates, & Pettit, 1998). This is one reason why the ability of the parents to support one another and work together during this period of transition may be so important.

Sibling Relationships and Early Sleep Problems

Though few studies have focused specifically on sleep problems during the transition to siblinghood, this time period is often viewed as a stressful period and a time of adjustment for the entire family. How the family responds throughout this normative transition may influence the firstborn's adaptation and behavior (Volling, 2012). Of the studies that have examined sleep problems across the transition to siblinghood, Field and Reite (1984) found an increase in overall sleep time, nocturnal awakenings, night crying, and duration of deep sleep from ten days before birth to two days after the mother was hospitalized. Ten days after the mother returned home, these behaviors decreased. This suggests that sleep problems in children may have been a result of separation issues rather than the transition to siblinghood itself. Trause and colleagues (1981) also found increased sleep problems during the transition to siblinghood, but the study only extended to the mother's discharge from the hospital, making it difficult to ascertain whether sleep problems were permanent, transitory, or simply a reaction to parental separation. No study has examined directly whether children's sleep problems are related to the developing sibling relationship, but it is possible that the nocturnal awakenings of an infant sibling in the months after the birth may affect children's sleep patterns. It is less clear whether such disruptions in sleep would affect sibling relations so we advanced no specific hypotheses in this regard.

Results

Individual Differences in Trajectories of Sleep Problems

The unconditional latent linear model which revealed no significant change in sleep problems for the sample overall was chosen as the final model to be used in the GMM analyses (see Chapter III). Results of the GMM indicated that the four-class model with a linear growth factor was considered the best fitting model for the *sleep problems* subscale based on fit indices. The four-class model had better fit indices, AIC = 4056.387, BIC = 4121.710, LMR = .321, than the three-class model, AIC = 4066.814, BIC = 4121.823, and no major improvement in fit from the five-class model, AIC = 4053.389, BIC = 4129.035, LMR-LRT = .177; the four-class model also had higher entropy (.839) than the five-class model (.824). Estimates and standard errors for the fixed effects of each class are presented in Table 16 and the different trajectory patterns for the four classes are displayed in Figure 10; all of which are consistent with projected linear patterns of change and stability shown in Figure 1.

The largest class representing 55.6% of the sample ($n = 128$) was denoted the *low-stable* class; these children showed low levels of sleep problems at the prenatal timepoint that remained low throughout the first year. The second class, and 37.8% of the sample ($n = 87$), represented a *mid-decreasing* trajectory. These children had moderate levels of sleep problems at the onset and their symptoms showed a linear decrease over time. A third class and 5.6% of the sample ($n = 13$) denoted the *high-stable* class, showed high levels of sleep problems at the prenatal timepoint that were stable over time. The fourth class and 1% of the sample ($n = 2$) was labeled the *extreme-high-stable* class, and the children in this class showed the highest levels of sleep problems at the prenatal timepoint, which remained high over time.

When examining the spaghetti plots of the individual trajectories for each class, we found, as with prior CBCL subscales, that the intercepts of the various classes mapped well onto the cut-off ranges (see Figure 6 in the supplemental materials). That is, children in the low-stable class were below the normative mean with a few children above the mean. Most children in the mid-decreasing class were between the normative mean and the borderline clinical cut-off. This was similar to the high-stable group, where the children fell between the normative mean and the clinical range cut-off, with a few children presenting with symptoms above the clinical cut-off. Of the 2 children who were in the extreme-high-stable class, both showed symptoms above the clinical cut-off. Thus, our results showed that the identified classes represented meaningful distinctions between children falling within the normative, borderline, and clinical ranges on sleep problems, even though several of the riskier classes were quite small.

Predicting Sleep Problem Trajectories

Five variables emerged from the data mining procedures as candidate prenatal predictors for children's sleep trajectories: children's negative emotionality, parents' reports of coparenting conflict, mothers' age, observed marital negative interaction, and mothers' parental self-efficacy. The multinomial logistic regression analyses revealed that the model testing higher-

order interactions among the five candidate predictors was not a significantly better fit than the reduced model with direct effects, $LR \text{ Chisq} (df = 78) = 75.13, p = 0.57$; therefore, the results of the reduced model with additive, centered main effects are presented in Table 17.

Using the low-stable class as a reference, children's negative emotionality and coparenting conflict had significant effects ($z's > 1.96$). As children's negative emotionality increased there was an increased likelihood of children being in the mid-decreasing class relative to the low-stable reference class and an increased likelihood of being in the high-stable class relative to the low-stable reference class. In addition, increased coparenting conflict predicted increased chances of membership in the mid-decreasing class relative to the low-stable class.

Because of our interest in discerning differences between classes hitting different levels of clinical significance, we also conducted exploratory multinomial logistic regressions using several of the other classes as the reference class. Using the mid-decreasing class as the reference class, we found that children's negative emotionality significantly predicted membership in the high stable class. Specifically, children with increased negative emotionality were significantly more likely to be in the high stable class, $b = 1.34, z = 2.13, OR = 3.8$, versus the mid-decreasing class. Other results using the mid-decreasing and then high-stable class as the reference did not differ from the results reported above.

Consequences of Sleep Problems for Sibling Relationships at One Year

We conducted regression analyses using the low-stable class as the reference class to test whether children's sleep problem trajectories predicted siblings' positive involvement, conflict, or avoidance 12 months after the infant was born. Results were non-significant indicating no mean differences for sibling relationship quality.

Discussion of Children's Sleep Problem Trajectories

Results indicated the best fitting model describing children's sleep problems across the transition to siblinghood was a linear latent growth model that indicated no change in children's sleep problems, on average, following the birth of a sibling. This is inconsistent with previous literature examining the transition to siblinghood, which found that the presence of the infant might create or exacerbate children's sleep disturbances (Dunn & Kendrick, 1982). When examining individual differences within the sample, however, children's sleep trajectories revealed four different patterns following the birth of their sibling. The first class (55.6% of the sample) showed low levels of sleep problems before and after the birth of their sibling. The second class, accounting for 38% of children, exhibited moderate levels of sleep problems initially that waned over time, a typical trajectory often found by sleep researchers and reflects the normative development of regulatory systems (Weinraub et al., 2012). The third smaller class of only 6% of children (high-stable) suffered from a number of sleep issues both before and after their sibling's birth with little change across timepoints. The two children in the extreme-high-stable class (1%) also did not evidence changes in their sleep problems over time indicating that the transition was not responsible for these children's clinically significant levels of sleep difficulties before and after the birth of their infant sibling.

When examining the predictors of these different trajectory patterns, our findings suggest that child characteristics and family processes may be more responsible for individual differences in children's sleep problems before and after the birth than the birth of the infant sibling, as most patterns revealed low, modest, or high problems before the birth that remained stable or actually decreased over the transition period. Indeed, the multinomial regressions indicated children's temperament (i.e., negative emotionality), as well as coparenting conflict before the birth, distinguished children in the mid-decreasing class from the low-stable class. Thus, it appears that both temperamental characteristics of children and family relationship functioning were important predictors of children's sleep patterns after the birth. Although our results were found in a community-based sample of low-risk parents, the findings were consistent with many prior studies finding children's difficult temperament and parenting conflict as predictors of children's sleep problems (DeLeon & Karraker, 2007; Weinraub et al., 2012).

Numerous studies have emphasized the importance of temperament in the development of sleep difficulties (Owens-Stively et al., 1997; Sadeh et al., 1994; Schaefer, 1990). Children who are temperamentally reactive may have a harder time developing the self-regulation skills necessary for sleeping throughout the night (Bates, Pettit, Dodge, & Ridge, 1998; Belsky, Hsieh, & Crnic, 1998; Mary Klevjord Rothbart & Bates, 2006). Additionally, difficult child temperament influences the quality of care children often receive, which may also play a role in the parental strategies used to put children to sleep, as well as respond to night awakenings.

Research has emphasized the bidirectional relationship between parental behaviors and children's sleep and the importance of viewing children's sleep difficulties within an ecological family systems model (Scher & Asher, 2004). Coparenting conflict can increase stress and deplete the resources needed for mothers and fathers to parent sensitively and effectively. At the same time, children living in a family with a high amount of interparental conflict experience a multitude of negative emotions and become dysregulated, making it harder for children to calm down at night (El-Sheikh & Sadeh, 2015). According to a neurobehavioral perspective, sleep and vigilance are opposing processes – sleep requires a lack of awareness and monitoring of the external environment, whereas vigilance requires heightened monitoring of the external environment for threats (Dahl & El-Sheikh, 2007). From an evolutionary perspective, social bonds, family, and specifically safety and security provided by caregivers enable greater safety for periods of sleep. Thus, it makes sense that when a core component of safety provided by parents is threatened, children respond with vigilant biobehavioral processes, and therefore, decreased sleep.

Family systems theory underscores that family members have bidirectional influences on one another (Cox & Paley, 1997). Therefore, interparental conflict and children's sleep can be viewed as a bidirectional relation—conflict between parents can lead to a dysregulated child who is harder to soothe, and parents are less sensitive and responsive due to the stress of their own discord. Indeed, infant crying at night during the first few months has a negative impact on parents own sleep quality, marital quality, stress, mood, and general fatigue (Meijer & van den Wittenboer, 2007; Meltzer & Mindell, 2007), all of which are key determinants of parenting (Belsky, 1984). Sensitive parents are more likely to be able to

respond to their children's nighttime distress while also respecting the growing need for autonomy and the scaffolding of self-soothing skills (El-Sheikh & Sadeh, 2015). Sleep processes represent some of the earliest interactions between innate variables, such as temperament and family functioning, and further studies examining sleep across the transition to siblinghood may elucidate these dynamics.

Relations were not found between children's sleep problems and sibling relationships at 12 months, which is not surprising as it is not clear why disturbed sleep would translate directly into behaviors directed to an infant sibling. Further research, however, may need to take a more nuanced look at family and sleep processes than we were able to capture here with the CBCL syndrome scale to articulate whether a crying infant that may be responsible for disruptions in children's sleep may eventually be the recipient of the older sibling's hostile and reactive behaviors.

In sum, findings from this relatively low-risk, community-based sample of children experiencing the birth of an infant sibling demonstrated that a majority of parents reported their children had no sleep problems over the course of the year following the birth. Of those with borderline or even clinical elevations in sleep problems, there was no evidence of a drastic change in their sleep problems once the infant was born and brought home, which is somewhat surprising given the significant number of night awakenings and feedings a newborn infant requires and the sleep disturbances and fatigue that parents often experience during the early postpartum months. These levels of children's sleep problems already existed before the birth of the sibling. We must acknowledge, however, that parent reports, particularly during a time when they, themselves, are busy attending to a newborn at night, may not reliably capture the true extent of children's sleep difficulties over the transition. For example, Field and Reite (1984), using time-lapse video footage, found that the quality of the older children's sleep quality did decrease in the ten days after the mother returned home from the hospital with the infant sibling. Thus, the use of these assessments to track children's actual sleep patterns may indicate levels of sleep difficulties for these children that we were unable to uncover here and we would recommend future studies move beyond parent report in order to address such a possibility. Dunn and Kendrick (1982) also reported disruptions in older children's sleep patterns after the birth of the sibling. Their sample, however, consisted of working class families in Cambridge, England and it is likely that many of the siblings were sharing a room, or living in small houses where a crying infant could cause disruption, or parents were experiencing greater stress due to financial difficulties. Previous research has linked low SES to sleep problems in children (Sheridan et al., 2013). Our study consisted of middle to high SES families so it is possible that sample differences with respect to SES and financial stress accounted for our lack of findings in contrast to those of Dunn and Kendrick (1982).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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FIGURE 1.
Theorized trajectory patterns of change reflecting adjustment and adaptation, stability, and linear increase.

FIGURE 10.

Trajectory classes for sleep problems from Growth Mixture Model ($n=230$).

Table 16

Growth Mixture Model Results for Sleep Problems: Parameter Estimates and Standard Errors for Fixed Effects

Classes	Low-stable	Mid-decreasing	High-stable	Extreme-high-stable
Parameters	n = 128 (55.6%)	n = 87 (37.8%)	n = 13 (5.6%)	n = 2 (1%)
Intercept	1.431 *** (.216)	4.328 *** (.291)	7.788 *** (.671)	12.140 *** (.888)
Linear slope	.053 (.036)	-.093 ** (.039)	-.216 (.181)	-.075 (.071)

Note. Standard errors in parentheses. The random effect (variance) of intercept est. = .449, $SE = .308$, $p = .145$; the random effect of linear slope est. = .035, $SE = .013$, $p = .008$.

*
 $p < .05$,

**
 $p < .01$,

 $p < .001$.

Table 17

Results of Multinomial Logistic Regression Analysis Examining Class Differences for Sleep Problems with the Low-Stable Class as the Reference Class

Predictor	Low-stable vs.	b	SE	z	p	OR
Mothers' age	Mid-decreasing	-0.04	0.04	-1.18	n.s.	0.96
	High-stable	0.003	0.09	0.03	n.s.	1.00
	Extreme-high	-0.13	0.17	-0.73	n.s.	0.88
Children's negative emotionality	Mid-decreasing	0.57	0.28	2.07	0.038	1.77
	High-stable	1.92	0.63	3.03	0.002	6.80
	Extreme-high	-0.46	1.30	-0.35	n.s.	0.63
Mothers' parental efficacy ^a	Mid-decreasing	-0.03	0.44	-0.08	n.s.	0.97
	High-stable	1.01	0.95	1.06	n.s.	2.74
	Extreme-high	0.16	2.27	0.07	n.s.	1.18
Coparenting conflict	Mid-decreasing	1.33	0.39	3.41	<0.001	3.77
	High-stable	0.69	0.83	0.84	n.s.	2.00
	Extreme-high	1.51	1.86	0.81	n.s.	4.54
Observed negative marital interaction	Mid-decreasing	-0.07	0.07	-0.96	n.s.	0.93
	High-stable	0.32	0.15	0.21	n.s.	1.03
	Extreme-high	-0.27	0.49	-0.55	n.s.	0.76

Note. n.s. = nonsignificant. OR= Odds Ratio.

^ahigher scores indicate lower sense of efficacy as a parent