

FATHERS AND SLEEP: A SYSTEMATIC LITERATURE REVIEW OF BIDIRECTIONAL LINKS BETWEEN PATERNAL FACTORS AND CHILDREN'S SLEEP IN THE FIRST THREE YEARS OF LIFE

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**Objective:** During childhood, sleep problems are a common concern for parents and families. The literature on children's sleep documents a strong association between parental factors and infant sleep quality. However, most studies have only examined maternal attitudes and behaviors. To systematically identify and assess the existing literature on the role of fathers in children's sleep over the first three years of life.

**Method:** Studies were identified from January 1993 to July 2020 in four electronic databases, following PRIMSA guidelines.

**Results:** The initial search yielded a total of 657 records. Fifty-nine studies were full review, and 26 studies met all inclusion criteria and formed the basis for the review. Studies were divided into thematic groups as a function of the paternal variables they investigated: Extrinsic Parenting factors, Parent-child Interaction Context, and Distal Environmental Influences.

**Conclusions:** This review points up a range of paternal variables that can represent risk or protective factors for child sleep. Our results may help parents and healthcare practitioners to identify evidence-based knowledge about sleep. Furthermore, identifying paternal factors that contribute to sleep problems can usefully inform the design of individualized interventions.

**Key words:** systematic review, sleep, parenting, father, infant, toddler

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## Introduction

During childhood, sleep problems are a common concern for parents and families (Goodlin-Jones, Burnham, Gaylor, & Anders, 2001). Numerous studies have documented the longitudinal effects of sleep issues on cognitive, emotional, and behavioral development (Sadeh, 2007). Hence, the critical need to enhance our understanding of the risk and protective factors that can influence children's sleep. Sadeh and Anders (1993) proposed a transactional model that maps out the contributions of both the child and its caregivers to infant sleep outcomes (Sadeh, Tikotzky, & Scher, 2010). Alongside circadian rhythm, physiological reactivity, temperament, and other intrinsic factors shaping biological and individual differences among infants, distal, extrinsic and interaction factors can also affect children's sleep-wake patterns, particularly during the first years of life. Specifically, distal environmental factors, such as socioeconomic conditions and family processes (e.g., couple relationships and perceived social support), extrinsic parenting factors, such as parental characteristics (e.g., cognition, personality, mental health issues), and interactional factors (e.g., emotional availability) can be implicated in parental bedtime practices, parent-child interaction quality, and child sleep (Teti, Crosby, McDaniel, Shimitzu, & Whitesell, 2015).

While the contribution of maternal factors and behaviors to children's sleep is well-established,

less attention has been paid to the role of fathers. A growing body of research suggests that fathers make a strong, positive, and lasting contribution to children's cognitive and socio-emotional development (van Bakel & Hall, 2020; Boyce et al., 2006; Cabrera, 2020; Lamb, 2010; Sarkadi, Kristiansson, Oberklaid, & Bremberg, 2008). Although much of the earliest literature was focused on the associations between father absence and mental disorders in children, researchers have recently begun to investigate the nature and quality of father engagement (Pleck, 2012). Pleck (2007) revisited the theoretical model developed by Lamb (2010), proposing a new multicomponent theory of paternal involvement. This revised framework encompasses both aspects of paternal engagement (e.g., positive engagement activities, warmth, and responsiveness), and distal factors (e.g., socioeconomic status, family functioning, couple relationships) that can interact with paternal involvement to influence children's development. Hence, fathers can impact on their children's development both directly and indirectly. For example, a father can indirectly affect the child's outcomes by reinforcing and encouraging his spouse's or partner's behaviors, or by maintaining positive family functioning and a satisfying marital relationship (Pleck, 2007).

The literature on children's sleep documents a strong association between parental factors, including parents' bedtime and nighttime behaviors, and infant sleep (Sadeh et al., 2010). For example, parents can contribute

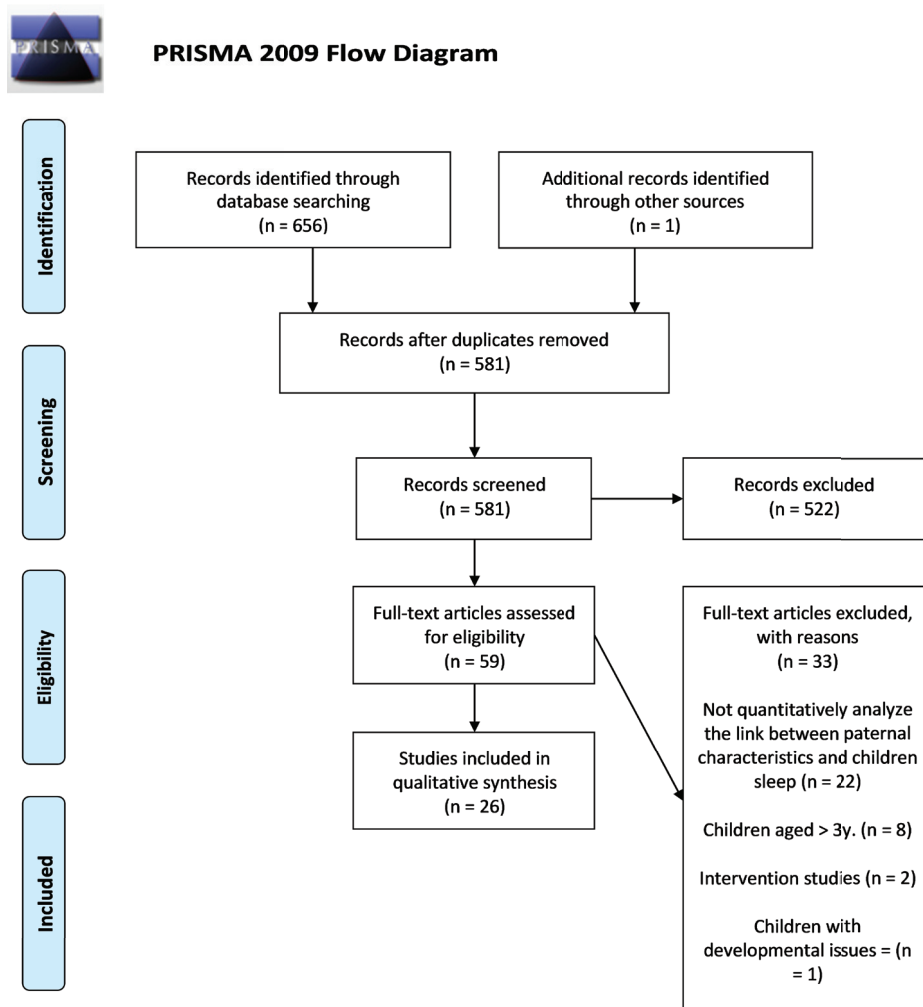
to the consolidation of infant sleep by encouraging self-soothing behaviors at bedtime and during the night (Tikotzky & Sadeh, 2009). Indeed parent-child interaction could moderate children biological rhythms and infant self-regulation, with a regulatory effect also on sleep. As stated above, most studies have only examined maternal attitudes and behaviors, and their availability, warmth, and sensitivity at bedtime (Voltaire & Teti, 2018). Yet, children developmental outcomes are known to be related to the father-child relationship (Barker, Iles, & Ramchandani, 2017) and several authors have reported paternal factors may influence children's sleep (Tikotzky, Sadeh, & Glickman-Gavrieli, 2011). For these reasons, we decided to systematically assess the existing literature on the role of fathers in children's sleep over the first three years of life, in order to determine, emphasized and organized the paternal factors –within the theoretical framework of the transactional model – that result associated with bedtime practices and children's sleep patterns, with a view to advancing our understanding of the paternal risk and protective factors that can impact on infant sleep.

of outcomes, as well as a lack of detailed statistical information in many studies, precluded a meta-analysis; we, therefore, adopted a systematic narrative approach to report our key findings. First, we conducted a search to identify existing studies on fathers' role in children's sleep during the first three years of life, adopting the following inclusion criteria: a) articles published between January 1993, when the transactional model of children's development was adapted to sleep by Sadeh and Anders (1993), and July 2020; b) empirical studies in peer-reviewed, English-language scientific journals; c) studies with samples comprising the parents of typically developing 0- to 3-year-olds. This age range was chosen in light of the significant changes in children's sleep consolidation and regulation, and in view of the regulatory effect of their parents in these processes in terms of moderation of children's biological rhythms and self-regulation skills (Camerota, Propper, & Teti, 2019). The studies were identified via an Internet search of the SCOPUS, WOS, PubMed, and PsycINFO electronic databases. We adopted an iterative search strategy with three sets of terms: ("father\*" OR "paternal") AND ("infant\*" OR "toddler\*") AND ("sleep" OR "sleep quality" OR "bedtime" OR "bedtime routine\*"). We excluded studies that: a) did not measure paternal variables; b) did not quantitatively analyze the link between paternal characteristics and children's sleep (in terms of sleep-wake pattern and sleeping arrangements); c) were intervention studies; d) had samples including parents

## Methods

In planning, conducting, and reporting on this study, we followed the PRISMA guidelines on systematic reviews (Liberati et al., 2009). Strong heterogeneity in both the studies themselves and authors' reporting

Figure 1. Flowchart for the systematic review procedure



of children aged over 3 years (in the case of longitudinal studies, this criterion was applied to children's age at baseline); e) had samples including parents of children with developmental issues (excepting sleep problems); f) grey literature; g) articles whose full text could not be accessed. The flowchart for the systematic review procedure is displayed in **figure 1**.

The initial search yielded a total of 657 records. After eliminating duplicates, 581 studies remained. Following an initial check of the titles and abstracts, 522 studies were rejected as not meeting the inclusion criteria, leaving 59 studies to be read thoroughly. Finally, 26 studies met all inclusion criteria and formed the basis for the review. Detailed information was drawn from each of the relevant articles using a researcher-developed data extraction sheet. The following areas were included: 1) authors and year of publication; 2) country of data collection; 3) aim of the study; 4) sample characteristics (number and age range of children); 5) research design; 6) paternal variables under study; 7) child sleep variables under study; 8) measures of children's sleep; 9) key findings regarding the direct link between paternal factors and children's sleep. The data were coded by 2 of the authors and the coding procedure was refined via a consensus discussion procedure. More specifically, first, five articles were randomly chosen for coding. Discrepancies were then resolved via joint review and discussion, and minor adjustments were made to the data extraction sheet. Authors then extracted data from ten articles each and accuracy was jointly assessed by all 3 of the author-judges. The information extracted from the set of relevant articles is summarized in **table 1**.

The main aim of this review was to assess which paternal factors resulted associated with bedtime practices and children's sleep patterns and to identify, among them, potential risk and protective factors for children sleep quality; hence, we decided to exclude intervention studies and, for this reason, no assessment of risk of bias for randomized trials was undertaken (Higgins et al., 2011). We discussed limitations at the study and review-level in the Limitations section.

## Results

Of the 26 articles included in the final review, thirteen adopted a cross-sectional research design, and 13 were longitudinal. The studies reviewed were conducted in 8 countries: UK (1), USA (6), Israel (6), Canada (5), Australia (3), Italy (3), Netherlands (1), Ireland (1). All articles had been published between 2006 and 2020, and the number of participants ranged from 41 parents to 5089 families.

Considering sleep measures, fourteen of the reviewed studies investigated infant and child sleep by analyzing sleep efficiency and consolidation (number and duration of night wakings, longest sleep bout, sleep onset and wake times, total sleep duration). Of these, four assessed sleep via sleep logs, two via actigraphy, three via both sleep logs and actigraphy, and four via parent-report questionnaires. The remaining studies (12/26) analyzed the sleep patterns of children whose parents perceived sleep as an issue, and in two of these, parents were invited to share their perceptions of difficulties at bedtime.

According to our research questions, in order to assess which paternal factors resulted associated with bedtime practices and children's sleep patterns and to identify, among them, potential risk and protective

factors for children sleep, we presented in **table 1** the 26 articles divided into thematic groups as a function of the paternal variables they investigated. We defined these thematic categories based on the transactional model of sleep-wake regulation (Camerota et al., 2019). We included studies that examined multiple paternal factors under each of the relevant categories.

### *Extrinsic parenting factors*

Sixteen studies examined associations between infant sleep and extrinsic paternal parenting factors, in terms of fathers' mental health (15/16; depression, stress, and fatigue) and parenting self-efficacy (2/16).

### **Mental health**

**Depression.** Studies investigated the association between paternal postnatal depression and children sleep, found both parent-driven and child-driven effects. On the one hand, paternal postnatal depression resulted associated with paternal perceived children sleep problems at 4 and 6 months (Cook et al., 2017), infant bedtime difficulties perceived by mothers at 8-12 months (Ragni, De Stasio, Barni, Gentile, & Giampaolo, 2019), and non-healthy maternal and paternal bedtime practices at 9 months (e.g. the child was less likely to be put to sleep on his/her back, less likely to have ever been breastfed, more likely to be put to bed with a bottle, and three times more likely to be put to bed asleep) (Paulson, Dauber, & Leiferman, 2006). On the other hand, McDaniel and Teti (2012) observed, in their longitudinal study, a significant indirect effect of infant night awakenings on paternal and maternal depression, at 1 and 3 months postpartum.

Although these studies highlighted bidirectional associations between paternal depression and children sleep, cross-sectional studies by Philpott and Corcoran (2018), and Cockshaw, Muscat, Obst, & Thorpe (2014) did not confirm these findings: their regression analyses did not show any significant associations between infant sleep problems, infant sleep behaviors, and paternal postnatal depression. Furthermore, in a cross-sectional study with parents of infants aged between 1 and 24 months, Countermeine and Teti (2010) found that paternal adaptation to infant sleep (the extent to which fathers viewed their infant's sleep arrangements, bedtime routine, and night waking as problematic, as well as how satisfied they were with their infant's current sleep arrangements) was not correlated with paternal depressive symptoms.

**Stress and fatigue.** Regarding paternal stress, both parent-driven and child-driven effects were found. Results from cross-sectional studies showed that fathers' higher levels of stress were associated with their perception of children's sleep as a problem (Martin, Hiscock, Hardy, Davey, & Wake, 2007), with problematic bedtime interactions (De Stasio, Ragni, Boldrini, Bevilacqua, & Gentile, 2018), and with a higher number of children night wakings (Millikovskyy-Ayalon, Atzaba-Poria, & Meiri, 2015; Sinai & Tikotzky, 2012), during both the first months of life, 4-8 months (Martin et al., 2007; Sinai & Tikotzky, 2012), and the first years of life, 1-3 years (Bernier, Belanger, Bordeleau, & Carrier, 2013; De Stasio et al., 2018; Millikovskyy-Ayalon et al., 2015).

In terms of child-driven effects, Loutzenhiser, McAuslan, & Sharpe (2015), in their longitudinal

**Table 1.** Characteristics of the included articles divided into thematic groups as a function of the paternal variables they investigated

Author, Country	Participants, Infants age	Study design	Paternal variables related to sleep	Children Sleep outcome (measure)	Main Results
<b>Extrinsic Parenting Factors</b>					
Bernier et al. (2013), Canada	85 families; T1=15 m.; T2=18 m.; T3=24 m.	Longitudinal	MH-Stress	Sleep quality (SL)	SLC at 2y. and enhancement in SC from 18m. to 2y. associated with lower paternal parenting stress, in particular, for children living in lower SES homes
De Stasio et al., (2018), Italy	41 parents; 18-36 m.	Cross-sectional	MH-Stress	Bedtime interactions (Q)	Problematic BT interactive behaviors associated with paternal stress levels regarding difficulties accepting the child
Martin et al., (2007), Australia	5107 families; 8 m.	Cross-sectional	MH-Stress	Sleep perceived as a problem by parents (Q)	SLP associated with poor paternal general health and paternal psychological distress
Millikovsky-Ayalon et al., (2015), Israel	51 families; 1–3 y.	Cross-sectional	MH-Stress	Sleep perceived as a problem by parents (Q)	SLP associated with paternal stress regarding difficulties accepting the child in SLP group
Sinai & Tikotzky (2012), Israel	50 families (25 mothers were on maternity leave); 4–5 m.	Cross-sectional	MH-Stress	Sleep quality (SL); Sleep perceived as a problem by parents (Q)	No. NW associated with paternal stress at 4-5m.; Higher no. NW associated with paternal higher stress in the child domain score, in the group of mothers on leave
Loutzenhiser et al., (2015), Canada	108 couples; T1=pregnancy; T2=1 m.; T3= 3 m.; T4= 6 m.	Longitudinal	MH-Fatigue	Sleep quality (SL)	SLD at 1 m. predicted parental fatigue in the first 6 m. post-partum
Loutzenhiser & Sevigny (2008), Canada	72 families; 3 m.	Cross-sectional	MH-Stress MH-Depression	Sleep quality (I)	Infant SLD predicted fathers' psychological functioning
Cockshaw et al., (2014), Australia	219 fathers; 0-24 w.	Cross-sectional	MH-Depression	Sleep perceived as a problem by parents (Q)	Not sign. associations
Counterterme & Teti (2010), USA	45 families; 1-24 m.	Cross-sectional	MH-Depression	Parental adaptation to infant sleep (Q)	Not sign. associations

**Table 1.** *Continued*

McDaniel & Teti (2012), USA	150 families; T1=1 m.; T2=3 m.	Longitudinal	MH-Depression	Sleep quality (SL)	Sig. indirect effects (through Parental SLQ) between SLP at 1 m. and parental depressive symptoms at 1 and 3 m.; Sign. indirect effects (through Parental SLQ) between SLP at 3 m. and parental depression at 3 m.
Paulson et al., (2006), USA	5089 families; 9 m.	Cross-sectional	MH-Depression	BT practices and Sleep position (I)	Parental depression associated with a child put to sleep on his/her back, rarely breastfed, put to bed with a bottle and asleep
Philpott & Corcoran, (2018), Ireland	100 fathers; 0-12 m.	Cross-sectional	MH-Depression	Sleep perceived as a problem by parents (Q)	Not sign. associations
Ragni et al., (2019), Italy	60 families; 8-12 m.	Cross-sectional	MH-Affective disorders	Sleep perceived as a problem by parents (Q)	Paternal affective disorders accounted for 17.2% of the explained variance for infant bedtime difficulties perceived by mothers.
Cook et al., (2017), Australia	102 fathers; T1=1 m.; T2=4 m.; T3=6 m.	Longitudinal	MH-Depression Self-efficacy	Sleep perceived as a problem by parents (Q)	SLP associated with paternal postnatal depressive symptoms both at 4 and 6 m.; SLP at 4 m. associated with parental doubt about competence as a parent but not at 6 m.
Zaidman-Zait & Hall, (2015), Canada	1487 families; T1=5 m.; T2=17 m.; T3=29 m.	Longitudinal	Self-efficacy	Sleep perceived as a problem by parents (Q)	At 29 m. Fathers of SLP children reported lower parenting impact; At 29 m. fathers with SLP children reported higher overprotectiveness
<b>Parent-child interaction Context</b>					
Zentall et al., (2012), USA	46 families; T1=7 m.; T2=12 m.; T3=14 m.	Longitudinal	IS-Attachment	Sleep quality (Q)	Not sign. associations
Millikovskiy-Ayalon et al., 2015	51 families; 1-3 y.	Cross-sectional	IS-Caring and PI	Sleep perceived as a problem by parents (Q)	SLP associated with less paternal involvement in child caregiving
Peltz et al. (2016), USA	249 families; T1=2-3 y; after 2 m. (T2); 4 m. (T3), 6 m. (T4), 8 m. (T5)	Longitudinal	IS-Caring and PI	Sleep perceived as a problem by parents (Q)	Mothers were significantly more responsible for putting the children to bed (parents jointly reporting that mothers assumed 58% of the responsibility for this task)
Ragni et al., (2019), Italy	60 families; 8-12 m.	Cross-sectional	IS-Caring and PI	Sleep perceived as a problem by parents (Q)	higher perceived paternal involvement predicted lower child's bedtime difficulties reported by both parents
Sinai & Tikotzky (2012), Israel	50 families (25 mothers were on maternity leave); 4-5 m.	Cross-sectional	IS-Caring and PI	Sleep quality (SL); Sleep perceived as a problem by parents (Q)	Mothers awake at night for a longer duration more often than fathers in both groups (on maternity leave and not)



**Table 1.** *Continued*

Tikotzky et al., (2011), Israel	56 couples; T1=1 m.; T2=6 m.	Longitudinal	IS-Caring and PI	Sleep quality (Actigraphy + SL)	Fathers were less involved in putting the child to sleep and in approaching the infants during the night; Lower no. NW, shorter SLD and later SLO time were associated with higher PI at 1 and 6m.
Tikotzky et al., (2015), Israel	57 families; T1= 3 m.; T2=6 m.	Longitudinal	IS-Caring and PI	Sleep quality (Actigraphy + SL)	Not sign. associations with infant sleep efficiency; No. NW at 6m. associated with general PI at 3 m.
Bernier & Carrier (2016), Canada	85 fathers; T1=2y.; T2=3y.	Longitudinal	IS-Emotional support and evocation	Sleep quality (Actigraphy)	SLD predicted by paternal emotional support and paternal evocation of the child
Ball (2006), UK	20 families (10 breast-feeding); 2-6 m.	Cross-sectional	IS-Responsiveness at BT & cognitions	Co-sleeping and Sleep position (Video)	There were consistently synchronous arousal and triadic nights, but the majority of fathers slept through their infants' arousals
Cook et al., (2017), Australia	102 fathers; T1=1 m.; T2=4 m.; T3=6 m.	Longitudinal	IS-Responsiveness at BT & cognitions	Sleep perceived as a problem by parents (Q)	SLP associated with paternal anger about children sleep behaviors both at 4 and 6 m
Kahn et al., (2018), Israel	65 couples; T1= pregnancy; T2=3 m.; T3= 6 m.	Longitudinal	IS-Responsiveness at BT & cognitions	Sleep quality (Actigraphy)	Fathers had higher PCT than mothers; Paternal PCT at pregnancy not sign. associated with infant NW at 3 m.; NW at 3 m. predicted paternal PCT at 6 m.
Reader et al., (2017), USA	167 mothers and 155 fathers; T1=1 m.; T2=3 m.; T3=6 m.; T4=9 m.; T5=12 m.	Longitudinal	IS-Responsiveness at BT & cognitions	Sleep quality (Q)	Mothers endorsed stronger beliefs about responding to infant NW than fathers
Sadeh et al. (2007), Israel	96 families (48 with SLP); 5-29 m.	Cross-sectional	IS-Responsiveness at BT & cognitions	Sleep quality (Actigraphy + SL)	Mothers rated significantly higher than fathers on the ISVIS-Distress scale
Cook et al., (2017), Australia	102 fathers; T1=1 m.; T2=4 m.; T3=6 m.	Longitudinal	IB-Overprotectiveness, active comfort, limit setting	Sleep perceived as a problem by parents (Q)	Not sign. associations
Millikovskiy-Ayalon et al., (2015), Israel	51 families; Children aged 1-3 y.	Cross-sectional	IB-Overprotectiveness, active comfort, limit setting	Sleep perceived as a problem by parents (Q)	Parents of SLP children engaged them in bedtime interactions that could interfere with sleep-wake self-regulation (e.g. use of active physical comforting strategies)

Table 1. Continued

Sadeh et al. (2007), Israel	96 families (48 with SLP); 5-29 m.	Cross-sectional	IB-Overprotectiveness, active comfort, limit setting	Sleep quality (Actigraphy + SL)	Fathers rated higher than mothers on the ISVIS-Limits scale; On the ISVIS-Limits scale parents in the clinical group rated higher; NW associated with paternal difficulty in limit setting
Zaidman-Zait & Hall (2015)	1487 families; T1=5 m.; T2=17 m.; T3=29 m.	Longitudinal	IB-Overprotectiveness, active comfort, limit setting	Sleep perceived as a problem by parents (Q)	At 5 and 29 m. fathers with SLP children reported higher overprotectiveness scores
<b>Distal Environmental Influences</b>					
Bernier et al. (2013), Canada	85 families; T1=15 m.; T2=18 m.; T3=24 m.	Longitudinal	CR (Marital satisfaction) SS SES	Sleep quality (SL)	Paternal marital satisfaction related to SLC at 2 y. and greater gains in SLC between 18m. and 2y., only in children from lower SES backgrounds; Family SES moderated the relationship between paternal psychosocial functioning and toddlers' SLC at 2 y., as well as gains in SLC between 18 m. and 2 y.
Cook et al., (2017), Australia	102 fathers; T1=1 m.; T2=4 m.; T3=6 m.	Longitudinal	SS	Sleep perceived as a problem by parents (Q)	Not sign. associations
De Stasio et al. (2018), Italy	41 parents; 18-36 m.	Cross-sectional	CR (Marital satisfaction) SS	Bedtime interactions (Q)	Not sign. associations
Loutzenhiser & Sevigny (2008), Canada	72 families; 3 m.	Cross-sectional	CR (Marital satisfaction)	Sleep quality (I)	Not sign. associations
McDaniel & Teti (2012), USA	150 families; T1=1 m.; T2=3 m.	Longitudinal	CR (Co-parenting)	Sleep quality (SL)	Sign. indirect effects (via parent NW, parent SLQ, and parent depression) between infant NW at 1 m. and co-parenting at 1 and 3 m.; Sign. indirect effects between infant NW and co-parenting at 3 m.
Meijer & Van Den Wittenboer, (2007), Netherlands	107 couples; T1=birth; T2=2w.; T3=7w.; T4=1y.	Longitudinal	CR (Marital satisfaction)	Sleep quality (Q)	Not sign. associations
Peltz et al., (2016), USA	249 families; T1=2-3 y; after 2 m. (T2); 4 m. (T3); 6 m. (T4); 8 m. (T5)	Longitudinal	CR (Co-parental cooperation; Marital satisfaction)	Sleep perceived as a problem by parents (Q)	Higher paternal FF predicted a decrease on children's SLP 2 m. later; Children SLP not sign. predict lower levels of paternal FF 2 m. later; Not sign. association between paternal co-parental cooperation and children SLP; Children SLP did not predict paternal marital satisfaction 2 m. later; Higher paternal marital satisfaction predicted fewer children SLP 2 m. later
Reader et al., (2017), USA	167 mothers and 155 fathers; T1=1 m.; T2=3 m.; T3=6 m.; T4=9 m.; T5=12 m.	Longitudinal	CR (Co-parenting)	Sleep quality (Q)	Discrepancy between parents' beliefs about responding to infant NW predicted worse co-parenting in families where mothers endorsed stronger beliefs than fathers

Note: BT=Bedtime; CR=Couple relationships; I=Interview; IB= Interactive behaviors; IS= Interpersonal Systems; m.=months; MH=Mental health; NT=Nighttime; NW=night wakings; PCT=Parental cry tolerance; PI=Paternal Involvement; Q=parent-report questionnaire; SES=Socio-economic status; SL=Sleep Logs; SLC=Sleep consolidation; SLD=Sleep duration; SLO= Sleep Onset; SLP=Sleep problems; SLQ=Sleep quality; SS= Social Support; w.=weeks; y.=years

study, found that infant sleep duration at 1 month after birth, predicted differential patterns of fatigue between fathers and mothers over the first 6 months postpartum. In addition, a cross-sectional study by Loutzenhiser and Sevigny (2008) examined levels of both paternal distress and paternal parenting stress, finding that infant sleep duration at three months after birth predicted fathers' psychological functioning. Finally, a cross-sectional study by De Stasio, Boldrini, Ragni, & Gentile (2020) found that the time required by 18-36-month-old children to fall asleep represents a negative predictive variable for paternal parenting stress.

### Parenting self-efficacy

Two studies analyzed parental self-efficacy, in one case focusing on parenting self-competence (Cook et al., 2017) and in the other on paternal sense of parental impact, or the extent to which father believed their behaviors to influence their children (Zaidman-Zait & Hall, 2015). In both studies, child-driven effects were found. Greater reported sleep problems at 4 months were associated with fathers' doubts about their competence as parents (e.g. 'When my child doesn't sleep at night, I doubt my competence as a parent') (Cook et al., 2017), and fathers whose 29-month-old children woke for 20 minutes or longer at a time, reported significantly lower parenting impact than did the fathers of children in no-wake and under-20-minutes'-wakes groups (Zaidman-Zait & Hall, 2015).

### Parent-child interaction context

#### *Interpersonal systems*

A range of paternal variables related to interpersonal systems fall under this heading and were therefore included in this section: father-infant attachment (1/14), paternal involvement in children caring (7/14), paternal emotional support and frequency of evocation of the infant in his/her absence (1/14), paternal responsiveness at bedtime and nighttime and sleep-related cognitions (5/14).

**Attachment.** Only one – longitudinal – study by Zentall, Braungart-Rieker, Ekas, Lickenbrock (2012) examined the association between attachment and infant sleep without identifying any significant associations between father-infant attachment (secure and disorganized patterns) and infant night wakings.

**Paternal involvement in children caring.** With regard to paternal involvement in children caring, Peltz, Rogge, Sturge-Apple, O'Connor, & Pigeon (2016), Sinai and Tikotzky (2012), and Tikotzky et al., (2011) found that fathers of both 4-6 months infants and 2-3 years old children were less involved than mothers in putting the child to sleep and approached the infants less often during the night. However, when fathers were involved in their children daily and bedtime caring, both mothers and fathers reported a decrease in children night wakings at 6 months (Tikotzky et al., 2011), a more consolidated infant sleep at 6 months (Tikotzky et al., 2015), lower perceived bedtime difficulties (e.g. fussing, crying or protesting) at 8-12 months (Ragni et al., 2019), and less sleep problems at 1-3 years of age (De Stasio et al., 2020; Millikovsky-Ayalon et al., 2015).

**Paternal emotional support and evocation.** Bernier and Carrier (2016) longitudinally investigated the relationship between paternal emotional support and paternal evocation of the child in his/her absence

(e.g. telling anecdotes to friends, looking at pictures, or reminiscing about when the child was younger) at 2 years after birth, with children's sleep duration and efficiency at age 3 years, finding that these two paternal factors could represent protective factors children's total sleep duration. In other words, fathers who reported providing more frequent emotional support to their child and those who reported evoking their child more frequently in his/her absence had children who slept longer at night one year later. These associations were no longer significant when child sleep efficiency was taken into account.

**Paternal responsiveness at bedtime and nighttime and sleep-related cognitions.** Regarding paternal responsiveness at bedtime and their sleep-related cognitions, fathers reported to be less distressed than mothers in responding to infant night cues during the first year of life (how do they think the infant will feel if they do not respond; e.g., "My child will feel abandoned if I don't respond immediately to his/her cries at night" "If I try to resist my child's demands at night, then he/she will get even more upset"), endorsing a delayed-response approach to infant night wakings (Reader, Teti, & Cleveland, 2017). Moreover, fathers of children aged between 5 and 29 months, in a cross-sectional study by Sadeh, Flint-Ofir, Tirosh, & Tikotzky (2007), obtained lower scores than did mothers when was asked them whether they should directly assist or soothe their child in hypothetical problematic sleep scenarios where he/she is highly anxious or distressed. These outcomes may suggest that fathers are less attuned to signs of infant distress or that they may show higher tolerance to these signals than mothers. For example, in an investigation of parental cry tolerance (PCT), Kahn et al., (2018) found that fathers displayed significantly higher PCT than did mothers. They also observed that paternal cry tolerance during pregnancy did not significantly predict infant nocturnal wakefulness or infant night wakings at 3 months postpartum. While nocturnal wakefulness at 3 months was significantly associated with paternal cry-tolerance at 6 months, this pattern did not hold for infant night-wakings at 3 months. These findings were also confirmed by a study of Ball (2006) yielded that bed-sharing mothers and infants consistently displayed synchronous arousal patterns, while the majority of fathers slept through half of their infants' arousals. In addition to these findings, a longitudinal study by Cook et al., (2017) found that fathers of 4 and 6 months children with sleep problems, experienced less intense anger than did mothers in relation to children's sleep behaviors (e.g., 'When my child cries at night, I think I might lose control and harm him/her'). According to the studies concerning paternal involvement in children bedtime and nighttime caring, these results may be related to the fact that mothers are generally more likely to be involved in nighttime interactions with their wakening infant than are father.

#### *Interactive behaviors*

Paternal variables related to interactive behaviors at bedtime and nighttime were included in this section. We found 4 studies examined paternal practices in terms of overprotectiveness, active comfort, and limit setting.

In relation to paternal interactions at bedtime (e.g. active comforting and problematic interactive behaviors), fathers inclined to engage in bedtime interactions with their children that could interfere with sleep-wake self-regulation – for example, making greater use of active physical comforting strategies - and fathers who obtained significantly higher overprotectiveness



scores (i.e., displayed more excessive concern for their children's safety and protection) had respectively 1-3 years old children with sleep problems (Millikovsky-Ayalon et al., 2015) and 5-29 months old children with night wakes of 20 minutes or longer (Zaidman-Zait & Hall, 2015). However, Sadeh et al. (2007) found that fathers (of children aged 5-29 months), when given hypothetical examples of infants with sleep problems, were more likely to interpret them as excessive infant demandingness and to endorse a limit-setting approach. Cook et al. (2017) did not confirm these results with fathers of 4- and 6-months old children.

## Distal environmental influences

### *Socio-economic conditions*

One study examined the associations between paternal socioeconomic status and infant sleep quality (Bernier et al., 2013), finding that family socioeconomic status (maternal and paternal education and family income, standardized and averaged into a global family SES index) moderated the relationship between paternal psychosocial functioning and toddlers' sleep consolidation at 2 years of age as well as gains in sleep consolidation between 18 months and 2 years of age. However, this was only the case for children living in lower SES families: these same interactions did not attain statistical significance among children from higher SES backgrounds.

### *Family functioning*

**Couple relationships and social support.** We identified two discrete sub-systems within the broader domain of family functioning: couple relationships and perceived social support. Seven studies specifically investigated couple relationships in terms of co-parental cooperation (1/7), co-parenting quality (2/7), and marital satisfaction (5/7). Finally, three studies investigated the role of paternal perceived social support.

Considering co-parental cooperation and co-parenting quality, mixed results emerged. While McDaniel & Teti (2012) found indirect effects (via parent night waking, parent sleep quality, and parent depressive symptoms) between infant night wakings at 1 month and co-parenting at 1 and 3 months, as well as significant indirect effects between infant night wakings at 3 months and co-parenting quality at 3 months, Peltz et al. (2016) did not find parent-driven effects of co-parental cooperation (how partners collaborate with one other in relation to their child) on children's bedtime sleep issues as reported by mothers.

Interestingly, paternally perceived co-parenting quality may also be associated with discrepancies between mothers' and fathers' beliefs about responding to children's night wakings (Reader et al., 2017). The more parents endorsed beliefs about responding more immediately to infant night wakings, the more negatively they perceived co-parenting quality, and this was particularly true for families in which mothers endorsed stronger beliefs than fathers.

Along with co-parenting quality, marital satisfaction may also facilitate the sharing of bedtime and nighttime care between parents. Studies examined associations between infant sleep and marital satisfaction did not find child-driven effects on paternal marital satisfaction at 3 months and at 2-3 years of age of the children (Loutzenhiser & Sevigny, 2008; Peltz et al., 2016). However, parent-driven effects on children sleep were found. Peltz and colleagues (2016) showed that higher

paternal marital satisfaction predicted fewer child sleep problems at bedtimes as reported by mothers two months later, in children aged 2-3 years. Moreover, Bernier and colleague (2013), reported – in an earlier longitudinal study – that greater paternal marital satisfaction was related to better sleep consolidation at 2 years after birth and greater gains in sleep consolidation between 18 and 24 months, but only in children from lower SES backgrounds. Results from cross-sectional studies, did not confirm these associations (De Stasio et al., 2018; Meijer & Van Den Wittenboer, 2007).

In the context of family functioning and family relationships, perceived social support is another factor that may be implicated in infant sleep quality. Bernier and colleagues (2013) found that greater paternally-perceived social support was related to more robust sleep consolidation at 2 years after birth, as well as to greater gains in sleep consolidation between 18 months and 2 years. However, both Cook and colleagues' (2017) longitudinal study with parents of children aged 4 and 6 months, and De Stasio and colleagues' (2018) cross-sectional study with parents of toddlers aged between 18 and 36 months, failed to confirm this association.

## Discussion

The literature on children's sleep reveals that parental characteristics and behaviors are strongly related to infant sleep (Sadeh et al., 2010); nonetheless, few studies have taken into account both mothers and fathers. Although research has shown that fathers and fathering play a significant part in children's development, with unequivocal longitudinal effects on their cognitive and socio-emotional learning (Pleck, 2012), sleep research has only recently begun to examine the role of fathers in infants' and children's sleep.

Our main research question was which paternal factors resulted associated with bedtime practices and children's sleep patterns over the first three years of life and whether, among them, there were potential risk and protective factors for children sleep. We identified 26 salient studies and categorized the paternal factors assessed in them following the theoretical framework of the transactional model (Camerota et al., 2019; Sadeh & Anders, 1993).

First, regarding extrinsic parenting factors, fathers' mental health in terms of postnatal depression and parenting stress, resulted a risk factor for parental-reported children sleep problems (Martin et al., 2007; Millikovsky-Ayalon et al., 2015), bedtime difficulties (De Stasio et al., 2018; Ragni et al., 2019), sleep consolidation (Bernier et al., 2013), and healthy maternal and paternal bedtime practices (Paulson et al., 2006). These findings are of extremely importance considering that higher levels of stress and depression are negatively associated with parental warmth and reciprocity, crucial factors in caregiver-child interactions at bedtime (Teti & Crosby, 2012; Tikotzky, 2017). However, most of these outcomes were obtained in cross-sectional correlational studies and require corroboration via follow-up research, taking into account both parent-driven and child-driven effects (Cook et al., 2017; Loutzenhiser et al., 2015; McDaniel & Teti, 2012).

Given the primary role of parent-child interaction in infant development, paternal factors related to the context of parent-child interaction, were also found to be implicated in child sleep.

During the first three years of life, paternal

responsiveness at bedtime and nighttime was found to be less strong than maternal one. Fathers resulted less involved than mothers in putting children to sleep and less frequently approach their infant during the night (Peltz et al., 2016; Sinai & Tikotzky, 2012; Tikotzky et al., 2011). Furthermore, they rarely check on their children while co-sleeping with them, even when infants wake during the night (Ball, 2006).

However, fathers' involvement in children's daytime and bedtime caring, and their emotional support to the child, have potential benefits for children's sleep quality and bedtime difficulties (Bernier & Carrier, 2016; Ragni et al., 2019; Tikotzky et al., 2011, 2015). These links are likely explained by the quality of the father-child relationship; however, virtually no studies have examined the potential role of this variable in terms of emotional availability (at bedtime and during the daytime), in relation to children's sleep during the first three years of life. Only Zentall and colleagues (2012) set out to explore the relationship between children's sleep and attachment but found no significant associations.

Among the factors related to the *parent-child interaction context*, bedtime and nighttime parental practices have also been identified as associated with children's sleep quality. Bedtime interactions that could interfere with children sleep-wake self-regulation – including active physical comforting strategies and overprotectiveness, understood as excessive concern for the safety and protection of the child – are more common among fathers of children with sleep problems (between 5 months and 3 years of age) (Millikovsky-Ayalon et al., 2015; Zaidman-Zait & Hall, 2015). This set of findings is in line with studies showing that more active settling behaviors at bedtime and during the night could represent risk factors for children sleep regulation and consolidation processes. Caregivers may enhance children's self-regulatory capacities by using more autonomy-encouraging strategies, such as waiting before responding to infant signals, verbally (rather than physically) reassuring the child, or providing a comforting transitional object like a blanket or stuffed toy (Mindell, Sadeh, Kohyama, & How, 2010; Morrell & Cortina-Borja, 2002).

In terms of distal environmental factors, socioeconomic status resulted in an environmental predictor of children's sleep quality; specifically, paternal psychosocial functioning could have a greater impact on toddlers' sleep when the familial socioeconomic context is non-optimal for child sleep quality (Bernier et al. 2013). These results are consistent with the hypothesis that disadvantaged children may be more vulnerable to adverse environmental conditions, yet in the presence of supportive environmental conditions, such as positive parental functioning, can potentially have the best outcomes (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007). From our review, only one study confirms this association (Bernier et al., 2013). Further studies are needed in order to corroborate this hypothesis.

Finally, among distal factors, also *family processes* are associated with sleep quality and parent-reported sleep problems at bedtime, but with different outcomes for toddlers and infants. Specifically, higher levels of paternal marital satisfaction (Bernier et al., 2013; Peltz et al., 2016) and higher levels of parentally-perceived social support (Bernier et al., 2013) reduce sleep problems at bedtime and enhance sleep consolidation in toddlers. For infants, on the other hand, longitudinal studies conducted in the first year of life have only confirmed the child-driven path (McDaniel & Teti,

2012; Reader et al., 2017). Greater conflict, lower marital satisfaction, and poorer family functioning have been shown to decrease children's sense of emotional safety, leading to higher levels of arousal, vigilance, and more inadequate sleep (Kelly & El-Sheikh, 2011). Children's sleep problems, in turn, may disrupt dyadic functioning within the family system, increasing parental frustration, parental conflict, and compromised parental sleep (Peltz et al., 2016). However, results from this review are mixed and required additional studies in order to assess these associations longitudinally and bidirectionally both in infants and toddlers.

### *Methodological considerations and limitations*

critical issues arise from this review. First, the results yielded by the analyzed studies are mixed and sometimes inconsistent. The 26 studies measured different sleep outcomes (sleep quality and quantity assessed using a range of different criteria, bedtime sleep problems as reported by parents, sleep practices, sleeping arrangements, and sleep location) with different methodologies (actigraphy, sleep diaries, and self-report questionnaire) which poses difficulties in comparing them. Only 13/26 studies had a longitudinal study design, only 5/26 studies collected objective data on children's sleep patterns through actigraphy, and only half of the studies (12/26) analyzed the association between paternal factors and child's sleep with samples of more than 100 fathers.

In light of the limitations affecting the reviewed studies and outcomes, further research based on longitudinal designs that test predictive models and uses objective sleep measures is needed to more thoroughly investigate causal relations and bidirectional links between paternal factors and children's sleep. Furthermore, if we view infants' sleep as a familial or dyadic phenomenon, the direct and moderation effects assessed in future studies should be analyzed at both individual and familial/dyadic levels, with a view to better clarifying what couple and familial dynamics represent sources of variability in child sleep quality.

The findings of this review should also be interpreted in light of the limitations of our own work. First, we only assessed the English-language literature, and may, therefore, have overlooked significant findings reported in other languages. Second, although we strove to conduct an exhaustive search, it is possible that a relevant search term may have been omitted and consequently that relevant studies were not retrieved. Third, although we attempted to thoroughly screen the retrieved studies, again it is possible that some salient studies were overlooked. Nonetheless, to the best of our knowledge, this review is the first to systematically review the role of fathers in children's sleep in the first three years of life.

### *Future directions for research and practice and conclusions*

in conclusion, this review points up a range of paternal variables that can represent risk or protective factors for child sleep. On the one hand, the review suggests for future research, the importance of corroborating these findings via further investigation, and of examining new paternal characteristics with a potential bearing on sleep, such as paternal emotional availability at bedtime and paternal daytime sensitivity.

Recent decades have seen considerable advances in research showing the positive effects of paternal involvement in child care generally (Pleck, 2012).

The present review suggests that paternal involvement benefit children's sleep outcomes, making the quality of the father-child relationship a key factor to be taken into account in future inquiry and in clinical practice, alongside the mother-infant relationship (Teti & Crosby, 2012).

In addition, given that the 26 studies reviewed were all conducted in Western countries, it will be of interest to investigate these relationships in Eastern cultures in the future. Children's sleep, and especially parental bedtime practices and behaviors, vary widely across different cultures (Mindell & Williamson, 2018).

Results from this review could also help parents and healthcare practitioners in identifying evidence-based knowledge about sleep. Parents frequently report a lack of confidence when it comes to managing their child's sleep (Mindell, Leichman, Puzino, Walters, & Bhullar, 2015; Owens & Jones, 2011). Healthcare practitioners on their part have reported that it is difficult for them to provide evidence-based care in the domain of sleep due to insufficient training and education, and a lack of time and institutional support (Boerner, Coulombe, & Corkum, 2015). Hence, our results may potentially enhance help-seeking and help-receiving processes in relation to infant sleep. Furthermore, identifying paternal factors that contribute to sleep problems can usefully inform the design of individualized interventions that take into account the characteristics of both the child and its family (Tikotzky, 2017).

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