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CONCEPTUALIZATIONS AND DETERMINANTS OF MATERNAL ADAPTATION TO INFANT SLEEP: BIRTH TO SIX MONTHS

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ABSTRACT

Of the many decisions that parents make regarding child-rearing practices during the first six months of their infant's life, some of the most important involve the choices that surround infant sleep, including parent and infant sleep arrangements, bedtime routines, nighttime sleep practices, and the like. The present study investigated how these choices influence maternal adaptation, maternal emotional availability, maternal and infant sleep quality, co-parenting, spousal support, and maternal distress over the first six months of life. Mothers were asked to complete questionnaires regarding their infant's sleep behaviors and patterns, as well as their attitudes and feelings surrounding those behaviors. Additional measures included maternal and infant sleep quality via actigraphy and maternal emotional availability at bedtime. Data was collected on 120 mothers and infants at one month, 104 mothers and infants at three months, and 97 mothers and infants at six months. Maternal adaptation to infant sleep and maternal emotional availability at bedtime were both stable across the first six months. Maternal adaptation scores improved significantly across the first six months, but maternal emotional availability at bedtime did not. Maternal adaptation and maternal emotional availability at six months were both predicted by negative co-parenting at one and three months, such that mothers who reported more conflict, competition, and undermining in their relationship with their partners were less well-adapted and less emotionally available to their infant at bedtime. Mothers of infants who woke up more frequently across the first three months were also less well-adapted at six months. Regarding sleep arrangements, mothers who slept in a separate room from their infant were more likely to be well-adapted to their infant's sleep patterns and more emotionally available at bedtime than

mothers who slept in the same room as their infant, although this result was partially mediated by maternal reports of negative co-parenting. In a culture in which solitary infant sleep is mainstream, those parents who choose to share sleep with their infant may be faced with challenges above and beyond the many that already exist when adapting to life with an infant. Results emphasize the importance of taking into account both individual and contextual differences in the quality of mothers' adaptation to infant sleep behavior, a construct largely ignored in the child sleep literature to date, in understanding linkages between infant sleep patterns and maternal adaptation.

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There was never a child so lovely but his mother was glad to get him to sleep.

Ralph Waldo Emerson

That which you perceive to be real, will be real in its consequences.

W. I. Thomas

Introduction

Parents make many decisions regarding child-rearing practices during the first two years of their infant's life. Some of the most important involve the choices that surround infant sleep, including parent and infant sleep arrangements, the implementation of bedtime routines, nighttime sleep practices, sleep training methods, and the like. These choices bear importantly on the family as a whole, as there is compiling evidence that suggests that childhood sleeping problems are not only disruptive to the child, but to family life as well (Morrell & Steele, 2003). During the first two years of life, the most frequent complaint by parents during pediatric visits is in regard to sleep-related issues (Lozoff, Wolf, & Davis, 1985). In fact, up to 50% of parents seek professional assistance for what they perceive to be problems with their infant's sleeping patterns (Anders, Halpern, & Hua, 1992), and approximately 30% of children experience sleep problems during the first three years of life (Sadeh, Mindell, Luedtke, & Wiegand, 2009).

Many parents are concerned, if not preoccupied, with the challenges pertaining to their infant's sleep development. Sleep problems that develop in infancy appear to be persistent, and are associated with daytime behavioral and emotional problems in children and adolescents, as well as parental distress (Bertocci, Dahl, Williamson, Iosif, Birmaher, Axelson, & Ryan, 2005; Dahl & Harvey, 2007; Forbes, Bertocci, Gregory, Ryan, Axelson, Birmaher, & Dahl, 2008; Sadeh, Mindell, Luedtke, & Wiegand, 2009). One can readily see how infant sleep problems could threaten parent, child, and family well-being, including parents' ability to adapt to the parental role in the context of infant sleep development. Although much is known about the impact of infant sleep disruption on infant and parental functioning, less is known about parental adaptation to infant sleep

from a broader, ecological perspective. One study (Countermine & Teti, 2010) examined predictors of parental adaptation to infant sleep and found that maternal adaptation to infant sleep is not simply a function of infant sleep disruption but rather multiply determined by mediators such as maternal depression, spousal criticism, and maternal sleep quality. The present study will examine how certain proximal and distal factors influence maternal adaptation in the context of infant sleep, and how parents' choices regarding infant sleep relate to maternal and infant sleep quality as well as to broader indices of maternal adaptation including maternal distress and co-parenting. These questions will be addressed within a longitudinal sample of infants and their mothers over the first six months of the infant's life.

Review of the Literature

What is parental adaptation?

The notion of adaptation in the field of human development is by no means a new one. At its most general level, human adaptation can be described in both biological and social terms. Biologically, adaptation has been conceptualized in terms of the quality of fit between an organism and its environment, perhaps as the result of a structural or functional change in the organism in response to a challenge or change in its environment (Darwin, 1859). It has also been characterized as a process by which a population becomes better suited to its habitat over the life course of multiple generations (Bowler, 1989). Although much variation exists within a species or population at the level of the individual, those traits or variations which are adaptive and result in a better fit with the environment are most often naturally selected and ultimately passed on from one

generation to the next (Dobzhansky, 1962). However, maladaptation can occur at the species level, when a deleterious mutation or trait is passed on, resulting in extinction of the species (Payne & Finnegan, 2007).

Socially, human adaptation has also been characterized in terms of biosocial transactions between an organism and its environment, with good adaptation conceptualized as transactions that mutually benefit the individual and his or her social niche, and poor adaptation conceptualized as transactions that do not benefit the individual or his or her social niche (Troost & Filsinger, 1993). Rather, an individual's response to an environmental change or challenge can be envisioned as existing on a continuum from poor adaptation to good adaptation. Schlossberg (1981) defined human adaptation to life transitions as a process during which an individual moves from being completely preoccupied with the transition to finally integrating the transition into his or her life. Life transitions require people to modify and reorganize the way they view the world and themselves, and subsequently result in changes in their behavior and relationships. The process of adaptation moves from being pervasive to being bounded within the transitioning individual. In other words, during a major life transition such as the birth of a baby, a new parent's awareness of the transition permeates all of his or her attitudes and behaviors. Once adapted, the parent integrates the change into his or her life. Therefore, when the transition to parenthood occurs, a mother or father is completely conscious of being a new parent. After some time (and this amount of time will vary between individuals) the new mother or father remains aware of being a parent, but this awareness is only one aspect, albeit a major one, of his or her life.

Good or positive adaptation should result in a socially competent individual who elicits positive responses from others in his or her environment. Characteristics of both the individual and his or her environment will influence one's adaptation to a transition. Environmental characteristics include internal support systems such as intimate relationships, family relationships, and friends, as well as external or institutional support systems such as work, church, welfare, or other community support groups. Individual characteristics include the one's sense of competency, overall mental health and well-being, and one's perception of the transition as positive or negative, internal or external, gradual or sudden, on-time or off-time, and permanent or temporary (Schlossberg, 1981).

It is proposed here that adaptation can be conceptualized and defined along three major dimensions: emotional, pertaining to specific emotional states or experiences that affect one's tendency to engage with or withdraw form the world; cognitive, pertaining to thoughts and perceptions about oneself in relation to the world; and behavioral, pertaining to the outcome of emotions and cognitions, and having the potential to elicit favorable or unfavorable responses from the environment, which in turn impact emotions and cognitions. Quality of adaptation in emotional, cognitive, and behavioral domains can readily be applied to parental adaptation as a construct, which has been studied in both broad (e.g., parental adaptation across multiple contexts) and narrow domains (e.g., parental adaptation in specific contexts, such as infant sleep). It has often been studied during the transition to parenthood, specifically with regard to how parents adapt to or cope with the changes, challenges, and stressors that a new baby brings to daily life (Broussard & Cornes, 2009). Parental adaptation can thus be defined as an individual's emotional, cognitive, and behavioral responses to both the transition to parenthood and

the parental role itself, as well as the parent's ability to adjust his or her emotional, cognitive, and behavioral responses over time as the child develops.

One would expect the variables within these three domains to be inter-correlated, given that parental adaptation is both multi-dimensional and holistic. The following sections will examine empirical work on these three domains of parental adaptation, with commentary on what would be considered good vs. poor parental adaptation. It should be noted here that the work reviewed is, as Teti and Huang (2005) described, "decidedly Western in cultural orientation and cannot escape the inherent circularity that plagues any working definition of parenting competence, namely that parenting competence can only be defined in terms of its propensity to move children toward goals that their culture deems important" (p. 161). If a well-adapted parent is a competent parent, then the same assumption must be inherently understood: any definition of good vs. poor parental adaptation is bound by the standards of the culture in which the parent lives. The proceeding sections will discuss the three proposed dimensions of parental adaptation, (emotional, cognitive, and behavioral), in detail, followed by a brief review of the theoretical foundation of parental adaptation as a construct.

The Emotional Dimension

Simply stated, happy parents raise happy children. Positive and negative emotions both felt and exhibited by parents, especially those with young children, vary widely on an almost minute to minute basis, as parenting is arguably one of the most emotional endeavors a person can undertake (Dunn & Munn, 1989; Lee & Bates, 1985). It elicits more joy, affection, and pride as well as more anger, frustration, and worry than

any other human task. Parenting is without a doubt an emotional experience, and researchers unilaterally agree that the emotions parents feel are important to parenting. Positive emotions are intrinsic and vital to competent parenting, while negative emotions can lead to maladaptive parenting. Indeed, emotions are a central part of both effective and ineffective parenting. The following paragraphs will examine how parental emotions are theoretically related to parental adaptation, as well as how positive emotions (joy, contentment, affection, pride) and negative emotions (anger, irritability, frustration, sadness) elicit parental cognitions and organize parental behavior thereby influencing child development.

Four conclusions about emotion and parenting can be drawn from the vast research conducted in this area (Dix, 1991). First, parents experience and express emotions daily and frequently throughout the day, especially parents of young children. Second, parental emotions reflect the quality of the caregiving environment such that positive affect and warmth predict favorable child development, while negative affect and hostility predict maladjustment in children. Third, parental emotions are influenced by stressors and supports that are proximal to, but not inherent it, the parent-child relationship, such as the parents' occupations and the marital relationship. Fourth, chronic and intense negative emotions are evident in distressed families, including families who are in living poverty or experiencing divorce, families who have difficult children or families with dysfunctional (abusive, depressed, neglectful) parents.

Dix presented a model for understanding affective processes in parenting, drawing from the literature in experimental and social psychology. His model explains why parents experience emotions, how those emotions influence parenting, and why

parents' emotions are so intrinsic to competent parenting and developmental outcomes for children. In the model, the affective system is comprised of three sets of processes: activation, engagement, and regulation. The activation process precedes emotion, determining when and which emotions will occur as well as how strongly the emotion will be felt. Once particular emotions are activated, people turn their attention toward the environment, and the engagement process begins. This engagement process is reflected in people's thoughts, physiology, motivation, feelings, behaviors, and facial and vocal expressions and is dependent upon which and how strongly emotions are activated. Finally, the regulation process aids people in understanding and controlling their emotions and expressions by aiding people in evaluating what they are feeling and why, and determining how others will react to particular emotional behaviors. In parenting, the activation process begins during parent-child interactions. Parents may feel positive emotions when watching their child succeed at a difficult task, or negative emotions when the child is being disobedient. Either set of emotions will activate the engagement process, when parents notice their feelings and reactions. During the regulation process, parents must evaluate what they are feeling, decide how they will react, and think about how their reactions will influence their child's behavior. Within this framework of understanding parental emotions, one can see the mutual influence between parental cognitions and parental emotions.

There is ample evidence in the parenting literature of a positive association between parental emotions and child development, such that parents who display more positive affect in their parenting have children who are happier and more well-adjusted, while parents who display more negative affect in their parenting have children who are

more at risk for maladjustment. Positive emotions have been found to promote patient, sensitive caregiving, early parent-child bonding, and increase parents' willingness to encourage, teach, and comfort their children (Ainsworth, Blehar, Waters, & Wall, 1978; Belsky, 1984), while negative emotions promote insensitive, coercive, and even abusive parenting (McLoyd, 1990; Patterson, 1986; Radke-Yarrow, Zahn-Waxler, Richardson, & Susman, 1994).

Cassidy, Parke, Butkovsky, and Braungart (1992) examined connections between emotional expressiveness within the family context and children's peer relations and found that for both mothers and fathers, expressiveness of positive emotions predicted children's success in their peer relations. In addition, they found that children's understanding of emotions partially mediated this link, such that even children of less expressive parents who had a good grasp of emotion recognition were more successful in their peer relations than were children who exhibited less emotional understanding. In a study examining parental contributions to children's emotional competence, Denham, Mitchell-Copeland, Strandberg, Auerbach, and Blair (1997) found that parental modeling of expressive styles and emotional responsiveness to child emotions predicted children's emotional and social competence, such that children whose parents were more affectively positive tended to display more positive emotion with peers, while children whose parents showed more negative emotion appeared less socially competent during peer interactions.

Research relating parental negative emotions such as anger and sadness to child development and behavior indicates that in general, parent-child interactions characterized by displays of parental negativity and emotional unavailability are linked to

a range of deleterious child outcomes, including decreased social competence and increased behavior problems (Denham, Workman, Cole, Weissbrod, Kendziora, & Zahn-Waxler, 2000; Garner & Estep, 2001; Martin, Clements, & Crnic, 2002), muted, negative expressions in infancy (Baumrind, 1971; Field et al., 1988), and less focused attention and task persistence in toddlerhood (Redding, Harmon, & Morgan, 1990; Gaertner, Spinrad, & Eisenberg, 2008). Negativity within the family context as evidenced by high levels of stress and negative emotions such as anger, irritability, and sadness appear to adversely influence child adjustment (Crnic & Greenberg, 1990; Gottman & Levenson, 1986). The pathway for this relationship is likely to be that parenting is often compromised in families experiencing excessive levels of stress, marital conflict, or parental depression (Dumas & Wekerle, 1995; Teti, Gelfand, & Pompa, 1990), with heightened family negativity linked to less sensitive parenting and more aversive responses to child behavior.

The amount of generalized stress and distress (specifically anxious and depressive symptoms) experienced by parents has been studied frequently. However, one must not readily make the assumption that generalized measures of stress and distress are necessarily indicative of how well adapted a parent is to the parenting role. One would expect a generalized measure of stress or distress to correlate positively with parental adaptation, but there needs to remain a clear distinction between general adaptation and parental adaptation. Hans Selye (1991) defined generalized stress as the "nonspecific (that is, common) result of any demand upon the body, be the effect mental or somatic" (p. 22). He went on to say that a variety of dissimilar situations, including, but not limited to effort, fatigue, concentration, and fear, are capable of producing stress

reactions in the body. His concept of stress, however, was not completely negative. He felt that the stress of life had four basic variations: good stress (eustress), bad stress (distress) overstress (hyperstress), and understress (hypostress), and that different individuals have within themselves different capacities to handle varying levels of each type of stress (Selye, 1987). As stated previously, being a parent, especially a parent of small children, can be a stressful undertaking. How parents handle the stress of parenting is certainly part and parcel of adapting to the parental role.

That depressive symptoms and stress compromise parenting is well established. Depression in mothers has been repeatedly linked to poor parenting, which in turn is commonly identified as one major pathway accounting for the increased rates of psychopathology among children of depressed mothers (Gelfand & Teti, 1990; Goodman & Brand, 2008; Goodman, Broth, Hall, & Stowe, 2008; Luoma, Kaukonen, Mäntymaa, Puura, Tamminen, & Salmelin, 2004). Depressive symptoms are associated with flat and negative emotional affect in parent-child interactions for both mothers and infants, with mothers showing more negative affect and infants displaying less positive affect in depressed dyads than in nondepressed dyads (Cohn, Campbell, Matias, & Hopkins, 1990). In a comprehensive review of depression in mothers, Goodman (2007) reported that several studies, which tested whether inadequate parenting mediated the link between maternal depression and pernicious child outcomes, provided evidence that parenting quality, or how parents parent, was at least a partial if not a full mediator. Indeed, parental emotions are an important aspect of parental adaptation because of the extent to which parental emotions influence parental cognitions and in turn parenting behavior during parent-child interactions. Frijda (1986, 2010) described emotions as the causal

determinants of action, with reflective processing, or thought, as a potential influence on whether the behavior that follows an emotion is not impulsive but calculated and goal-directed. He argued that the way in which individuals appraise emotional events influences their motivation, which in turn may (or may not) cause some course of action from the individual. He described certain actions or behaviors as impulsive because they are elicited automatically and without prior intention, foresight, reflection, or planning (e.g., without cognition). Certainly the parenting role includes aspects of emotions that potentially elicit impulsive action. But parenting also provides an opportunity for reflective processing or appraisal, which can dramatically alter or even overrule impulsive behavior. When parents appraise their emotions during parent-child interactions, they may assess the meaning of the interaction, what they may or may not do, what they may or may not offer, as well as what they can or cannot do to deal or cope in the interaction. In this way, emotions offer the opportunity for either an impulsive action or a reflective action, depending on whether or not the reflective process (or cognition) is engaged. The following section will examine more closely the role of parental cognitions in competent parenting and parental adaptation.

The Cognitive Dimension

Parental cognitions are a vital component of parental adaptation because they influence parents' emotions as well as organize parents' behavior. Broadly speaking, parental cognitions include generalized schemas about the role of a parent, schemas regarding what one expects from the parental role, as well as social-cognitive parenting schemas that predict whether a parent will correctly interpret or misinterpret a child's

cues or behaviors. It must be noted here that these schemas are embedded in the idea that the parenting role is socially constructed and therefore not consistent across cultures, classes, races, or ethnicities (Azar, 2002). Regardless of context, however, competent parents exhibit what Azar called "developmentally sensitive schema…including accurate perceptions of children's capabilities as well as what their own role is in moving them forward developmentally" (p. 370). Effective parents, therefore, are able to adapt their responses to any situation if they possess appropriate cognitive schemas about the parenting role.

Specific parental cognitions include (but are not limited to) parents' knowledge and expectations of child development, parental assessment of self-efficacy in the parenting role, and parental perceptions of one's own child (Azar, Nix, & Makin-Byrd, 2005). Adaptive vs. maladaptive parenting has been linked to variations in these cognitions because they guide parents in their evaluations of potentially problematic or challenging child behaviors. Parents then determine for themselves the root of or motivations behind their child's behavior. Subsequently, these various facets of parental cognitions are inextricably intertwined. For example, a lack of accurate information with regard to normative child development may lead a young parent to believe that it is possible to stop a sick or colicky infant from crying, when in reality it is not. The parent may have inappropriate expectations of his or her infant to stop crying and could get angry at the sick infant for continuing to cry, which could in turn lead to feelings of low self-efficacy in the parental role for being unable to stop the infant from crying.

Parental self-efficacy is defined as beliefs about one's ability to be successful as a parent (Hess, Teti, & Hussey-Gardner, 2004). Parents who feel that they are able to

perform competently and effectively in the many tasks that parents face with their children are more likely to persevere during challenging situations. This definition of parenting self-efficacy is rooted in Bandura's theory of self-efficacy. Specifically, Bandura (1986, 1989a, 1989b) described self-efficacious individuals as persisting in a given task until success is achieved, and self-inefficacious individuals as giving up prematurely even when they have the knowledge or skills needed to succeed in a given task. He proposed that when confronted with stress, individuals with low self-efficacy internalize failure and may experience pronounced anxiety and depression as well as diminished role satisfaction. By extension, inefficacious parents tend to feel exhausted by their parental responsibilities, and may become incapable of dealing with the emotional and physical tasks required of parents. On the other hand, efficacious parents tend to feel empowered in their parenting role, enjoy positive mental health, and therefore are able to manage their parental duties while feeling less burdened and greater role satisfaction (Coleman & Karraker, 2003). Parental self-efficacy has been associated with a number of adaptive parental and child outcomes. Teti and Gelfand (1997) found that mothers' self-efficacy related positively and significantly to their behavioral competence when interacting with their infant. Landy and Menna (2006) found that mothers with high self-efficacy interacted in a more sensitive and confident manner with their children, resulting in improved child behavior, as compared to mothers with low self-efficacy. Parenting self-efficacy has also been found to be positively associated with parenting competence in specific tasks such as feeding, diapering, and play interactions (Bohlin & Hagekull, 1987; Teti & Gelfand, 1991; Walker, Crain, & Thompson, 1986).

A parent's belief in his own ability to be successful in the many tasks of parenthood, however, is not sufficient in and of itself for achieving competence in parenting. Bandura (1989a) argued that in order to successfully master a task, one must not only have confidence in one's ability to perform a task but must also possess specific and accurate knowledge about the skill set required to complete the task. In other words, parental self-efficacy would be expected to be positively associated with parental competence and positive child development only when the parent possesses equitable knowledge of child development and the behaviors required for good parenting. Indeed, parents who possess at least a rudimentary knowledge of typical child development are likely to experience lower levels of stress in the parental role and exhibit higher quality parenting than those who do not (Brunnquell, Crichton, & Egeland, 1981; Conrad, Gross, Fogg, & Ruchala, 1992; Huang, Caughy, Genevro, & Miller, 2005; Reich, 2005; Veddovi, Kenny, Gibson, Bowen, & Starte, 2001). Hess, Teti, and Hussey-Gardner (2004) examined the relationship between parental self-efficacy and parenting competence and found a moderating effect for knowledge of infant development, such that when knowledge of infant development was high, the two were positively correlated, but when knowledge of infant development was low, the two were negatively correlated. They also reported that maternal sensitivity was lowest for the naively confident mother, whose reported self-efficacy was high while her actual knowledge of infant development was low.

Parental perceptions of one's own child is another important cognitive component in the construct of parental adaptation because maladaptive parenting has been linked to negative parental attributions of child behavior, while adaptive parenting has been linked

to positive parental attributions of child behavior. Bugental (2009) proposed that the beliefs or interpretive biases that parents have when they perceive their child to be difficult impacts their responses to their child. When parents misinterpret their child's cues or behaviors, they may be assigning negative attributions to their children inappropriately, while parents who correctly interpret their child's cues may be more likely to assign positive attributions to their child's behavior. Parents who believe that their children are misbehaving simply to aggravate or annoy them are more likely to abuse their children (Haskett et al., 2003; Dopke & Milner, 2000), whereas mothers who perceive their infants as better than average when compared to their concept of other babies are more likely to engage in developmentally appropriate face to face interactions with their infants, leading to better developmental progress of the infant (Broussard & Harther, 1970; Scher & Tirosh, 1997). Teti, Hess, and O'Connell (2005) found that when mothers' perceived their pre-term infants as lethargic and unresponsive, they were more likely to also perceive their infants as vulnerable even when there was no medical justification for such perceptions, placing both the child and the parent at risk for maladjustment. They also found that mothers' perceptions of their infant's vulnerability were predicted by their feelings of self-efficacy in feeding their infants. There is much evidence to suggest that when infants are judged as more vulnerable or difficult by their parents, the parents may feel less efficacious in the parenting role (Coleman & Karraker, 2003; Hagekull & Bohlin, 1990; Leerkes & Burney, 2007; Richter & Boger, 1983; Roberts, 1983; Teti, Hess, & O'Connell, 2005), suggesting a link between parental perceptions of their children and parental self-efficacy. Parental cognitions including self-efficacy, perceptions of one's child, and knowledge of child development are

therefore inter-related and certainly influence what a parent thinks about being a parent, which, in turn, is a vital component of parental adaptation.

As Frijda (2010) stated, emotions are intimately related to behavior, but behavior is strongly influenced by one's thoughts in response to emotional events. The path between emotions and behaviors in the parental role includes the potential for the parent to have cognitions about the emotions experienced as a parent. These cognitions in turn motivate and influence the parents' behaviors that may or may not be set into motion in response to parent-child interactions. These behaviors can be either adaptive or maladaptive. The following section will examine the importance of parental behavior in the construct of parental adaptation.

The Behavioral Dimension

If the ways in which parents think and feel about parenting are important aspects of successful parenting, then the way parents behave in the parenting role is tantamount. The literature linking qualitative behavioral aspects of parenting such as parental sensitivity and emotional availability with socio-emotional and cognitive outcomes in children is vast and long-standing (Teti & Huang, 2005). Beginning with Mary Ainsworth's work on attachment in infancy, it is now widely accepted that parental sensitivity is the most important aspect of parenting in establishing a secure infant-parent attachment relationship. Ainsworth (1969) viewed sensitive caregiving as comprised of four components: (1) Awareness of child signals, (2) interpreting those signals accurately, (3) responding promptly and contingently to child signals, and (4) responding appropriately to those signals. Bowlby (1958) acknowledged that the quality of

attachment between an infant and his caregiver depended on the overall quality of care. Indeed, sensitive parenting in the first year of life has been shown to foster positive and mutual interpersonal parent-child orientation in the second year of life and beyond (Ainsworth, Bell & Stayton, 1974; Kochanska & Aksan, 1995; Londerville & Main, 1981; Stayton & Ainsworth, 1973).

Emotional availability in parenting is defined as the extent to which parents are open to the emotional signals of their children, their children's responsiveness, and the nature of their affective exchanges during ongoing interactions (Emde & Easterbrooks, 1987). As a construct, it encompasses characteristics of caregiver sensitivity, intrusiveness, structuring, and hostility (Biringen, Robinson, & Emde, 1994). These characteristics have been found to be significantly associated with infant-caregiver attachment socio-emotional competence in children across developmental epoch (infancy to age 7), caregiving environmental risk (substance abuse, socioeconomic status, and mental health), and cultural milieu (Biringen, Brown, et al., 2000; Biringen, Matheny, Bretherton, Renouf & Sherman, 2000; Easterbrooks & Biringen, 2000; Oyen, Landy, & Hilburn-Cobb, 2000; Swanson, Beckwith, & Howard, 2000; Ziv, Aviezer, Gini, Sagi, & Koren-Karie, 2000). In addition, emotional availability has been described as an essential element of competent parenting and positive child outcomes (Aviezer, Sagi, Joels, & Ziv, 1999; Biringen & Robinson, 1991; Bretherton, 2000; Lovas, 2005).

A variety of parenting behaviors have been linked to problems in child development, including maternal intrusiveness (Field, Healy, Goldstein, & Guthertz, 1990), harsh, inconsistent discipline (Leung & Slep, 2006), and low responsiveness (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Indeed, a growing body of literature on

proactive parenting, or parenting that involves organizing and structuring children's lives through positive interactions to promote child well-being and development, indicates that parents' use of proactive strategies can prevent problem behavior in the short and longer term (Denham et al., 2000; Gardner et al., 1999; Gardner et al., 2007). Although parents realize that maintaining positivity will likely influence child development and well-being in a positive way across infancy and early childhood, the ability to maintain a positive stance in parenting becomes a greater challenge during the transition to toddlerhood. Teti and Huang (2005) argued that in addition to being sensitive and emotionally available, successful parents must adapt and change their emotional and behavioral responses as their children grow from infants to preschoolers, and that the stability of successful parents over time is contingent upon their ability to respond with sensitivity to the "qualitatively new and different needs and demands" (p. 162) of their developing child. As children get older, elements of control, limit setting, clarity of communication, and maturity of demands become part and parcel of parenting, and these can be done well or poorly. In other words, parenting must be consistent, adaptive, as well as emotionally regulated in order to be effective.

In sum, the emotional, cognitive, and behavioral components of parental adaptation are influenced by one another to produce either adaptive or maladaptive parenting. Ford (1992) wrote of competence in people (or effective functioning at the level of the personality) as "the attainment of relevant goals in specified environments, using appropriate means and resulting in positive developmental outcomes" (p. 67). He theorized that to function effectively and competently required a motivated and skillful person whose biological foundation and behavioral abilities enable that person to engage

in reciprocal relationships within a responsive environment. In the specific context of parental adaptation, each parent brings to the table his or her own parenting skills, knowledge, and motivations, which can either by bolstered or undermined by his or her own underlying biological foundation and behavioral tendencies. Ford also takes into account the responsiveness of the environment, which in this case would include the characteristics of the child, the marital relationship, and social support, to name but a few. If any of these components are missing, inadequate, or deficient, parental adaptation will undoubtedly be more challenging than if these components are all in place.

Parental Adaptation in Context

Ecological Theory

Two theories stand out as providing the best template through which to examine both proximal and distal influences on parental adaptation: ecological theory and family systems theory. While the ecological perspective has been cast as central to developmental study given the important role of culture in understanding behavior (Bronfenbrenner and Morris, 1998), the family systems perspective provides an equally important lens for examining the role of the family in the developing child (Nichols and Schwartz, 2005).

When Urie Bronfenbrenner introduced his ecological theory of development in the 1970's, he suggested that social scientists were in the habit of studying "the strange behavior of children in strange situations with strange adults for the briefest possible period of time" (Bronfenbrenner, 1979, p. 513). He argued for the need to study humans contextually, proposing a theoretical framework for the ecology of human development,

which he defined as "the scientific study of development as a function of the progressive, reciprocal interplay, through the life course, between an active, growing human organism and the changing properties of its environment, both immediate, and more remote" (ibid, p. 514). From his theory, Bronfenbrenner formulated a *process-person-context-time* (or *PPCT*) model for studying human development. Within this model, he described the interactions between an individual and his or her environment as *proximal processes*, which operate over time and are posited as the primary mechanisms producing human development (Bronfenbrenner & Morris, 1998). He felt that the power of theses interactions would be greatly influenced by characteristics of the person, the immediate and more remote contexts in which they occur, and the time periods during which they take place. He coined the term "developmentally instigative characteristics" (p. 97) to refer to individual qualities or personal characteristics that invite, permit, or inhibit engagement in proximal developmental processes, and recommended their application as parameters in future research utilizing the ecological paradigm. Elder and Shanahan (2006) restated this idea by suggesting that social development occurs through the exchange of developing persons within changing environments.

Jay Belsky (1984) reviewed research on "why parents parent the way they do" (p. 83) and presented a model of competent parental functioning. This model included three domains of determinants: personal psychological resources of parents, characteristics of the child, and contextual sources of stress. In his model, parental functioning is multiply determined by sources of environmental stress and support which not only directly affect parenting, but also affect parenting indirectly by influencing parents' psychological well-being. He posited that the personality of both parents influences contextual support and

stress (including, but not limited to, the marital relationship) which in turn feeds back to shape parenting. He felt the most important factor in buffering the parent-child relationship from stress was the parent's personal psychological resources. This provides support for the inclusion of the cognitive, emotional, and behavioral dimensions of parental adaptation discussed previously.

Darling (2007) reiterated the importance of including "the person in the center of the circles" (p. 203) when utilizing an ecological approach to the study of parenting. The beauty of ecological theory is that the individual at the center of one set of circles is the child, with her own unique set of personal characteristics, while the individual at the center of another set of circles is the parent, likewise with his own set of characteristics. Darling argued that the central force in development is "the active person: shaping environments, evoking responses from them, and reacting to them" (p. 204). In the ecological model, one must recognize the contribution of both the parent *and* the child as individuals when studying any aspect of parenting.

Indeed, the adaptive implications of any individual or personal attribute depend on its relationship with the attributes of others in the environment and to the situation itself (Moen, Elder, & Luscher, 2005; Handel, Paolucci, Hall, & Axinn, 1978). Therefore, in the study of parental adaptation, one must bear in mind that the overarching culture's contribution to any individual's thoughts and actions is neither insignificant nor random. In addition, the reciprocal nature of the proximal processes described in the ecological paradigm that occur between individuals and other individuals, as well as between individuals and their environments, provides an excellent segue to a discussion

of family systems theory as a separate but equal framework to outline the proximal and distal influences parental adaptation.

Family Systems Theory

Stemming from Ludwig von Bertalanffy's *General Systems Theory* and the work of pioneering family therapists such as Murray Bowen, Jay Haley, and Salvador Minuchin, family systems theory has been described in various but similar ways by a number of social scientists. Salvador Minuchin (1974) defined a family as a system that operates through transactional patterns, and that family structure is "the invisible set of functional demands that organizes the ways in which family members interact" (p. 51). The repetitious nature of a family's transactions establishes patterns of how that family relates to each other. Family systems theory allows us to examine the patterns of influence that shape family members' behavior, including the mutual influence that occurs between each person within a family (Nichols & Schwartz, 2005; Whitchurch & Constantine, 1993). The family system is comprised of interdependent subsystems (parent-child subsystems, marital subsystems, sibling subsystems) which affect and are affected by each other (Golombok, 2002; Bornstein & Sawyer, 2006). Indeed, a change in one subsystem within a family leads to changes in the others.

One concept in family systems theory, *homeostasis*, is crucial in understanding family functioning, especially during those times of transition which require families to adapt. It refers to the self-regulation that allows a family to maintain itself in a state of dynamic balance. When a family is faced with a change or challenge that upsets its state of equilibrium, the family will eventually return to its preferred state of equilibrium, or to

a new state, be it adaptive or maladaptive, after a period of disequilibrium. Bornstein and Sawyer (2006) described this phenomenon as *adaptive self-organization*. During times of transition, the equilibrium established prior to the transition is disrupted, requiring a family to adapt and reorganize to once again achieve equilibrium or homeostasis.

Family systems theory, therefore, may be especially helpful for studying families during times of transition, such as the birth of a child. The change will inevitably be challenging, and the family must then go through a transition period. According to Patricia Minuchin (2002), the patterns of family interaction during this process are neither stable nor predictable, at least for a time. One must expect a period of uncertainty, conflict, and confusion in family relationships during times of transition, especially when those transitions are marked by an abrupt change followed by an immediate period of crisis, such as the birth of a baby. A family requires time to adapt to its new patterns of interaction and communication. This movement between disequilibrium and equilibrium within the family following transitions is central to family systems theory.

The introduction of a child into the family system has profound effects, which may be magnified by particular characteristics of both the parent(s) and the child. This holds true with first- and later-born children. Socialization of children by parents is an ongoing, circular, interactive process with cumulative effects. The effects are not only reciprocal, but also incremental and interactive. Indeed, the parent-child relationship is created by their constant interactions, and both parties contribute to the rules and patterns that are being created. Empirical evidence of the mutual influence that exists between

individuals within a family as well as the family within its environment from both an ecological and family systems perspective will be discussed in the following section.

Some Empirical Work Stimulated by Ecological and Family Systems Theories

The reciprocal nature of the parent-child relationship was highlighted by Belsky, Gillstrap, and Rovine (1984) who found that as infants age, parents exhibit more engaging, responsive, stimulating, and affectionate behavior toward their infant. They suggested that not only do parents become more experienced and more comfortable in the parenting role over time, but also that as infants develop, their crying and sleeping decrease, while smiling and exploration increase, resulting in more opportunity for parents to engage the infant. Claxton and Perry-Jenkins (2008) argued that the birth of a child requires the family system to reorganize in order to accommodate the changes and challenges that accompany the transition, as well as to renegotiate existing boundaries with regard to interpersonal power and emotional closeness. They found that the more time husbands and wives spent together outside of the home (without the child), the higher their levels of reported marital satisfaction. Cowan and Cowan (1995) found that when mothers and fathers rated their parent role as increasing after the birth of their first child, ratings of their lover and partner role decreased. Similarly, Van Egeren (2003) found that as co-parenting postpartum increased, marital satisfaction decreased, indicating that one aspect of the couple or family relationship may be maintained at the expense of another. Therefore, from a family systems perspective, the impact of the transition to parenthood on the developmental course of marital satisfaction represents only part of the influence that the transition has on the larger family system. It is possible

that declines in marital satisfaction postpartum are counterbalanced or compensated by levels of satisfaction with the parenting role.

Likewise, Belsky and Rovine (1990) noted that a basic assumption of becoming a parent is that it disrupts intimacy and communication between spouses, and therefore results in decreases in marital quality or satisfaction, at least in the short term. In their study, prediction of martial quality following the birth of the first child improved when analyses included pre- and postnatal marital data as well as data on infant temperament, such that when mothers rated their infants as more temperamentally difficult, their marriages were more likely to experience decline in reported quality. They also found that the degree to which a couple experienced decline in marital quality varied by the couple's capacity to adapt to the challenges of parenthood. Easterbrooks, Barrett, Brady, and Davis (2007) found that higher quality father-mother relationships were related to greater father involvement with children, and Teti, Sakin, Kucera, and Corns (1996) observed a significantly positive relationship between marital harmony during the third trimester of pregnancy with a second child and security of attachment of the first child at four to eight weeks after the second child's birth. These studies provide more evidence of the mutual influence that exists between individuals and subsystems within the larger family system.

Parental Adaptation to Infant Sleep

Characteristics of Normative Infant Sleep Development

Generally speaking, over the first two years of life the total daily sleep time for infants gradually declines and a clear day/night cycle of waking and sleeping is

established. The total length of infant sleep in a 24-hour period typically decreases from 10-18 hours in the newborn to 14-15 hours by 12 months, to 12-14 hours between 1 and 3 years, with a steady increase in consolidated sleep at night in conjunction with fewer but longer naps during the day (Meltzer & Mindell, 2006). All children wake for brief periods through the night, but only about 20% to 30% of toddlers wake their parents in the process with signaling behaviors such as crying or getting out of bed. Others, however, have been trained to self-soothe during a night waking and put themselves back to sleep. Still other infants return to sleep independently at a very young age following normative night wakings. Whatever path they may take, infant sleep-wake patterns over the first two years of life involve a "complex matrix of biological-physiological processes as well as developmental-psychosocial ones" (Sadeh, Flint-Ofir, Tirosh, & Tikotzky, 2007), and result in two main features: first, the gradual reduction of total daily sleep time, and second, the concentration and consolidation of a nocturnal sleep episode. In other words, whereas most, if not all, newborns have short naps and short wakeful periods across a 24-hour period with no real delineation between night and day, most 2 year olds take one or two naps during the day and sleep for a longer time at night.

Most newborn infants wake up every 3-4 hours through the day and during the night for about the first month of life. These arousals will require a parent's attention for feeding and settling. By 12 months, most infants will arouse every 6 hours through the night (Adams, Jones, Esmail & Mitchell, 2004). These night wakings are typically not regarded as problematic by parents, pediatricians, or researchers unless the infant has difficulty self-soothing. If an infant is unable to self-soothe and settle himself back to sleep after a night waking, he will most likely wake up fully and signal to parents for

attention and help in falling back to sleep. Therefore, infants who are able to self-soothe tend to exhibit more mature sleep patterns and longer periods of sleep because they are not fully waking up after a normative night waking (Middlemiss, 2004). However, the ability to self-soothe following night wakings has been found to vary for individual infants across multiple nights, with self-soothers on one night also signaling to parents on another night, and infants who signal to parents on one night exhibiting the ability to self-soothe following a night waking on another night (Gaylor, Goodlin-Jones, & Anders, 2001; Keener, Zeanah, & Anders, 1989). In addition, infants who were once self-soothers earlier in infancy may begin signaling to parents as they mature both socio-emotionally and cognitively and separation anxiety becomes more pronounced.

Parental Adaptation to Infant Sleep Behavior

Certainly both signaling to parents and self-soothing behaviors are normative aspects of infant sleep. How any one parent or family reacts and responds to those behaviors from a cognitive, emotional, and behavioral standpoint is the very nature of parental adaptation to infant sleep. In keeping with the three components of parental adaptation proposed above, parental adaptation in the context of infant sleep can be conceptualized in much the same way: cognitively, emotionally, and behaviorally. First, parental cognitions about infant sleep would include specific schemas about how parents view their role with regard to how their infant's sleep development should proceed, as well as how accurately parents interpret their infant's cues at bedtime and through the night. These cognitions would also influence parental expectations of how their infant's sleep development should proceed. Parents' knowledge of normative infant sleep

development would influence their schemas inasmuch as that knowledge informs a parents' sleep schema to be developmentally sensitive. How efficacious parents feel in their ability to put their infant to bed at night and get their infant back to sleep through the night would be included in the cognitive domain, as well as parents' positive or negative perceptions of their own child. Second, parents' emotions in the context of infant sleep development would also be expected to play an important role in the adaptation process. If positive emotions have been found to promote patient, sensitive caregiving broadly speaking, and negative emotions promote insensitive, coercive, and even abusive parenting, then these emotions would certainly be expected to influence parental sensitivity in specific contexts such as at bedtime or through the night. Sensitive caregiving and emotional availability in the context of infant sleep would be evidenced by the well-adapted parent, whereas a parent who behaves intrusively or harshly at bedtime or through the night would likely be poorly adapted in the context of infant sleep development. As stated previously, the link between maternal emotional availability and positive child development has been well-established. Evidence as to a link between maternal emotional availability and infant sleep quality also exists. Teti, Kim, Mayer, and Countermine (2010) found that mothers' emotional availability at bedtime predicted infant sleep quality through the night. Likewise, Porter (2009) suggested that sensitive mothering at bedtime and through the night leads to a greater likelihood of a secure infant-mother attachment. Therefore, maternal emotional availability at bedtime will be included as a measure of maternal adaptation to infant sleep in the present study. The following section will discuss variables that may influence and predict parental adaptation to infant sleep.

Parental expectations for when and how an infant should sleep through the night may vary widely from one family to the next. It certainly varies in the sleep literature, ranging from quite general (e.g., 'sleeping at night without waking the parents' or 'sleeping from one hour after bedtime until the start of the next day') to much more specific (e.g., 'sleeping from 10 pm to 5 am' or 'not waking or disturbing the parents between midnight and 5 am') (Adams, Jones, Esmail & Mitchell, 2004). Parents' knowledge of normative infant sleep development would likely influence their perception of their infant's sleep behavior as typical vs. problematic. As stated previously, almost 50% of parents raise concerns to pediatricians in the first year of life about their child's sleep patterns. Recall that by 12 months, most children sleep 6 hours through the night without signaling to parents (Adams, Jones, Esmail & Mitchell, 2004). Research also indicates that 20-30% of children experience sleep-related problems as reported by parents in the first three years of life (Sadeh, Mindell, Luedtke, & Wiegand, 2009), and that 20-30% of toddlers wake their parents through the night for help in settling back to sleep (Middlemiss, 2004). It is likely not a coincidence that these percentages are the same. Indeed, as Adams, Jones, Esmail, and Mitchell (2004) stated, "Although parents may perceive the failure of their infant to attain regular sleeping through the night as a sleep problem, this is simply a feature of normal maturation of infant sleep physiology" (p. 98). Perhaps some parents simply want and/or expect their children to sleep through the night sooner for their own sake. When parents do regard night wakings in infancy and childhood as problematic, it may depend largely on what they believe to be normal or disordered sleep and how different their child's sleep behavior is from that "norm" (Messer & Richards, 1993), as well as their own contextual circumstances (e.g., early

shift the next day, other children to tend to, single parent, etc.). If parents do perceive a problem with their child's sleep behaviors or patterns, then the problem is undoubtedly not the night wakings themselves but rather that the parents are being woken up by the signaling or crying behavior that follows those night wakings. Parents may not be aware of how often their infant wakes through the night unless the infant requires the parents' attention and help to fall back to sleep. If parents do not perceive a problem with their infant's night wakings, but rather view them as a phase of development that their infant will ultimately pass through, then arguably those parents may adapt more positively to their infant's sleep.

The Social Ecology of Parental Adaptation to Infant Sleep

Although infant sleep has traditionally been viewed as a characteristic of individual infants (Anders, Halpern, & Hua, 1992), the developmental milestone of sleeping through the night likely has both individual and relational components. Individual differences in both infant and parent attributes, as well as variations in the parent-child relationship across families and across cultures have been cited as contributing significantly to infant sleep patterns in the first two years of life (Morrell & Steele, 2003). Dahl and El-Sheikh (2007) suggested the need to emphasize a family context for understanding sleep: first, sleep problems in one family member often impact multiple family members; second, family contexts such as sleeping arrangements, stress levels, attitudes, and emotional environments often have a considerable impact on sleep; and third, the interaction of sleep and family environments can impact other developmental domains in childhood and beyond.

Many factors affect the development of normative infant sleep. Infant temperament, attachment status, breastfeeding, sleep arrangements, cultural background, parental sensitivity, maternal emotional availability, and parental cognitions about infant sleep are among the variables that have been shown to be linked to how sleep development proceeds in infancy and childhood (for a review, see Middlemiss, 2004). Sadeh and Anders (1993) described a transactional systems model of sleep-wake regulation, which views infant sleep problems as developing through the reciprocal influence of the infant and his environment. They suggested a number of contexts that contribute to infant sleep development and infant sleep disorders, including sleep arrangements, maternal psychopathology, and behaviors exhibited by the parents during the bedtime routine and through the night. These variables, as well as infant and maternal sleep quality, co-parenting and spousal support, and maternal perceptions of infant sleep behavior as problematic will be examined in the following paragraphs as ecological predictors of maternal adaptation to infant sleep.

Infant Sleep Arrangements. Co-sleeping, defined for the purposes of this study as infant-parent bedsharing or infant-parent room-sharing, has repeatedly been found to put children at risk for the development of sleep problems, at least in countries such as the United States where solitary sleeping is the norm (Goldberg & Keller, 2007; Madansky & Edelbrock, 1990). Specifically, co-sleeping has been linked to an increased likelihood and persistence of night wakings in infancy and childhood, and is significantly associated with later bedtimes, shorter nighttime sleep duration, and increased bedtime resistance and sleep anxiety (Anders & Dahl, 2007; Cortesi, Giannotti, Sebastiani, Vagnoni, & Marioni, 2008; Morrell, 2002). In countries and within ethnic or racial

groups where co-sleeping is more normative, however, this link vanishes (Lozoff, Wolf, & Davis, 1996; Milan, Snow, & Belay, 2007; Small, 1998; Worthman & Brown, 2007). Keller and Goldberg (2004) found that when co-sleeping in the United States is the sleep arrangement of choice (i.e., labeled as *intentional* or *proactive* co-sleeping), these negative outcomes are not linked to co-sleeping.

Specifically with regard to the influence of sleep arrangements on parental adaptation to infant sleep, it is true that simple proximity to their infant while sleeping may make parents more aware of their children waking up through the night, but those parents may not necessarily consider the night wakings to be problematic. Ramos, Youngclarke, and Anderson (2007) found that the frequency of parents reporting what they termed "potentially problematic" sleep behaviors such as difficulty falling asleep and tendencies to wake up during the night was higher for parents who co-slept with their children, but that when parents intentionally co-slept with their children because they felt that it is the best arrangement, they did not view these behaviors as problematic. Conversely, when parents allowed their children to sleep in their bed but were not happy with that arrangement, they tended to perceive bedtime struggles and night wakings as more problematic. Taylor, Donovan, and Leavitt (2008) found that habitual co-sleeping that was the sleep arrangement of choice for parents was associated with decreased maternal depression and mothers working fewer hours, both which will be discussed as potential predictors of parental adaptation to infant sleep in the following paragraphs. Countermine and Teti (2010) found a link between shared sleep arrangements and maternal adaptation to infant sleep, specifically that mothers who slept in close proximity to their infant (either in the same bed or the same room) were more likely to be poorly

adapted to their infant's sleep behaviors. This link, however, was found to be mediated by spousal support, maternal sleep quality, and maternal depressive symptoms. These mediators will be discussed in more detail in the following sections.

Parental Psychiatric Symptoms. Maternal depression has been found to be associated with child sleep difficulties (Bayer, Hiscock, Hampton, & Wake, 2007; Dennis & Ross, 2005; Meltzer & Mindell, 2007; Messer & Martin, 1993; Warren, Howe, Simmens, & Dahl, 2006), although the direction of this association is not clear. Countermine and Teti (2010) found that maternal depression was not only associated with infant sleep disruptions, but that it mediated the link between maternal adaptation to infant sleep patterns and shared sleep arrangements, such that when mothers reported higher levels of depressive symptoms, the link between shared sleep arrangements and maternal adaptation to infant sleep patterns vanished.

Co-parenting and Spousal Support. The extent to which parents agree with each other regarding the management of their infant's sleep has been significantly linked to maternal depressive symptoms, such that when parents disagreed about their bedtime and nighttime routines for putting their infant to sleep, mothers were more at risk for depressive symptoms (Bayer, Hiscock, Hampton, & Wake, 2006). Countermine and Teti (2010) found that spousal criticism mediated the link between sleep arrangements and parental adaptation to infant sleep, such that when mothers felt criticized by their spouses regarding their infant's sleep arrangements, the link between co-sleeping and maternal adaptation to infant sleep patterns disappeared. Therefore, specific choices that parents make in their management of infant sleep may be of less consequence to parents and children than is the degree to which both parents are comfortable and satisfied with those

choices. Although the link between spousal support and parental adaptation has not been extensively studied, it appears to be important, in light of previous work emphasizing the role of spousal support on maternal well-being (Field et al., 2007; Gelfand & Teti, 1990; Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007).

Parent and Infant Sleep Quality. Mothers' and fathers' sleep quality may be another important factor in parental adaptation to infant sleep. Meltzer and Mindell (2007) identified maternal sleep quality as a mediator of the association between infant sleep disruption and maternal distress, suggesting that mothers with sleep-disturbed infants are prone to depression when infant sleep difficulties disturb mothers' sleep. Countermine and Teti (2010) also found that maternal sleep quality mediated the link between sleep arrangements and maternal adaptation to infant sleep, specifically that when mothers who co-slept with their infants experienced a good night's sleep, their adaptation scores did not suffer. This is important in light of evidence that suggests that shared sleep arrangements result in lighter sleep for both mothers and infants, and that this lighter sleep quality is protective against Sudden Infant Death Syndrome and therefore physiologically and biologically adaptive for the infant (McKenna, Mosko, Richard, & Drummond, 1994; McKenna, 1996). Teti, Kim, Mayer, and Countermine (2010) found that infant sleep quality was positively related to maternal emotional availability. Other studies have identified a link between infant sleep quality and maternal depression, but as stated previously, the direction of that link remains unclear.

In the present study, we will examine the stability and change in maternal adaptation to infant sleep patterns over the first six months of life, as well as what factors (e.g., sleep arrangements, maternal self-reported generalized distress symptoms, co-

parenting and spousal support, and objective and subjective measures of infant and maternal sleep quality) may help predict mothers' ability to adapt to their infant's sleep patterns.

The Present Study

The present study examined maternal adaptation to infant sleep over the first six months of the infant's life, as well as predictors of mothers' adaptation to infant sleep development. Based on previous work by Countermine and Teti (2010), this study also examined potential mediators of links between sleep arrangements and maternal adaptation to infant sleep. Four questions were addressed:

1. What is the stability in scores for maternal adaptation to infant sleep patterns across 1, 3, and 6 months?

2. What is the change in scores for maternal adaptation to infant sleep patterns across 1, 3, and 6 months?

3. Can maternal adaptation to infant sleep at 6 months be predicted by infant and maternal sleep quality, maternal self-reported depressive symptoms, co-parenting, or spousal support at 1 and/or 3 months?

4. If sleep arrangements at 6 months (as measured by a dummy-coded variable that indicated whether or not mothers slept in the same bed as their infant, in the same room but separate beds as their infant, or in separate rooms from their infant) is found to be a significant predictor of maternal adaptation to infant sleep at 6 months, are these results mediated by maternal depressive symptoms, co-parenting, or maternal sleep efficiency at 6 months?

Methods

Design

The present study utilized a longitudinal design to survey and observe parents on their infant's sleep behaviors and routines, as well as parents' perceptions of those behaviors and routines, at 1, 3, and 6 months of infant age. Subjective measures of

mothers' perceptions of their own and their infants' sleep behaviors and routines were collected via paper and pencil measures at 1, 3, and 6 months. Objective measures of infant and maternal sleep quality were collected via actigraphy for seven days and nights at 1, 3, and 6 months, and objective measures of infant and maternal behaviors and routines at bedtime and through the night were collected with digital videography for one night at each time point.

Participants

Participants were mothers and infants who had completed the 1, 3, and 6 month data collection time points within a larger longitudinal study of infant sleep development and parenting practices called Project SIESTA II (Study of Infants' Emergent Sleep TrAjectories), which is currently following infants and their parents over the first two years of the infant's life. Data was collected on 120 mothers and infants at the 1-month time point, 104 mothers and infants at the 3-month time point, and 97 mothers and infants at the 6-month time point. Attrition analyses revealed that the mothers in families who dropped out of the study did not vary significantly from other mothers who remained in the study on all study variables.

Families were recruited through the maternity wards at the Mount Nittany Medical Center and Penn State Hershey Medical Center within 72 hours of the infant's birth. Mothers were 82% White, Caucasian, 5% Asian-American (6 mothers), 4% Black, African-American (5 mothers), 3.4% Latino (4 mothers), and 5% other (6 mothers). At time of recruitment, mothers ranged in age from 18 to 43 years (M = 29.5, SD = 5.4). The majority of the mothers (86%) had completed some postsecondary education, and 98%

Table 1.

Descriptive statistics of the mothers and target infants.

Variable	*M*	*SD*
Maternal Age	29.5	5.4
Annual Family Income	$67,530	$4,750
	Percentage	
Maternal Education		
Completed some high school	0.8	
Graduated high school	12.6	
Attended college but did not graduate	16.0	
Graduated college with an associate's degree	6.7	
Graduated college with a bachelor's degree	25.2	
Attended graduate school but did not graduate	7.6	
Completed graduate school	31.1	
Maternal Race/Ethnicity		
White, Caucasian	82.4	
Black, African-American	4.2	
Asian-American	5.0	
Latino	4.2	
Other	4.2	
Marital status		
Married or living with partner	98.3	
Families receiving federal or state assistance	5.3	
Infant Gender (female)	51.2	
Infant Birth Order		
Firstborn	35.8	
Laterborn	64.2	

were either married or living with their partner. Reported annual family income ranged from $10,000 to $300,000 (*M* = $67,530, *SD* = $4,750). Target child gender was 54% female and 46% male. Table 1 provides descriptive statistics of the participants.

Procedures

Conforming to accepted ethical standards, the Institutional Review Boards at both Penn State University and Mount Nittany Medical Center approved the protocol before data collection began. At the 1, 3, and 6 month time points, data collection procedures for the present study were as follows: during the initial home visit, mothers and fathers were both given informed consent forms to read and sign. Following informed consent procedures, both parents were given their own individual packet of questionnaires by the research assistant (RA). The RA explained to the parents that mothers and fathers should complete their questionnaires separately, and that they were not to discuss their answers with each other. Packets were left with the families to be completed over a seven-day period prior to the second home visit, and included the Sleep Practices Questionnaire-Adapted (from Keller & Goldberg, 2004), the SCL-90 Depression and Anxiety Scales (Derogatis, 1994), Co-Parenting Relationship Questionnaire (Feinberg, Brown, & Kan, 2012), the Infant Sleep Diary (Anders et al. 1992), and a demographic questionnaire. In addition, the RA telephoned both parents at their convenience in the morning for seven consecutive days to answer the Parental Adaptation to Infant Sleep subscale of the Sleep Practices Questionnaire. Also at the initial home visit, the parents and the target infant were all given actiwatches to wear for the entire seven-day data collection period, and

instructed to press the button on their own watch and their infant's watch any time they removed the watch (for a bath, swimming, dishwashing, etc.), whenever they were attempting to fall asleep (both for naps and at night), as well as immediately after they woke up from a nap, through the night, or in the morning. Table 2 provides an overview of the seven-day assessment activities at each time point.

On the morning of the second day of data collection at each time point, and again on every morning through the final day of data collection, the RA telephoned the mother to administer the Parental Adaptation to Infant Sleep Questionnaire, with questions taken directly from the SPQ-A, but inquiring specifically about her thoughts and feelings regarding putting her child to bed at bedtime and tending to her child through the night if the child woke up and signaled to her. These questions were asked specifically about bedtime and night awakenings during the previous night.

The second home visit was scheduled on the sixth day of data collection at each time point. During this visit, the RA set up cameras (ARM Electronics, model C420BCVFIR) and microphones (Channel Vision, model 5104-mic) to capture bedtime and nighttime routines; these were placed wherever the infant slept as well as wherever any bedtime or nighttime parenting behaviors or routines occurred and were connected to a digital video recorder (BOSCH Digital Versatile Recorder, 8-channel, model DIVAR XF). The parents were instructed to turn on the digital video recorder one hour prior to the start of bedtime and leave it on until after the infant was up for the day the following morning. The RA also checked the questionnaires for completion at this visit, and asked the mothers to complete any unanswered questions they may have inadvertently skipped. A third and final home visit was made the following morning, at which time all

Table 2.

Schedule of assessment activities across the 7-day data collection period at 1, 3, and 6 months.

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
ACT	ACT	ACT	ACT	ACT	ACT	ACT
CRQ*						
Dem*						
					DVR	DVR
ISD	ISD	ISD	ISD	ISD	ISD	ISD
					MEA	
PAIS	PAIS	PAIS	PAIS	PAIS	PAIS	PAIS
SCL-90*						
SPQ-A*						

Note. Abbreviations for assessment activites are as follows: ACT (Actigraphy), CRQ (Co-Parenting Relationship Questionnaire), Dem (Demographic Questionnaire), DVR (Digital Video Recording of Infant at Bedtime), ISD (Infant Sleep Diary), MEA (Maternal Emotional Availability at Bedtime), PAIS (Parental Adaptation to Infant Sleep Phone Interview), SCL-90 (Symptom Checklist-Depression Subscale), SPQ-A (Sleep Practices Questionnaire-Adapted).

*The CRQ, Dem, SCL-90, and SPQ-A were given to mothers on Day 1 of data collection, but mothers were able to complete these measures at their leisure over the entire week.

equipment and completed questionnaires were collected, and the families were compensated $100 for their participation.

Measures

All paper and pencil questionnaires and phone interviews for the purposes of this study were administered to mothers at 1, 3, and 6 months; sleep-wake activity via actigraphy was measured on mothers and infants at 1, 3, and 6 months; and maternal emotional availability at bedtime was measured on mothers at 1, 3, and 6 months. See Table 3 for a comprehensive list of assessments utilized within each category of measurement.

Demographics

Mothers completed a demographic questionnaire at 1 month and a follow-up demographic questionnaire at 3 and 6 months that asked for information about parental age, education, and household income. This information was utilized to describe the sample.

Maternal Adaptation

Maternal adaptation to infant sleep was measured via maternal reported cognitions surrounding her infant's sleep patterns and behaviors, as well as by maternal emotional availability at bedtime. These measures were chosen to represent mothers' adaptation to her infant's sleep patterns based on the theoretical framework outlined previously, specifically that maternal adaptation is comprised of three components:

Table 3.

Measures included in each category of assessment.

Maternal Adaptation
Cognitive Dimension
Maternal Adaptation to Infant Sleep, subscale of Sleep Practices Questionnaire-Adapted
Parental Adaptation to Infant Sleep, Daily Phone Interview
Emotional and Behavioral Dimensions
Maternal Emotional Availability at bedtime, Emotional Availability Scale
Ecological Predictors of Maternal Adaptation
Infant Sleep Behavior
Infant Sleep Diary
Sleep Practices Questionnaire-Adapted
Mother-Infant Sleep Arrangements
Infant Sleep Diary
Sleep Practices Questionnaire-Adapted
Maternal Depressive Symptoms
SCL-90 Depression Subscale
Co-Parenting and Spousal Support
Co-Parenting Relationship Questionnaire
Spousal Criticism, subscale of Sleep Practices Questionnaire-Adapted
Maternal and Infant Sleep Quality
Actiwatches
Infant Sleep Diary
Sleep Practices Questionnaire-Adapted

emotional, cognitive, and behavioral. For the emotional and cognitive component, the questions mothers were asked in the Sleep Practices Questionnaire and the Parental Adaptation to Infant Sleep questionnaire tapped into mothers' thoughts and feelings about their infant's sleep. The questions asked in the Sleep Practice Questionnaire comprised the Maternal Adaptation to Infant Sleep—Global variable. The questions asked in the Parental Adaptation to Infant Sleep questionnaire every morning via phone interview comprised the Maternal Adaptation to Infant Sleep—Daily variable. The behavioral component was measured by the mothers' emotional availability toward her infant at bedtime.

Sleep Practices Questionnaire-Adapted (SPQ). The SPQ is a questionnaire that has been adapted from the work of Goldberg and Keller (2004) which asks parents to report on their infants' sleep arrangements and sleeping habits, whether parents feel comfortable with the choices they have made with respect to their infants' sleeping quarters, why they have chosen these sleep arrangements for themselves and their child, and whether they feel supported in the choices they have made. From this measure, two subscales were created to measure maternal adaptation: the global measure and the daily measure.

Maternal Adaptation to Infant Sleep—Global. Five items from the SPQ were combined to compose a global maternal adaptation subscale, representing the emotional and cognitive components of maternal adaptation. These items inquired about how much mothers viewed their infant's sleep arrangements, bedtime routine, and night awakenings as a problem, as well as how satisfied mothers felt with their infant's current sleep arrangements. The five questions were: *How satisfied are you with your baby's current*

sleep location?, To what extent is your baby's current sleep location a problem for you?, Overall, how much of a problem is it for you to put your baby to sleep at bedtime?, How much of a problem for you are your baby's night wakings?, and *If you are not sleeping well, to what extent do you feel that it is due to your baby?*. Items were rated on a 5-point scale (1 = not at all satisfied, 5 = definitely satisfied). Mothers completed these questions within the SPQ at their leisure during the week of data collection at each time point. The items were not specifically inquiring about the previous night or any night in particular, but rather about mothers' thoughts about their infant's sleep in general at that point in time. Cronbach's alpha (averaged across 1, 3, and 6 months) for these 5 items was .71.

Maternal Adaptation to Infant Sleep—Daily. The same five items from the SPQ were combined to compose a daily maternal adaptation subscale. These items inquired about how much mothers viewed their infant's sleep arrangements, bedtime routine, and night awakenings as a problem, as well as how satisfied mothers felt with their infant's current sleep arrangements, but were worded specifically with regard to the previous night. The five questions were: *How satisfied are you with your baby's current sleep location?, To what extent is your baby's current sleep location a problem for you?, Overall, how much of a problem was it for you to put your baby to sleep at bedtime last night?, How much of a problem for you were your baby's night wakings?,* and *If you did not sleep well last night, how much do you feel it was due to your baby?*. Items were rated on a 5-point scale (1 = not at all satisfied, 5 = definitely satisfied). Mothers answered these questions every morning via the daily phone interview with the RA for the seven consecutive days of data collection at each time point, and were instructed to answer the questions with the previous night in mind. An average composite score across

the seven days of data collection was calculated for every mother. Cronbach's alpha for these items, averaged at 1, 3, and 6 months, was .70.

The Global and Daily measures of maternal adaptation were highly correlated (see Table 4), and subsequently a measure of maternal adaptation was created which averaged these two scores at each time point. This combined variable was utilized for all analyses of the cognitive component of maternal adaptation in the present study, and will from this point forward be referred to as mothers' cognitive adaptation scores. Note in Table 4 that maternal emotional availability was not correlated with either the Global, Daily, or combined measure of maternal adaptation at any time point.

Maternal Emotional Availability at Bedtime. From the digital video recordings collected on day 6 at 1, 3, and 6 months, mothers' Emotional Availability (EA) during bedtimes was coded with the Emotional Availability Scales (EAS; Biringen, Robinson, & Emde, 1998), a system designed to characterize the emotional quality of parenting from observations of interactions between parents and children. The EAS uses four scales to assess parental EA: sensitivity (parent's ability to read accurately and respond contingently to child signals with warmth and emotional connectedness), structuring (parent's capacity for appropriate scaffolding of child activities and setting appropriate limits), non-intrusiveness (reverse-scored, reflecting parent's capacity to respect the child's autonomy and personal space), and non-hostility (reverse-scored, assessing parent's ability to interact with the child without signs of covert or overt irritability/anger). Sensitivity is a 9-point scale, and the others are 5-point scales. Individual scales at each time point were z-scored and combined to form a composite variable of maternal emotional availability at 1, 3, and 6 months. Cronbach's alpha for

Table 4. *Intercorrelations between measures of maternal adaptation at 1, 3, and 6 months.*

Correlations

		MCA 1 month	MCA 3 months	MCA 6 months	MEA 1 month	MEA 3 months	MEA 6 months	MA-G 1 month	MA-G 3 months	MA-G 6 months	MA-D 1 month	MA-D 3 months	MA-D 6 months
MCA 1 month	Pearson Corr	1	.715**	.591**	-.124	-.053	-.070	.934**	.708**	.559**	.930**	.633**	.583**
	Sig. (2-tailed)		.000	.000	.292	.663	.565	.000	.000	.000	.000	.000	.000
MCA 3 months	Pearson Corr	.715**	1	.662**	-.182	-.007	-.019	.616**	.940**	.636**	.722**	.932**	.638**
	Sig. (2-tailed)	.000		.000	.152	.956	.879	.000	.000	.000	.000	.000	.000
MCA 6 months	Pearson Corr	.591**	.662**	1	-.136	.010	.083	.481**	.562**	.962**	.632**	.681**	.956**
	Sig. (2-tailed)	.000	.000		.288	.936	.508	.000	.000	.000	.000	.000	.000
MEA 1 month	Pearson Corr	-.124	-.182	-.136	1	.636**	.431**	-.206	-.096	-.068	-.069	-.193	-.168
	Sig. (2-tailed)	.292	.152	.288		.000	.001	.078	.430	.585	.554	.130	.185
MEA 3 months	Pearson Corr	-.053	-.007	.010	.636**	1	.623**	-.139	-.067	-.007	.041	.018	.000
	Sig. (2-tailed)	.663	.956	.936	.000		.000	.244	.576	.955	.737	.887	.999
MEA 6 months	Pearson Corr	-.070	-.019	.083	.431**	.623**	1	-.165	-.053	.053	.026	.017	.080
	Sig. (2-tailed)	.565	.879	.508	.001	.000		.169	.663	.662	.832	.894	.518
MA-G 1 month	Pearson Corr	.934**	.616**	.481**	-.206	-.139	-.165	1	.632**	.470**	.737**	.529**	.469**
	Sig. (2-tailed)	.000	.000	.000	.078	.244	.169		.000	.000	.000	.000	.000
MA-G 3 months	Pearson Corr	.708**	.940**	.562**	-.096	-.067	-.053	.632**	1	.557**	.696**	.752**	.533**
	Sig. (2-tailed)	.000	.000	.000	.430	.576	.663	.000		.000	.000	.000	.000
MA-G 6 months	Pearson Corr	.559**	.636**	.962**	-.068	-.007	.053	.470**	.557**	1	.588**	.641**	.839**
	Sig. (2-tailed)	.000	.000	.000	.585	.955	.662	.000	.000		.000	.000	.000
MA-D 1 month	Pearson Corr	.930**	.722**	.632**	-.069	.041	.026	.737**	.696**	.588**	1	.656**	.621**
	Sig. (2-tailed)	.000	.000	.000	.554	.737	.832	.000	.000	.000		.000	.000
MA-D 3 months	Pearson Corr	.633**	.932**	.681**	-.193	.018	.017	.529**	.752**	.641**	.656**	1	.671**
	Sig. (2-tailed)	.000	.000	.000	.130	.887	.894	.000	.000	.000	.000		.000
MA-D 6 months	Pearson Corr	.583**	.638**	.956**	-.168	.000	.080	.469**	.533**	.839**	.621**	.671**	1
	Sig. (2-tailed)	.000	.000	.000	.185	.999	.518	.000	.000	.000	.000	.000	

**Correlation is significant at the 0.01 level (2-tailed). *Note. MCA is the combined Global/Daily measure of maternal cognitive adaptation; MEA is maternal emotional availability; MA-G is maternal adaptation—Global; MA-D is maternal adaptation—Daily.*

the four individual scales was .83 at 1 month, .77 at 3 months, and .80 at 6 months. Data on maternal emotional availability was obtained for 75 mothers at 1 month, 72 mothers at 3 months, and 71 mothers at 6 months. Inter-rater reliability for the emotional availability coding was analyzed and yielded a single measures intraclass correlation of .975 with a 95% confidence interval of .957 - .986, and an average measures intraclass correlation of .988 (.975 - .993).

There are a few reasons why data on emotional availability at bedtime was missing on some mothers. First, there were times when our cameras were turned on by the families later than directed, which meant there was no bedtime interaction between mother and infant to code. Second, some infants were put to bed already asleep, with no interaction between mother and infant caught on camera. Finally, some families agreed to participate only in the paper and pencil portion of the study because they were uncomfortable with the idea of being video-recorded during bedtime and through the night.

Ecological Predictors of Maternal Adaptation

Sleep Arrangements. From the SPQ, we asked mothers where the target child typically slept. Responses included infants who slept alone in their own crib in a separate room from their mother, and infants who slept in the same room as their mother, either in the same bed or in a bassinet or crib near the bed. Results were dummy coded so that 0 = infants who slept in a separate room from their mother, 1 = infants who slept in the same room as their mother but in a separate bed, and 2 = infants who slept in the same bed as their mother.

Spousal criticism. A single item was extracted from the SPQ that inquired about the extent to which mothers felt criticized by their partners about where their baby slept. The specific item was worded as: *"Overall, to what extent do you feel criticized by your partner about your baby's sleep location?"* Mothers responded to this item on a 5-point scale (1 = not at all criticized, 5 = definitely criticized).

Maternal Depressive Symptoms. Mothers completed the depression subscale of the SCL-90-R (Derogatis, 2000) to assess their own depressive symptoms at 1, 3, and 6 months. The depressive symptoms subscale contains 13 items (e.g., crying easily, feeling lonely, feeling everything is an effort). Items were rated on a 5-point scale (1 = not at all, 5 = extremely). Higher scores indicated greater depressive symptoms. Cronbach's alpha for these 13 items was .91 at 1 month, .91 at 3 months, and .88 at 6 months.

Maternal Sleep Quality. Actigraph recordings of mothers' daytime and nighttime sleep and waking activity using the Mini-Mitter Actigraphy Model AW-64 wristwatches were collected across each seven-day data collection period at 1, 3, and 6 months of infant age. This system provides objective recordings of sleep/wake activity and software that enables one to collapse and summarize sleep and waking activity during the day and throughout the night. Specifically, sampling epoch length for all actiwatches was 1 minute, and a medium (40 activity counts) wake threshold value was used. Using Actiware (Version 5.0) software, actigraphy data, in actogram format, were uploaded onto a personal computer. The Sadeh algorithm (Sadeh, Sharkey, & Carskadon, 1994), which identifies sleep onset as the first of at least 3 continuous minutes of sleep and sleep offset as the last of at least 5 continuous minutes of sleep, was used to identify sleep bouts throughout the night. Actiware® (version 5.0) software (Respironics/Mini Mitter,

2005) was used to determine, for each mother for each of the seven nights, total sleep duration, total number of night wakings, sleep efficiency (total valid nighttime sleep/total time in bed), and sleep fragmentation (percent of mobile bouts + percent of immobile bouts less than 1 minute in duration). The mean of each of these measures was obtained for the full week of data collection at 1, 3, and 6 months.

Quality of co-parenting. The *Coparenting Relationship Scale* (CRS) is a measure of co-parenting developed by Feinberg, Brown, and Kan (2012), which asks mothers to describe how they work together with their partner as parents. This questionnaire was administered at 1, 3, and 6 months. Questions ranged from general, (e.g., *"I believe my partner is a good parent*") to more specific (e.g., "*How often in a typical week, when all 3 of you are together, do you yell at each other within earshot of your child?"*). Items were rated on a 7-point scale (0 = Not true of us/Never, 6 = Very true of us/Very Often). From the results, two dimensions of coparenting emerged: a positive dimension and a negative dimension (these dimensions were derived from the scale's authors). The positive dimension was comprised of items across 4 factors, including spousal agreement (α = .73), increased closeness (α = .77), support-cooperation (α = .86), and endorses partner's parenting (α = .81). The negative dimension was comprised of items across 2 factors, including exposure to conflict (α = .69) and competition-undermining (α = .58). It should be noted that these alphas were calculated from the data collected in the present study. In addition, intercorrelations between the four positive factors at 1 month ranged from .43 to .82, at 3 months from .43 to .77, and at 6 months from .36 to .75, all significant at $p < .001$. Correlations between the two negative factors were .28 ($p = .003$) at 1 month, .33 ($p = .001$) at 3 months, and .48 ($p < .001$) at 6 months.

Infant Sleep Behavior

Infant Sleep Diary. This measure, adapted from Anders et al. (1992), asked parents for information about the time their child was put down to sleep, the time the child actually fell asleep, whether the child was nursed to sleep, used a pacifier or some other sleep aid to fall asleep, the location of where the child was put to sleep, and the location of where the child woke up in the morning. The sleep diary also asked parents how many night wakings the child experienced and what parents did in response to those wakings. The Infant Sleep Diary was completed by one or both parents every morning for each of seven consecutive days of data collection at 1, 3, and 6 months, reporting on the previous night. This measure was used as a subjective assessment of infant sleep quality. Specifically, a waking frequency variable was created that averaged the number of parent-reported infant night wakings across one week. In addition, a tending frequency variable was created that averaged the number of times the parents reported that they had to return to their child at bedtime before the child fell asleep.

Infant Sleep Quality. Actigraph recordings (see description above) of infants' daytime and nighttime sleep and waking activity were collected across each seven-day data collection period at 1, 3, and 6 months of infant age. Again, this system provides objective recordings of sleep/wake activity and software that enables one to collapse and summarize waking activity during the day and throughout the night. From the data collected we were able to measure infants' sleep quality and sleep efficiency at each time point.

Results

Stability of Maternal Adaptation to Infant Sleep

To assess the stability of maternal adaptation to infant sleep patterns across the first 6 months of life, two separate linear regression analyses were conducted for both measures of maternal adaptation. Mothers' cognitive adaptation score at 3 months was regressed on cognitive adaptation at 1 month, and in the second analysis, cognitive adaptation at 6 months was regressed on cognitive adaptation at 3 months. As expected, mothers' cognitive adaptation scores at 1 month significantly predicted cognitive adaptation scores at 3 months, $\beta = .715$, $t(94) = 9.92$, $p < .001$. Mothers' cognitive adaptation scores at 3 months significantly predicted their cognitive adaptation scores at 6 months, $\beta = .662$, $t(85) = 8.13$, $p < .001$. In addition, mothers' cognitive adaptation scores at 1 month significantly predicted cognitive adaptation scores at 6 months, $\beta = .591$, $t(93) = 7.06$, $p < .001$. The same regression analyses were run for maternal emotional availability (EA), with similar results. Maternal EA at 1 month significantly predicted maternal EA at 3 months, $\beta = .636$, $t(47) = 5.64$, $p < .001$, and maternal EA at 3 months significantly predicted maternal EA at 6 months, $\beta = .623$, $t(55) = 5.91$, $p < .001$. Maternal EA at 1 month also significantly predicted maternal EA at 6 months, $\beta = .431$, $t(51) = 3.42$, $p = .001$.

Change in Maternal Adaptation Scores

To assess change in mean scores of maternal adaptation to infant sleep patterns over the first 6 months of life, a repeated measures ANOVA of both measures of maternal adaptation (cognitive and maternal EA) was conducted across at 1, 3, and 6

months. For the cognitive adaptation variable, results indicated that there was a significant difference in mean maternal adaptation between time points ($F(2, 172) = 59.34$, $p < .001$). Pairwise comparisons of mean scores indicate that maternal adaptation did not significantly increase from 1 month ($M = 19.24$, $SD = .35$) to 3 months ($M = 21.80$, $SD = .34$). The mean maternal adaptation score at 6 months ($M = 22.15$, $SD = .37$), increase significantly from mean scores at 1 month ($p < .001$) and 3 months ($p < .001$). These results indicate that the cognitive measure of maternal adaptation to infant sleep in the present study increased significantly over the first 6 months of life, but most of the increase took place between 3 and 6 months of infant age.

The same analyses were run on maternal emotional availability to infant sleep at 1, 3, and 6 months. Results indicated that there were no significant differences in mean scores between time points ($F(2, 84) = .243$, $p = .785$). Pairwise comparisons of mean scores indicate that maternal emotional availability did not significantly increase from 1 month ($M = 18.91$, $SD = .50$) to 3 months ($M = 19.20$, $SD = .46$) to 6 months ($M = 19.04$, $SD = .45$). These results indicate that mean scores for maternal emotional availability at bedtime did not change significantly over the first 6 months of life.

Post-hoc analyses to investigate correlations between changes in maternal adaptation and ecological predictor variables over the first 6 months of infant life were conducted. Specifically, change scores from 1 to 3 months and 3 to 6 months were computed for both maternal emotional availability and maternal cognitive adaptation. The change scores from 1 to 3 months were then correlated with the ecological predictors of maternal adaptation at 1 month, and the change scores from 3 to 6 months were correlated with the ecological predictors at 3 months. Ecological predictors included in

these analyses were maternal depressive symptoms, maternal sleep quality via actigraphy, infant sleep quality via actigraphy, maternal report of infant night wakings, maternal report of the number of times an infant had to be returned to at bedtime before the infant fell asleep, maternal report of positive co-parenting, maternal report of negative co-parenting, and maternal report of spousal criticism about where the infant slept.

Results indicated that the only ecological predictor variable at 1 month that was significantly correlated with the change in maternal EA from 1 month to 3 months was mothers' report of the number of times the infant had to be returned to at bedtime. The correlation was negative ($r(39) = -.33$, $p < .05$), indicating that the more often an infant had to be returned to after being put to bed at 1 month before falling asleep, the more likely the mother's emotional availability at bedtime decreased from 1 to 3 months. None of the ecological predictors at 3 months were significantly correlated with the change score in maternal EA from 3 months to 6 months. For maternal cognitive adaptation, none of the ecological predictors at 1 month were significantly correlated with change scores from 1 month to 3 months, and none of the predictors at 3 months were significantly correlated with change in mothers' cognitive adaptation from 3 months to 6 months.

Next, change scores for the ecological variables listed above were calculated from 1 month to 3 months and from 3 months to 6 months. These change scores were then correlated with both maternal EA changes scores and mothers' cognitive adaptation change scores. Results indicated that the change in maternal EA from 1 to 3 months was significantly and negatively correlated with both the change in negative co-parenting ($r(46) = -.39$, $p < .01$) and the change in spousal criticism ($r(46) = -.31$, $p < .05$),

indicating that if a mother reported an increase in negative co-parenting or spousal criticism from 1 to 3 months, her emotional availability score from 1 to 3 months decreased. No significant correlations were found between change scores in ecological variables and the change in maternal EA from 3 to 6 months.

For the change in mothers' cognitive adaptation scores from 1 to 3 months, no significant correlations were found, but for the change in mother's cognitive adaptation scores from 3 to 6 months, a significant and negative correlation was found with the change in the number of infant night wakings mothers reported from 3 to 6 months. This result indicates that if a mother reported an increase in her infant's night wakings from 3 to 6 months, her cognitive adaptation scores were more likely to decrease from 3 to 6 months.

Predictors of Maternal Adaptation to Infant Sleep

Question 3 addressed whether maternal adaptation to infant sleep at 6 months could be predicted by objective measures of infant and maternal sleep quality via actigraphy, subjective measures of infant sleep quality via maternal report, maternal self-reported depressive symptoms, co-parenting, or spousal criticism at 1 and 3 months. Initial analyses revealed that each predictor variable at 1 month was significantly correlated with itself at 3 months (see Table 5), so the 1 and 3 month variables for each predictor were combined by averaging their scores at 1 and 3 months. This yielded a score for each predictor across 1 and 3 months. Table 6 shows the correlations between predictor variables averaged across 1 and 3 months. Specifically, maternal depressive symptoms was significantly and negatively correlated with the positive dimension of co-

Table 5.

Intercorrelations between predictor variables at 1 and 3 months.

	matdep, 1 month	matdep, 3 mos	InfAct, 1 month	InfAct, 3 mos	MomAct, 1 month	MomAct, 3 mos	wakefreq, 1 month	wakefreq, 3 mos	tendfreq, 1 month	tendfreq, 3 mos	Pos CP, 1 month	Pos CP, 3 mos	Neg CP, 1 month	Neg CP, 3 mos	spcrit, 1 month	spcrit, 3 mos
matdep, 1 month	1	.577**	.020	.131	-.065	.034	.016	-.058	.143	.043	-.287**	-.290**	.209*	.192	.068	.019
matdep, 3 mos	.577**	1	-.024	.077	-.064	.083	-.031	-.089	.328**	.013	-.355**	-.507**	.311**	.451**	-.001	.040
InfAct, 1 month	.020	-.024	1	.317**	.366**	.365**	-.039	.170	-.051	-.077	-.042	-.104	.024	.001	.096	.109
InfAct, 3 mos	.131	.077	.317**	1	.121	.011	-.048	.131	-.035	.070	-.120	-.134	.230*	.205	.200	.070
MomAct, 1 month	-.065	-.064	.366**	.121	1	.602**	-.252*	-.043	.028	-.149	.173	.167	-.116	-.241*	.120	.005
MomAct 3 mos	.034	.083	.365**	.011	.602**	1	-.118	-.162	-.057	-.070	-.051	-.073	-.042	-.083	-.058	-.054
wakefreq, 1 month	.016	-.031	-.039	-.048	-.252*	-.118	1	.543**	.232*	.234*	.000	-.051	-.001	.019	.114	.204*
wakefreq, 3 mos	-.058	-.089	.170	.131	-.043	-.162	.543**	1	.485**	.332**	.084	.080	.059	.064	.026	.004
tendfreq, 1 month	.143	.328**	-.051	-.035	.028	-.057	.232*	.485**	1	.403**	-.014	-.124	.025	.145	-.006	-.068
tendfreq, 3 mos	.043	.013	-.077	.070	-.149	-.070	.234*	.332**	.403**	1	-.043	.015	.151	.134	-.139	-.073
Pos CP, 1 month	-.287**	-.355**	-.042	-.120	.173	-.051	.000	.084	-.014	-.043	1	.774**	-.470**	-.510**	-.139	-.070
Pos CP, 3 mos	-.290**	-.507**	-.104	-.134	.167	-.073	-.051	.080	-.124	.015	.774**	1	-.442**	-.652**	-.249*	-.143
Neg CP, 1 month	.209*	.311**	.024	.230*	-.116	-.042	-.001	.059	.025	.151	-.470**	-.442**	1	.674**	.097	.351**
Neg CP, 3 mos	.192	.451**	.001	.205	-.241*	-.083	.019	.064	.145	.134	-.510**	-.652**	.674**	1	.219*	.192
spcrit, 1 month	.068	-.001	.096	.200	.120	-.058	.114	.026	-.006	-.139	-.139	-.249*	.097	.219*	1	.620**
spcrit, 3 mos	.019	.040	.109	.070	.005	-.054	.204*	.004	-.068	-.073	-.070	-.143	.351**	.192	.620**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Note. Abbreviations for variables are as follows: Maternal depressive symptoms (matdep), Infant Actigraphy (InfAct), Maternal Actigraphy (MomAct), number of times infant woke during the night (wakefreq), number of times infant had to be settled before falling asleep (tendfreq), positive co-parenting (Pos CP), negative co-parenting (Neg CP), spousal criticism (spcrit).

Table 6.

Correlations between predictor variables averaged across 1 and 3 months.

Correlations

	InfAct	MomAct	tendfreq	wakefreq	Pos CP	Neg CP	spcrit	matdep
InfAct	1	.298**	-.067	.024	-.119	.171	.166	.056
MomAct	.298**	1	-.035	-.185	.098	-.169	-.015	-.049
tendfreq	-.067	-.035	1	.486**	-.091	.130	-.071	.273*
wakefreq	.024	-.185	.486**	1	.030	.055	.104	-.053
Pos CP	-.119	.098	-.091	.030	1	-.627**	-.182	-.426**
Neg CP	.171	-.169	.130	.055	-.627**	1	.252*	.335**
spcrit	.166	-.015	-.071	.104	-.182	.252*	1	.046
matdep	.056	-.049	.273*	-.053	-.426**	.335**	.046	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Note. Abbreviations for variables are as follows: Maternal depressive symptoms (matdep), Infant Actigraphy (InfAct), Maternal Actigraphy (MomAct), number of times infant woke during the night (wakefreq), number of times infant had to be settled before falling asleep (tendfreq), positive co-parenting (Pos CP), negative co-parenting (Neg CP), spousal criticism (spcrit).

parenting, significantly and positively correlated with the negative dimension of co-parenting, and significantly and positively correlated with the number of times mothers reported returning to their infant at bedtime until the infant fell asleep. Spousal criticism was significantly and positively correlated with negative co-parenting. The number of times mothers had to return to their infant at bedtime was significantly and positively correlated with the number of reported infant night wakings, and maternal sleep quality as measured objectively via actigraphy was significantly and positively correlated with infant sleep quality via actigraphy. Finally, negative co-parenting was significantly and negatively correlated with positive co-parenting.

The cognitive measure of maternal adaptation at 6 months was regressed on each of the combined 1 and 3 month predictor variables in a stepwise multiple regression. Results indicated that mothers' cognitive adaptation scores were significantly predicted by the mean number of infant night wakings across 1 and 3 months as reported by parents via the daily sleep diary, as well as by mothers' reports of negative co-parenting across 1 and 3 months (see Table 7). These results indicate that the more the mother perceived and reported that her infant woke through the night at 1 and 3 months and the more negative co-parenting reported by mothers across the first three months, the more the mothers viewed their infant's sleep behaviors at bedtime and through the night as problematic at 6 months. It is interesting to note that infant sleep efficiency, as measured objectively via actigraphy, was not a significant predictor of maternal adaptation, even though mothers' perceptions of how frequently her infant woke through the night was. Variables excluded from this model included maternal depressive symptoms, spousal criticism, maternal sleep efficiency, infant sleep efficiency, positive co-parenting, and the number of times the infant had to be returned to at bedtime across 1 and 3 months.

Likewise, maternal EA at bedtime at 6 months was regressed on each of the combined 1 and 3 month predictor variables in a stepwise multiple regression. Results indicated that mothers' reports of negative co-parenting across 1 and 3 months, as well as the mean number of infant night wakings across 1 and 3 months as reported by parents via the daily sleep diary (see Table 7), significantly predicted maternal emotional availability at bedtime at 6 months. Note that the relationship between perceived infant night wakings and maternal EA is positive, indicating that the more the infant woke through the night at one and three months, the more emotionally available the mother was at bedtime at six months. Again, actual infant sleep efficiency measured objectively by actigraphy was not a significant predictor. Variables excluded from this model included maternal depressive symptoms, spousal criticism, maternal sleep efficiency, infant sleep efficiency, positive co-parenting, and the number of times the infant had to be returned to at bedtime, all averaged across 1 and 3 months.

Table 7.

Beta weights, t-values, and significance levels for the predictor variables (averaged across 1 and 3 months) on maternal cognitive adaptation and maternal emotional availability at 6 months.

Predictor Variables	Cognitive Adaptation	Emotional Availability
Negative Co-parenting	β = -.320, $t(52)$ = -2.69**	β = -.541, $t(43)$ = -4.34***
Waking Frequency	β = -.411, $t(52)$ = -3.46**	β = .267, $t(43)$ = 2.20*

Note. Non-significant variables for both step-wise regression models included maternal depressive symptoms, spousal criticism, maternal sleep efficiency, infant sleep efficiency, positive co-parenting, and the number of times the infant had to be returned to at bedtime.
*p < .05. **p < .01. ***p < .001.

Sleep Arrangements and Maternal Adaptation to Infant Sleep

For Question 4, to determine if sleep arrangements significantly predicted either the cognitive measure of maternal adaptation at 6 months or maternal emotional availability at bedtime at 6 months, two regressions were run with "sleep in separate room from parents at 6 months" as the reference category, since this subpopulation was the largest group (n = 62). The other two groups were "sleep in same bed as parents at 6 months" (bedsharers, n = 16) and "sleep in same room as parents, but not in same bed at 6 months" (roomsharers, n = 16). The regression for sleep arrangements predicting maternal cognitive adaptation was significant ($\chi^2(2) = 12.8$, $p < .01$). The parameter estimate for the bedsharers was also significant, $\beta = -.26$, $Wald(1) = 9.35$, $p = .002$. The parameter estimate for the roomsharers was significant, $\beta = -.21$, $Wald(1) = 6.06$, $p = .014$. The regression for sleep arrangements predicting maternal EA was significant, ($\chi^2(2) = 8.4$, $p < .05$). The parameter estimate for the bedsharers was not significant, $\beta = -.18$, $Wald(1) = 2.63$, $p = .105$. The parameter estimate for the roomsharers was significant, $\beta = -.31$, $Wald(1) = 6.93$, $p = .009$.

Results indicated that sleep arrangements at 6 months was significantly associated with both measures of maternal adaptation at 6 months. Specifically, those mothers whose infants slept in a separate room from them at 6 months had higher maternal cognitive adaptation scores and emotional availability scores than those mothers who slept in the same room as their infant. However, for emotional availability, it was only significant if mothers slept in the same room but not in the same bed as their infant. Mothers who slept in the same bed as their infant were not significantly less emotionally available to their infants at bedtime than mothers whose infants slept in a separate room.

Potential Mediators of the Relationship Between Sleep Arrangements and Maternal Adaptation to Infant Sleep

Given that sleep arrangements was significantly associated with both maternal cognitive adaptation and maternal emotional availability at 6 months, negative co-parenting, maternal depressive symptoms, and maternal sleep efficiency were analyzed as potential mediators of these relationships (see Countermine & Teti, 2010). The prerequisites for mediation as outlined by Baron and Kenny (1986) are: (a) The predictor (sleep arrangements) must be significantly correlated with the criterion (mothers' cognitive adaptation and maternal emotional availability); (b) the predictor variable must be correlated significantly with each of the three potential mediator variables (maternal sleep efficiency, negative co-parenting, and maternal depressive symptoms); and (c) each of these three mediators correlates significantly with the criterion. Pearson correlations for the three potential mediators, shown in Table 8, indicated that only maternal sleep quality met the prerequisites for mediation with cognitive adaptation as the criterion, and that only negative co-parenting met the prerequisites for mediation with maternal emotional availability as the criterion.

Next, the procedure to test for mediation from MacKinnon (2008) was followed. In this procedure, two sets of hierarchical multiple regression analyses (with three regressions per set) were conducted: one set for the link between mothers' cognitive adaptation and maternal sleep quality, and another set for the link between negative co-parenting and maternal emotional availability. The path models and results of these analyses are depicted in Figure 1. In the first set of regressions, cognitive adaptation was regressed on sleep arrangements, which determined the direct (unmediated) effect of sleep arrangements on maternal cognitive adaptation (Path c). In

Table 8.

Correlations and significance levels for the potential mediators on maternal adaptation and maternal emotional availability.

Potential Mediators	Maternal Adaptation G/D	Maternal EA	Sleep Arrangements
Maternal Sleep Quality	r(87) = .288**	r(69) = .045	r(90) = -.283*
Negative Co-parenting	r(91) = -.200	r(69) = -.330**	r(94) = .258*
Maternal Depressive Symptoms	r(95) = -.178	r(71) = -.357**	r(98) = .181

Note. Sleep arrangements dummy coded as 0 = mother slept in separate room from infant, 1 = mother slept in same room as infant. Partial correlation between sleep arrangements and maternal adaptation: r(94) = -.366**; partial correlation between sleep arrangements and maternal EA: r(70) = -.330**.
*p < .05. **p < .01.

the second regression, maternal sleep quality was regressed on sleep arrangements to determine the relationship between sleep arrangements and maternal sleep quality (Path a). In the third regression, cognitive adaptation was regressed on sleep arrangements and maternal sleep quality, which assessed the link between maternal sleep quality and cognitive adaptation (Path b), and the link between sleep arrangements and cognitive adaptation after controlling for maternal sleep quality (Path c'). For sleep arrangements in these mediation analyses, a "proximity to mother when sleeping" variable was created with results dummy coded so that 1 = infants who slept in a separate room from their mother, and 2 = infants who slept in the same room as their mother.

In the second set of regressions, maternal emotional availability was regressed on sleep arrangements, which determined the direct (unmediated) effect of sleep arrangements on maternal emotional availability (Path c). In the second regression, negative co-parenting was regressed on sleep arrangements to determine the relationship between sleep arrangements and

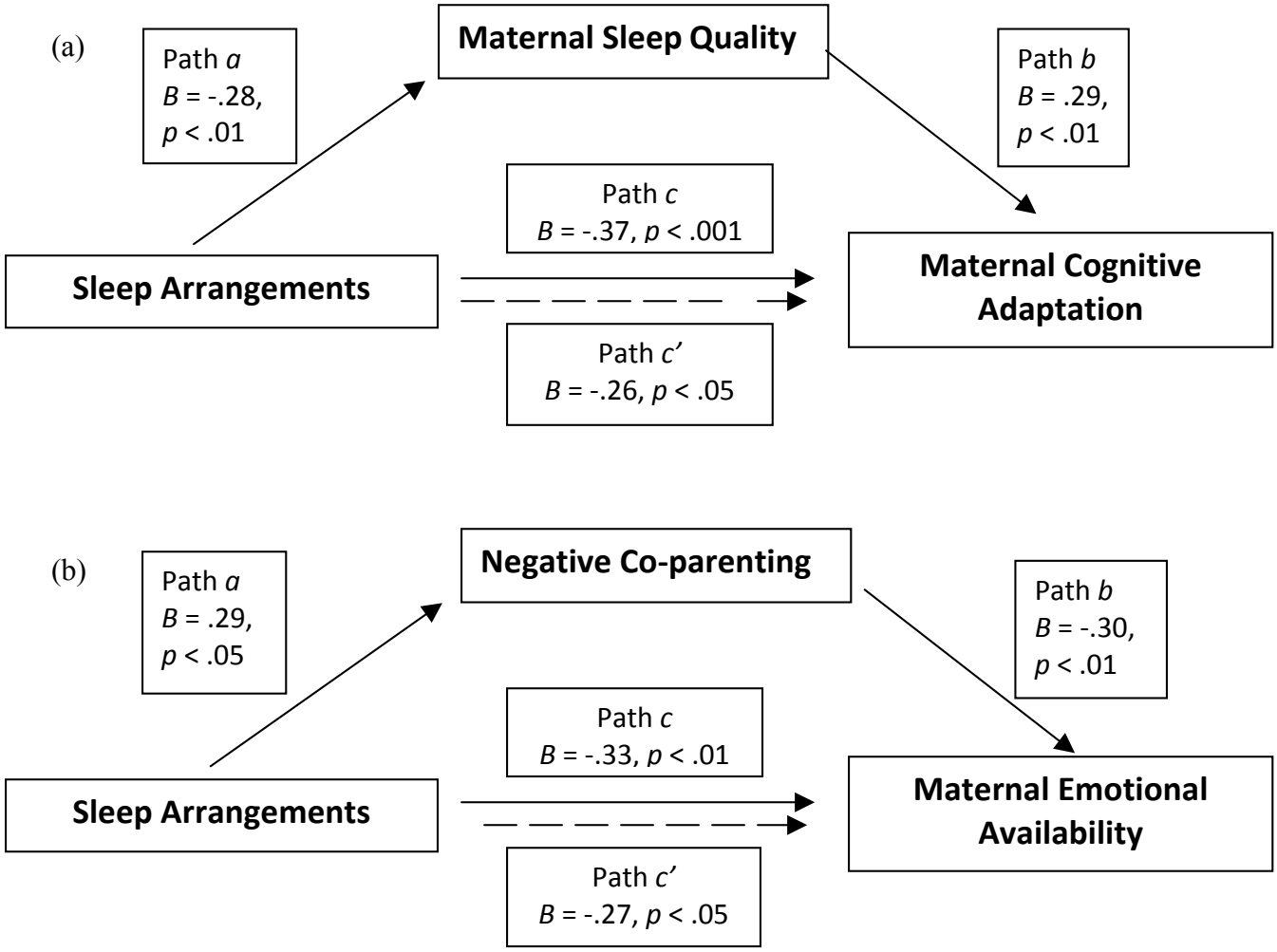

FIGURE 1. Potential mediators of the relation between sleep arrangements and maternal cognitive adaptation to infant sleep or maternal emotional availability. (a) Standardized regression coefficients (β) for the effect of sleep arrangements on maternal cognitive adaptation, testing maternal sleep quality as a mediator. Path c is the effect of sleep arrangements without adjusting for maternal sleep quality. Path c' is the effect of sleep arrangements after adjusting for maternal sleep quality. The mediated path was not statistically significant using MacKinnon's (2008) asymmetric confidence limits procedure. (b) Standardized regression coefficients (β) for the effect of sleep arrangements on maternal emotional availability, testing negative co-parenting as a mediator. Path c is the effect of sleep arrangements without adjusting for negative co-parenting. Path c' is the effect of sleep arrangements after adjusting for negative co-parenting. The mediated path was found to be statistically significant, $p < .05$, using MacKinnon's (2008) asymmetric confidence limits procedure. Partial mediation is suggested because Path c' remained statistically significant.

negative co-parenting (Path a). In the third regression, maternal emotional availability was regressed on sleep arrangements and negative co-parenting, which assessed the link between negative co-parenting and maternal emotional availability (Path b), and the link between sleep arrangements and maternal emotional availability after controlling for negative co-parenting (Path c'). The significance of the fully mediated paths was tested using MacKinnon's asymmetric confidence limits procedure, a test of mediation that takes into account the fact that the mediated effect (i.e., the product of the unstandardized regression coefficients obtained for Paths a and b) is typically not normally distributed. If the upper and lower confidence limit of the effect does not contain the value of 0, mediation is determined to be statistically significant.

Figures 1a and 1b provide beta weights and significance levels for each path in both mediational models. Lower and upper confidence limits for the mediation effect of maternal sleep quality on maternal adaptation (-.86, .68) did bracket the value of zero, indicating that the mediation effect was not significant. Lower and upper confidence limits for the mediation effect of negative co-parenting on maternal emotional availability (-.14, -.03) did not bracket the value of 0, indicating significant mediation. The c' path, which assessed the relation between sleep arrangements and maternal emotional availability after adjusting for the mediator (negative co-parenting), remained statistically significant for maternal sleep quality and negative co-parenting, suggesting partial, but not full, mediation by this variable.

Discussion

In the present study, mothers' cognitive adaptation to infant sleep and maternal emotional availability (EA) at bedtime were both stable across the infant's first six months of life.

Cognitive adaptation scores improved across the first 6 months, although the only significant increase was from 3 to 6 months. These results indicate that as their infants aged, mothers' thoughts and feelings regarding how much of a problem it was to put their infant to sleep at bedtime and back to sleep through the night became more positive, indicating that they felt it was less problematic. Mothers' EA scores, however, did not improve across the first six months but rather remained stable at whatever level they began. In other words, mothers who were rated high or low on emotional availability toward their infants at bedtime when their infant was one month old remained at generally the same level of EA at three and six months.

Post hoc analyses revealed that maternal emotional availability from 1 to 3 months was negatively correlated with three ecological predictors: 1) the number of times the mother reported that she had to return to her infant before her infant fell asleep at 1 month, 2) an increase in maternal report of negative co-parenting from 1 to 3 months, and 3) an increase in maternal report of spousal criticism from 1 to 3 months. In other words, mothers were rated as less emotionally available to their infant at bedtime at 3 months compared to their 1 month score when they had an infant who didn't fall asleep quickly without parental attention at 1 month. They were also rated as less emotionally available at 3 months if they reported an increase in spousal criticism and negative co-parenting (competition/undermining and contempt from partner) from 1 to 3 months.

This finding indicates that mothers' behavior toward their infant at bedtime and her perception of her relationship with her spouse are intricately related, and reflects results of a study by Belsky and Rovine (1990), who found that marital quality following the birth of a baby is positively associated with how well a couple adapts to the challenges of parenthood. A mother

who is becoming less emotionally available to her infant at bedtime over the first 3 months while concurrently feeling less and less supported by her partner may be caught in a negative reciprocal relationship between herself, her partner, and her child. Again, no significant correlations were found for the change scores in emotional availability from 3 to 6 months. Given that mothers tended to remain at generally the same level of emotional availability across the first 6 months, this result is not surprising.

The change in maternal cognitive adaptation scores from 1 to 3 months was not significantly correlated with any ecological variables, but change scores from 3 to 6 months for cognitive adaptation were found to be significantly and negatively correlated with the change in maternal reports of the number of infant night wakings from 3 to 6 months. Specifically, when the mother reported more infant night wakings at 6 months than she did at 3 months, her cognitive adaptation score decreased. If a mother expects that her infant should be waking up less from 3 to 6 months, but in fact the opposite is happening, it is not surprising that she would view her infant's bedtime and nighttime sleep patterns as more problematic at the latter time point.

Note in Table 4 that maternal cognitive adaptation and maternal EA were not correlated at any of the three time points. In the present study, cognitive adaptation was measured, as previously stated, by asking mothers to rate how much of a problem it was to put their baby to sleep at bedtime or back to sleep through the night, and emotional/behavioral adaptation was measured by mothers' emotional availability toward her infant at bedtime. Maternal emotional availability, by its very nature, is measuring a behavioral manifestation of maternal emotion. Likewise, the cognitive measure of maternal adaptation is measuring, to some degree, how a

mother is feeling about her baby's sleep patterns. Perhaps this is evidence that the way a mother feels has more influence on her thoughts than on her behavior, and the way she behaves remains stable regardless of her thoughts and feelings. In the first 6 months of life, when parenting is essentially a round-the-clock commitment, it may be that the thoughts and feelings that mothers report about their infant's sleep development are true and real to them, but are not reflected in their behavior as one might expect. Recent research in the area of adult sleep deprivation reveals that even an hour less of sleep per night can negatively impact adults' cognitive functioning, but adults who are sleep-deprived do not notice or report any decreases in cognitive functioning (Durmer & Dinges, 2006). If mothers of newborns who are dealing with frequent night wakings and sleep disruption are unable to recognize that they are in fact not operating at their full potential, then their behavior may not be a reflection of their thoughts.

Regarding the stability of maternal emotional availability at bedtime, additional research in the remainder of the first year of life and into the second year of life would be valuable to determine whether stability is maintained over a longer period of time. In a cross-sectional study of maternal EA and infant sleep, Teti, Kim, Mayer, and Countermine (2010) found an inverse relationship between maternal EA and infant age, such that mothers of older children were less emotionally available to their infant at bedtime than were mothers of younger children. The results found in the present study seem to be at odds with the negative correlation between maternal EA and infant age found by Teti et al (2010). However, the present study followed infants longitudinally over only the first 6 months of life, while Teti et al (2010) was a cross-sectional study with data on mother-infant dyads from 1-24 months of infant age. Perhaps a decline in maternal EA may not be as apparent in the first 6 months of life, but may emerge over

time. Recent research indicates that mothers' expression of negative emotion may be a reaction to their child's expressions of anger (Teti & Cole, 2011) that would not necessarily be evident in the first half of the first year of life. Certainly a toddler who is resisting bedtime, repeatedly getting out of bed, and struggling to fall asleep has the potential to draw more negative emotional expression from his mother than a 6 month old who is walked, rocked, bottle-fed, or nursed to sleep. With age come increases in a child's autonomy, mobility, cognition, and desire to exercise his own free will; although a newborn baby or a 6 month old has the ability to signal to his mother via crying, fussing, or calling out if he is hungry or needs comfort, he is quite limited in his repertoire of expressions and behaviors, unlike a toddler who has learned to walk and talk. Note that in the present study, there was a slight non-significant increase in mean maternal EA from 1 month to 3 months, and then a slight non-significant dip in mean maternal EA from 3 months to 6 months. Perhaps this dip in maternal EA at bedtime from 3 to 6 months represents the beginning of the same trend that Teti et al (2010) found. Further longitudinal research following the same mother-infant dyads from birth to 24 months would help elucidate the trend in maternal EA at bedtime in the first 2 years of life.

From regression analyses, maternal cognitive adaptation and maternal emotional availability at six months were both predicted by negative co-parenting at one and three months. The more a mother reported exposure to conflict, competitiveness, and undermining within the co-parenting relationship, the less adapted and less emotionally available she was to her child at bedtime. Indeed, this confirms previous work indicating that the quality of the marital relationship may bear importantly on how mothers function independently in the parental role (Bayer, Hiscock, Hampton, & Wake, 2006; Countermine & Teti, 2010; Field et al., 2007;

Gelfand & Teti, 1990; Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007). Interestingly, positive co-parenting did not significantly predict maternal cognitive adaptation or maternal EA. Perhaps the more salient messages to mothers from fathers are the ones that contain criticism and contempt rather than praise regarding how she is parenting. Indeed, believing that one is valued and cared for by a significant other is critical for the functioning of most close relationships (Clark & Lemay, 2010; Holmes & Rempel, 1989; Reis, Clark, & Holmes, 2004). Shapiro, Gottman, and Carrere (2000) found that after the birth of a child, a husband's negativity toward his wife was the strongest predictor of a decline in marital satisfaction and ultimately divorce. Perhaps when mothers report high levels of conflict between she and her partner in the form of undermining and criticism, this negatively impacts how she thinks and feels about herself as a wife and a mother, as well as how she behaves during interactions with her infant. Many studies over the years have found that the quality of the marital relationship is predictive of maternal functioning and maternal well-being (Field et al., 2007; Gelfand & Teti, 1990; Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007).

Results from multiple regression analyses indicated that maternal cognitive adaptation and maternal emotional availability were also predicted by the number of infant night wakings reported at 1 and 3 months, but the direction of the relationship was negative for the former and positive for the latter. In other words, the more a mother reported that her infant woke through the night at 1 and 3 months, the less well-adapted she was at 6 months in terms of her self-reported adaptation to infant sleep, but the more emotionally available she was observed to be at 6 months. For the cognitive adaptation variable, this may simply be a result of the fact that as infants age, their sleep patterns mature and subsequently consolidate to a more adult-like pattern

of longer wakeful periods during the day and longer bouts of sleep through the night, which in turn positively influences how mothers think and feel about her infant's sleep patterns because those patterns are moving in the "right direction," (i.e, closer to the infant sleeping through the night). For mothers' EA, however, the relationship was positive, with increased infant night wakings predicting greater emotional availability in mothers toward their infant at bedtime, although it should be noted that this link was quite modest. In fact, the zero-order correlation between frequency of infant night wakings across the first 3 months and maternal EA at 6 months was non-significant. So although this result is at odds with that reported by Teti, Kim, Mayer, and Countermine (2010), who found that maternal EA decreased as infant night wakings increased, this could be due to the fact that an increase in infant night wakings predicting an increase in EA in the present study was simply a suppression effect, or a result of the covariance among the variables that were included in the multiple regression analysis. It could also be that the sample studied by Teti et al (2010) included a cross-sectional sample of children from 1 to 24 months, whereas the present sample only included infants up to 6 months of age, so the amount of time needed to see such an effect was not reached. The effects of infant night wakings on maternal EA may actually change during the second year of life, as frequent night wakings in children older than 6 months may no longer be considered to be normative by most mothers, and as stated previously, older children may have their own bedtime agendas in the second year, elicitng more negative emotions in mothers.

It should be noted that although maternal depressive symptoms, number of times infant had to be returned to at bedtime, and maternal sleep efficiency (all averaged across 1 and 3 months) were significant predictors of cognitive adaptation at 6 months when each was the sole

variable entered into the regression, they were non-significant predictors when all the predictor variables were entered into a step-wise regression, indicating that when frequency of infant night wakings and negative co-parenting were entered into the model, all remaining predictor variables could be deleted from the model without substantially increasing the residual sum of squares. This could be partially explained by the high degree of colinearity between the predictor variables (see Table 5). For maternal EA, the same two variables were significant predictors, however the direction of the relationship between perceived frequency of infant night wakings across 1 and 3 months and maternal EA was positive. Keep in mind that maternal emotional availability in the present study was only measured at bedtime, and not during infant night wakings. Perhaps mothers who reported more frequent infant night wakings in the first 3 months simply had more practice settling their infants back to sleep than mothers who reported less frequent night wakings, thus improving their EA scores at 6 months.

Sleep arrangements at 6 months were significantly associated with both cognitive adaptation and maternal EA at 6 months. Specifically, mothers who slept in a separate room from their infant were more likely to be well-adapted to their infant's sleep patterns and more emotionally available at bedtime. Mediation analyses indicated that negative co-parenting significantly mediated the relationship between sleep arrangements and maternal EA, albeit only partially, suggesting that mothers who sleep in the same room as their infant are more likely to be emotionally available to their infant at bedtime if they report less competition, undermining, and competition within the parenting relationship. These results reflect those found by Countermine and Teti (2010), who reported that spousal criticism mediated the link between sleep arrangements and maternal adaptation, such that those mothers who slept in the same room

as their infant but who did not feel criticized by their partners were not as likely to be poorly adapted to their infant's sleep patterns as mothers who slept in the same room as their infant but did feel criticized by their spouses. Once again, criticism, competition, and undermining in the parenting relationship appear to bear importantly on the big picture of maternal adaptation to infant sleep. In a culture that considers solitary infant sleep to be not only normative but also the best sleeping arrangement for the infant, it may simply be that because mothers who choose to share sleep with their infant do not feel supported in their decision, and the stress that this causes them is translated in their thoughts, feelings, and behaviors surrounding their infant's sleep. Certainly, when mothers "admit" to their pediatricians that they are sleeping with their infant, they are told not to do so. They may be given materials on safe infant sleep choices that do not include bedsharing as an option. Mothers in this position may feel as though they are doing something wrong, even when co-sleeping is done both normatively and safely in at least two-thirds of the world's societies, and a large and growing body of research suggests that bedsharing, when done safely, may provide benefits to both mother and baby (McKenna & Volpe, 2007; Small, 2005).

Additional mediation analyses indicated that although maternal sleep efficiency met the prerequisites for mediating the relationship between sleep arrangements and cognitive adaptation, the mediating path was not significant. Sleeping in close proximity to one's infant has been shown in the past to be significantly associated with lighter maternal sleep states (Countermine & Teti, 2010) and shorter sleep durations (Worthman & Brown, 2007), so the relationship found between sleep arrangements and maternal sleep efficiency was expected. The work of Ramos, Youngclarke, and Anderson (2007) is supported in the present study, because

mothers who sleep in closer proximity to their infant have more opportunity to notice and respond to what could be considered potentially problematic night wakings than those who sleep separately from their infant. It may be difficult for mothers to feel as though they have had a good night's sleep at 6 months when they sleep in close proximity to their infant, but according to McKenna and Volpe (2007) this may actually be adaptive because it allows mothers to more quickly and easily notice if their infant is in any sort of distress. In addition, if parents were educated about the progression of normative infant sleep, they may be less likely to be concerned and distressed during the first year of their infant's life if the infant is signaling to them during night wakings. For a culture in which solitary infant sleep is mainstream, those parents who choose to share sleep with their infant are faced with challenges above and beyond the many that already exist when adapting to life with an infant. Mothers' cognitive adaptation to infant sleep as well as maternal emotional availability are both multiply determined, and future research extending into the second year of life is needed.

Limitations and Future Directions

The present study has several limitations. The majority of the mothers in this sample (65%) chose to put their infant to sleep in a separate room by 6 months of age, as is typical of our culture. Of those that slept in the same room as their infant at 6 months, 18% slept in separate beds and 17% slept in the same bed. If the sample had included more bedsharers and roomsharers, there would have been more power in the present study's ability to detect significant relationships. A larger sample would decrease the risk of failing to detect a relationship that exists between the variables included in analyses. This is especially important

in the present study, given that maternal adaptation to infant sleep is certainly multiply determined. Another limitation in this study is that the majority of the sample was Caucasian (82%) and middle class. A more heterogeneous sample (again with a larger number of infants who slept in the same room or bed as their mothers) might reveal variations in how mothers adapt to their infant's sleep patterns, as the numbers would support analyses that divided mothers into groups of those who chose to proactively share sleep with their infant and those who were reactively sharing sleep with their infant. In addition, more information on how fathers adapt to their infant's sleep patterns would inform the field of similarities and differences in the predictors of adaptation for mothers and fathers. Observational studies of how mothers and fathers interact would contribute objective information on how parents work as a team. Analyses could then be conducted regarding how mothers' and fathers' perceptions of one another as spouses, partners, and parents may reflect or contrast their actual interactions.

Previous research on maternal emotions and behavior has demonstrated that the expression of emotion, measured behaviorally, is only moderately correlated with the self-reported experience of emotion (Martin, Clements, & Crnic, 2002). This implies that parents' behaviors and parents' feelings may be related yet distinct dimensions of parenting. Therefore, the emotional and behavioral dimensions of maternal adaptation must be measured separately. Including neurophysiological measures of mothers would help to further elucidate what a mother is experiencing, how she feels about what she is experiencing, what she thinks about what she is experiencing, and how all of it works together to influence her behavior. Measuring mothers' cortisol levels would add an objective measure of their physiological stress levels, and help inform the field about the relationship between maternal cortisol levels and self-reported levels

of distress, and how those relate to maternal adaptation and emotional availability. Killeen and Teti (2012) found that EEG asymmetry in mothers is related to their emotional availability to their infant during daytime interactions. Including brain imaging in studies of maternal adaptation may help to shed light on differences in maternal emotions and cognitions by informing researchers about what part(s) of a mother's brain is in the driver's seat when she is asked questions about how she thinks or feels about her infant, or when she is interacting with her infant. Perhaps increased activity in the amygdala might indicate more emotionally-based thoughts, feelings, and actions, whereas more activity in the prefrontal cortex might indicate heightened reasoning and logic in a mother's thoughts, feelings, and behaviors surrounding her infant.

In a meta-analysis of brain imaging and parenting literature, Swain, Lorberbaum, Kose, and Strathearn (2007) reported that maternal parenting behavior was regulated by motivational systems in the basal forebrain and midbrain, by emotional control circuits in the amygdala and septal regions, and by sensation driven circuits in the thalamocingulate, although they did not report any individual differences that may have been found in mothers in the studies they reviewed on brain imaging and maternal functioning. Additional research is beginning to shed light on the brain basis of complex social emotional thinking (Pelphrey, Morris, Michelich, Allison, & McCarthy, 2005; Saxe, 2006). This research suggests that specific regions in the medial prefrontal cortex and temporal cortex mediate aspects of emotion and behavior. Further brain imaging and neurophysiological studies could help elucidate the differences between mothers with low and high emotional availability scores and poorly vs. well-adapted mothers.

Another limitation of the present study was its duration, which was only six months. This did limit the scope of the present study to the evolution of maternal adaptation in the first six months of life, with no information on how cognitive adaptation and maternal emotional availability at bedtime changes in the second half of the first year and into the second year of life. This study viewed cognitive adaptation and maternal emotional availability as dependent variables, whereas a longer longitudinal study may in fact find that cognitive adaptation and maternal emotional availability are more valuable as predictor variables of maternal and child well-being.

Furthermore, the way in which maternal adaptation was measured in the present study should be expanded in order to more clearly and distinctly operationalize the emotional, cognitive, and behavioral dimensions. The cognitive measure of adaptation utilized in the current study was comprised of only five questions, all which asked mothers to rate how much of a problem it was for them to put their infants to sleep at night and through the night, how much of a problem was their current sleep arrangements, and how much they felt that their sleep disruption was due to their baby. In the present study, those mothers who felt that it was more of a problem to put their infant to sleep were scored as more poorly adapted than those who did not, and in the present sample, those mothers who slept in the same bed or room as their infant had lower adaptation scores than those mothers whose infants slept alone in a separate room. Bedsharing in and of itself provides challenges above and beyond placing an infant in his or her own crib to sleep. Mothers who bedshare with their infant have to decide whether or not they are going to go to bed for the night with their infants, and if they are not, they have to decide where the baby is going to sleep if an adult is not sleeping with the baby to insure the baby's safety. A

mother who is simply placing a tired baby in a crib for the night would be faced with fewer logistical problems than a mother whose baby sleeps in her bed. Therefore, when a mother who shares a bed with her baby is asked the questions that comprised the cognitive measure of adaptation, e.g., "*Overall, how much of a problem is it for you to put your baby to sleep at bedtime",* she may be answering honestly that it was hard; but simply thinking that it is difficult to put her baby to sleep at bedtime does not necessarily mean that a mother is poorly adapted to her infant's sleep patterns.

As previously stated, empirical studies indicate that the correlation between mothers' experience of emotion and the behavioral expression of their emotions is moderate at best (Martin, Clements, & Crnic, 2002). Note that in the present study, mothers who slept in the same bed as their infant at 6 months were just as emotionally available to their infant at bedtime as mothers whose infants slept in a separate room; it was the roomsharers (those mothers who slept in the same room but not in the same bed as their infant) who were significantly less emotionally available to their infants at bedtime. Yet both the bedsharing and the roomsharing mothers were significantly less cognitively adapted in the present study. Perhaps finding a way to ask questions that tap into the cognitive and emotional dimensions of maternal adaptation separately would add to a more complete understanding of maternal adaptation in any context, including the context of infant sleep, and how sleep arrangements might influence those variables.

The construct of maternal adaptation is a topic that is ripe for a more sophisticated conceptual approach. Thelen and Smith (2006) suggested that development of an individual could only be understood as the multiple, mutual, and continuous interaction of all the levels

within the developing system, from the molecular to the cultural, including the actions, thoughts and feelings of the developing individual and the actions, thoughts, and feelings of others who interact with that individual. They also stated that development could only be understood as a system of nested processes that unfold over many timescales from milliseconds to years. The use of ecological momentary assessment procedures (Teti & Cole, 2011) to capture the emotion and cognitions of mothers in real time, in response to infant night wakings (or any other parenting context), could help to elucidate integrated patterns of interaction that occur between mother and child, father and child, and mother and father. Identifying variations in these patterns of interaction and how those variations contribute to how well or poorly adapted a mother is to her baby's sleep development would not only further inform the field on the multiple determinants of maternal adaptation to infant sleep, but could also, through examination of the aforementioned patterns of interaction, potentially aid the field in moving forward conceptually with regard to operationalizing maternal adaptation as a construct.

Perhaps the biggest limitation of the current study was simply the geographic region in which it was conducted. In many cultures around the world, bedsharing is a normative parenting practice for the first few years of life. Even in the United States, there are other regions that contain pockets of families who consider bedsharing a legitimate and preferred choice of infant-parent sleep arrangements. Over-sampling in the United States for parents who plan to bedshare over the first two years of their infants life, as well as carrying out this line of research in a culture that not only endorses but also embraces bedsharing may very well have vastly different results. Rather than a sample that contains a minority of bedsharers, one could imagine a sample from Korea or Japan that contained a minority of, if any, solitary-sleeping infants. One must

therefore be careful not to generalize these results to populations that are different than the one sampled in the present study. In addition, longitudinal research on the current sample may also indicate differences in maternal adaptation and maternal emotional availability as infants age that are not related to sleep arrangements, as well as individual differences in mothers' levels of emotional, cognitive, and behavioral adaptation.

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SELECTED PUBLICATIONS & PRESENTATIONS

Countermine, M.S. & Teti, D.M. (2010). Sleep Arrangements and Maternal Adaptation in Infancy. *Infant Mental Health Journal, 31 (6),* 647-663.

Countermine, M.S., Teti, D.M., & Mayer, G.E. (2008, June). *Parental Adaptation and Sleep Arrangements in Infancy*. Poster presented at the Association of Professional Sleep Societies (SLEEP 2008), Baltimore, MD.

Teti, D.M., Kim, B.R., Mayer, G.E., & Countermine, M.S. (2010) Maternal Emotional Availability at Bedtime Predicts Infant Sleep Quality. *Journal of Family Psychology, 24(3),* 307-315.

Teti, D.M., Countermine, M.S., & Mayer, G.E. (2009, April). Parenting practices and emotional availability at bedtime and at night, and infant sleep disruption. Paper submitted for presentation in K. Dyer (Chair), *Parental Management of Infant Sleep*. Symposium submitted for presentation at the biennial conference of the Society for Research in Child Development, Denver, CO.