RESEARCH ARTICLE

The relationship between parents' cognitions, bedtime behaviours and sleep-related practices with their child's sleep

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Summary

Certain parental cognitions about child sleep and bedtime behaviours used with their child have been linked to poorer child sleep. However, previous research has focused on mothers and explored only a limited range of sleep-related cognitions and practices. The present study investigated whether parental cognitions and sleep-related practices (both in connection with their own sleep and their child's sleep), alongside the bedtime behaviours used with their child were associated with and/or were predictive of their child's sleep. Mothers and fathers from 44 families (with a child aged 12–24 months) separately completed questionnaires reporting (i) their cognitions (about their own sleep and their child's sleep), (ii) sleep-related practices (used in connection with their own and their child's sleep) and (iii) bedtime behaviours used with their child. Child sleep was assessed through parental report and actigraphy. Both parents' cognitions about their own sleep predicted cognitions about their child's sleep. Mothers' own sleep-related practices predicted the types of practices they used with their child. Different patterns of maternal and paternal variables influenced parental perceptions of their child having a sleep problem. The present findings highlight the importance of including mothers and fathers in child sleep research. Parents' dysfunctional cognitions (their own sleep) and broader sleep-related practices (their own and child sleep) should be considered when exploring influences on child sleep. Results have possible implications for targets of interventions for child sleep problems and also potential implications for theoretical models of child sleep.

KEYWORDS
parental dyads, parenting, thoughts

INTRODUCTION

Child sleeplessness problems are common, occurring in around 10%–25% of infants and young children (Byars, Yolton, Rausch, Lanphear, & Beebe, 2012; Sadeh, Mindell, Luedtke, & Wiegand, 2009; Wake et al., 2006). Poor child sleep has been linked to a range of adverse outcomes in children (Bernier, Carlson, Bordeleau, & Carrier, 2010; Magee & Hale, 2012; Scher, 2005; Scher, Hall, Zaidman-Zait, & Weinberg, 2010;

Sivertsen et al., 2015; Taveras, Rifas-Shiman, Oken, Gunderson, & Gillman, 2008; Touchette et al., 2007) and their parents and the wider family unit (Bayer, Hiscock, Hampton, & Wake, 2007; Lam, Hiscock, & Wake, 2003; Martin, Hiscock, Hardy, Davey, & Wake, 2007; Thorne & Skuladottir, 2005). Understanding the mechanisms underlying child sleeplessness problems is therefore important.

Theoretical models of child sleep highlight the complex interplay between intrinsic, extrinsic, and environmental factors, many with

likely bi-directional relationships (Beebe, 2008; Karraker, 2008; Sadeh & Anders, 1993). An important factor identified in these models is 'parental cognitions' (i.e., parental thoughts, feelings, beliefs, or attitudes). Parental cognitions that could be pertinent to child sleep include those which relate to: (i) *sleep generally*, such as the importance of sleep for healthy functioning; (ii) their *own sleep*, such as thoughts relating to their functioning if they do not obtain an adequate amount of sleep; (iii) their *child's sleep*, which may take a range of forms, such as expectations or concerns around their child's sleep behaviour, perceptions about the nature of their child's sleep (good or poor sleeper) and thoughts about how to manage any child sleeplessness problems.

To date, research has only explored parental cognitions that relate to parental interpretation and management of child sleeplessness problems (Morrell, 1999; Sadeh, Flint-Ofir, Tirosh, & Tikotzky, 2007). A consistent link has been identified between parental cognitions, which reflect challenges with limit setting and/or resisting child demands and poor child sleep (Knappe, Pfarr, Petzoldt, Härtling, & Martini, 2020; Morrell, 1999; Sadeh et al., 2007; Tikotzky & Shaashua, 2012; Tikotzky, Sharabany, Hirsch, & Sadeh, 2010). Conversely, parental cognitions, which emphasise the importance of limiting parental involvement in child sleep, have been associated with better child sleep (Tikotzky et al., 2010; Tikotzky & Sadeh, 2009; Tikotzky & Shaashua, 2012). However, how parents think about their own sleep, or sleep more generally may influence their cognitions about their child's sleep. For example, it is plausible that parents who hold dysfunctional cognitions about their own sleep may also hold, or be more susceptible to developing, negative thoughts about their child's sleep.

Another factor that has been linked to poorer child sleep is the *parental bedtime behaviours used with their child*. For example, the transactional model of child sleep, suggests that parental settling methods involving extensive physical involvement with their child have the most direct link to impaired child sleep (Sadeh & Anders, 1993). A consistent link has been identified between high levels of parents' involvement in settling with poorer child sleep or child sleeplessness problems (Johnson & McMahon, 2008; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009; Touchette et al., 2005). It has been suggested that parental cognitions may drive how parents behave and respond to their child's sleep, such as the bedtime behaviours they employ (Johnson & McMahon, 2008; Morrell & Steele, 2003; Sadeh, Tikotzky, & Scher, 2010; Tikotzky & Sadeh, 2009). In this sense, parental cognitions and bedtime behaviours mutually play a role in child sleep, but bedtime behaviours mediate the relationship between parental cognitions and child sleep.

In addition to the strategies that parents use to settle their child to sleep, more general parental sleep-related practices may also be important. For example, use of appropriate bedtime routines, good sleep hygiene habits, and having a suitable child sleep environment have all been shown to be related to better child sleep (Mindell, Meltzer, Carskadon, & Chervin, 2009). Further, how parents behave in relation to their own sleep may be relevant to how they act in relation to their child's sleep. For example, parents who are aware of, and

TABLE 1 Demographic parental details

Variable, n (%)	Maternal (n = 44)	Paternal (n = 43)[a]
Education		
Compulsory school	0	4 (9.1)
College	2 (4.5)	2 (4.5)
Vocational training or qualification (inc. apprenticeships)	4 (9.1)	6 (13.6)
University Bachelor's degree	22 (50)	16 (36.4)
University Master's degree	9 (20.5)	6 (13.6)
Further postgraduate	7 (15.9)	9 (20.5)
Occupation		
Managers, directors, and senior officials	4 (9.1)	8 (18.2)
Professional and technical	18 (40.9)	24 (54.5)
Administrative and secretarial	3 (6.8)	2 (4.5)
Caring, leisure, and other service	3 (6.8)	4 (9.1)
Sales and customer services	3 (6.8)	1 (2.3)
Student	2 (4.5)	1 (2.3)
Full-time parent	5 (11.4)	1 (2.3)
Other	6 (13.6)	2 (4.5)

[a]Demographic data from one father missing.

practice, healthy sleep habits and prioritise their own sleep may also apply similar principles to their child's sleep, although this remains unverified.

Previous research exploring parental factors and child sleep has focused, almost exclusively, on mothers and largely overlooked the role of fathers (Morrell, 1999; Morrell & Cortina-Borja, 2002; Tikotzky & Sadeh, 2009; Tikotzky & Shaashua, 2012). Yet, differences between mothers and fathers have been identified in the sleep-related cognitions they hold and the relationship between parental cognitions and child sleep (Lollies, Schnatschmidt, Schlarb, & Genuneit, 2022; Sadeh et al., 2007; Tikotzky et al., 2010), as well as in the broader parenting cognitions and behaviours (relating to self-efficacy and coerciveness) and their relationship to child sleep problems (Zaidman-Zait & Hall, 2015). Collectively these findings emphasise the need for research that explores aspects of parental thoughts and/or behaviour to include both parents. In addition, reduced paternal involvement in child caregiving has been linked with child sleep problems (Millikovsky-Ayalon, Atzaba-Poria, & Meiri, 2015) further emphasising the need to include both parents in child sleep research.

Given that the existing literature may have overlooked mother/ father differences and additional aspects of parents' sleep-related practices, which may be important to child sleep, the present exploratory study examined the relationships between parental cognitions, sleep-related practices, and bedtime behaviours for parents' own, and their child's sleep in both mothers and fathers. The predictive contribution of (i) maternal and paternal *cognitions* about their own and their

child's sleep, (ii) parenting *bedtime behaviours* used with their child and (iii) broader *sleep-related practices* relating to their own and their child's sleep, assessed by both parental report and objective actigraphy was explored but given the exploratory nature of the study, no hypotheses were made.

METHODS

Participants and recruitment

Participants were recruited through various means including (i) social media (Facebook and Twitter) pages designed for the research, (ii) online parenting websites, (iii) Oxford Brookes Babylab (a database of local parents who have registered an interest in participating in child research at the University), and (iv) word of mouth.

Participants were 44 co-habiting mother, father, and child triads who lived in the south of England. Mothers were aged 25–44 years (mean [SD] 33.34 [4.24] years) and fathers (based on 43 responses, one missing) were aged 24–55 years (mean [SD] 35.12 [6.17] years). See Table 1 for overview of parental demographic details. Parents were heterosexual couples to enable maternal and paternal differences to be examined. No parents reported that they suffered from any medical, developmental, or psychiatric condition, which could be expected to affect their sleep.

Children (43.2% males) were aged 12–24 months (mean [SD] 18.32 [3.83] months). The majority of children ($n = 40$, 90.9%) were born at full term. Of those born prematurely (four, 9.1%), gestation ranged from 29 to 35 weeks (mean [SD] 32.00 [2.45] weeks). At the time of taking part in the study, all children were reported to be healthy by their parents, as well as physically and developmentally typical.

MEASURES

Child sleep

Objective child sleep – actigraphy

Ambulatory Monitoring Inc. Motionlogger Mini actigraphs were worn overnight by the child (on ankle) for at least 5 consecutive nights. Self-identified primary night-time caregivers also kept a sleep diary, for their child, for the same nights that the actigraph was worn. Actigraphy data was analysed using Sadeh's sleep scoring algorithm (Sadeh, Sharkey, & Carskadon, 1994), with movements scored in 1-min epochs. Scores were averaged over the 5 nights but excluded any unusual nights (e.g., illness).

Various variables were derived from actigraphy data, including: *bedtime*, the time the participant is in bed and attempting to initiate sleep, which was primarily obtained from sleep diary and validated by actigraphy; *sleep start time*, the time sleep was initiated; *sleep onset latency*, the time between bedtime and sleep start time; *wake-up time*,

the time of final waking the next morning; and *get-up time*, the time the participant got out of bed the next morning, which was primarily obtained from sleep diary and validated by actigraphy. Additional actigraphy variables regarding different aspects of the participants' sleep were also calculated. These included: *time in bed*, time from bedtime to get-up time; *sleep efficiency*, percentage of time in bed spent asleep; *activity mean*, average amount of movement recorded between sleep start and wake-up time; *sleep minutes*, total number of minutes spent asleep between sleep start and wake-up time; *wake after sleep* onset, number of minutes participant was awake overnight between sleep start and wake-up time; *and sleep fragmentation index*, level of restlessness between sleep start and wake-up time. For analysis purposes, child's *sleep efficiency* was used as an *objective assessment* of child sleep.

Subjectively reported child sleep

The 10-item Brief Infant Sleep Questionnaire (BISQ) (Sadeh, 2004) asks parents to report on various aspects of their child sleep behaviour. In the present study, parental response to the question "Do you consider your child's sleep as a problem?" provided a *parent definition* of of their child's sleep status. Parents responded: "a very serious problem," "a small problem" or "not a problem at all." Responses were dichotomised to "Yes" ("a very serious problem" or "a small problem") and "No" ("not a problem at all"). This item was used to represent parental perception of a child sleeplessness problem.

Parental sleep practices

Parental practices relating to their own sleep

The Sleep Practices and Attitudes Questionnaire (SPAQ; Grandner, Jackson, Gooneratne, & Patel, 2014) was adapted to provide a SPAQ for parents' own sleep (SPAQ-P). The original SPAQ includes 151 items across 16 sleep-related domains (see Supplement 1 for description of the domains). Five of the original 16 subscales, assessing actual sleep practices (coping with sleepiness; coping with acute insomnia; coping with chronic insomnia; activities in bed; and sleep environment), totalling 31 items, were used to create a measure of parental sleep-related practices (SPAQ-P). See Supplement 2 for items and scoring procedure.

Items were classified as representing positive or negative sleep-related behaviours (i.e., those known to be conducive or disruptive to sleep) to provide an overall indication of whether individuals endorsed overall positive or poor sleep-related practices. Any item not directly relevant to an individual's actual practices or that could have been misinterpreted were omitted, resulting in 28 items (14 positive and 14 negative) being included, with a minimum possible score of 28 and maximum score of 140. Higher scores indicated poorer sleep-related practices, while lower scores indicated positive sleep-related practices. See Supplement 2 for scoring methodology.

Parental practices relating to their child's sleep

No existing measure allows assessment of broader practices that parents may use with their child around sleep. For the present study, the SPAQ-P (see above) was adapted to form a measure of parental sleep-related practices with their child (SPAQ-C). Statements were adapted in consultation with experts in child sleep research to reflect how parents may behave in relation to various aspects of their child's sleep. Only unambiguously positive or negative items were included resulting in 20 (13 positive and seven negative) of the original 31 adult items being included. Individual items were scored and summed using the same method as reported for the SPAQ-P, to produce an overall score of parental sleep-related practices in relation to child sleep. Higher scores indicated poorer parental sleep-related practices in relation to their child's sleep, while a lower score indicated positive sleep practices with their child. Scores could range from 20 to 100. See Supplement 3 for example of adapted wording and classification of SPAQ-C items as positive or negative.

Parenting bedtime behaviours with child

The 19-item Parental Interactive Bedtime Behaviour Scale (PIBBS) (Morrell & Cortina-Borja, 2002) assesses the strategies parents report using when settling and soothing their child to sleep. Respondents rate how often they employ each behaviour ranging from never (0) to very often (4).

The PIBBS has five factors: active physical comforting (0–24); encourage autonomy (0–12); settle by movement (0–8); passive physical (0–8); and social comforting (0–12) and a total percentage score was also calculated. Higher total scores represent increased levels of parental involvement in settling.

Parental cognitions

Parental dysfunctional cognitions about their own sleep

The Dysfunctional Beliefs and Attitudes about Sleep questionnaire (DBAS) (Morin, Vallieres, & Ivers, 2007) is a 16-item, shortened version of the original DBAS (Morin, Stone, Trinkle, Mercer, & Remsberg, 1993). Participants rate how strongly they agree or disagree with each item ranging from 1 ("strongly disagree") to 10 ("strongly agree"). A total score is calculated by summing scores for each item and then dividing them by 16 (range 1–10). Higher scores represent increased endorsement of dysfunctional beliefs.

Parental cognitions about child sleep

The 20-item Parental Cognitions about Infant Sleep Questionnaire (PCISQ) (Sadeh et al., 2007) assesses parental cognitions about their child's sleep across five subscales: *limit setting*, parental difficulties in setting limits on their child's behaviour or resisting their demands (five items); *anger*, negative feelings towards their child (five items); *doubt*, reflecting feelings of doubt about parental competency (five items); *feeding*, concerns about overnight feeding issues (three items); and *safety*, parental concerns about overnight child safety (two items).

Each item is rated from "strongly disagree" (0) to "strongly agree" (5). Items 6, 11, 16, and 19 are reverse scored. Individual subscales and a total questionnaire score (derived by summing all subscales) can be calculated. Higher scores represent increased concerns and doubts across all of the subscales and the total score. The PCISQ questionnaire used in this study was comprised of 17 items (feeding subscale made up of items 2, 5, and 20 omitted due to not being age-appropriate) with a possible total score of 0–85.

Procedure

The study was approved via the University's Research Ethics committee. Following piloting, data were collected between April and November 2016. Participants were supplied with a participant information sheet and those who wanted to take part were contacted by telephone to arrange an appointment (at their home or an alternative convenient location) where they provided written consent. At this meeting, guidance was provided about how to use the actigraphs and complete the sleep diaries. Parents were provided with packs that included two paper copies of the questionnaire (option also offered to complete an electronic copy and link provided if preferred) to be completed independently by mothers and fathers, further instructions on how to use the actigraphs, and copies of the primary night-time caregiver and child sleep diaries. Primary night-time caregivers were asked to collect actigraphy data on their child's sleep for 5 nights alongside concurrent completion of sleep diaries. Actigraphs were placed on the child's ankle in the first instance. If this was problematic, parents were advised that the actigraph could be placed on the child's wrist. During the week in which actigraphy data were collected parents completed the questionnaires, reflecting on the "last few typical weeks." The researcher returned around a week later to collect actigraphs, sleep diaries, and where appropriate, completed questionnaires. After data collection, participating families received a £10 shopping voucher and, if desired, a summary of their child's actigraphy data.

Statistical analysis

Parametric test assumptions were met so Pearson correlation analyses were run and reported.

Hierarchical linear regression models were used to explore the predictive relationships between key variables (details of the variables in each analysis are provided below). All predictor variables were checked for multicollinearity, no correlation >0.7 was found and the examination of histograms and normality tests indicated all residuals were normally distributed. Where the outcome variable of interest was categorical, binary regressions were used and are reported.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 25.

TABLE 2 Children's actigraphy variables for the whole sample and split by primary night-time caregiver (PNCG) and maternal and paternal perception of child having or not having a child sleeplessness problem (CSP)

	Whole sample (n = 41)			PNCG No CSP (n = 31)			PNCG Yes CSP (n = 10)		
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max
Bedtime, clock time (min)	7:31 p.m. (0.42)	5:44 p.m.	8:51 p.m.	7:25 p.m. (0.39)	5:44 p.m.	8:51 p.m.	7:50 p.m. (0.45)	6:51 p.m.	8:48 p.m.
Sleep start time, clock time (min)	7:58 p.m. (0.41)	6:19 p.m.	9:33 p.m.	7:52 p.m. (0.39)	6:19 p.m.	9:16 p.m.	8:14 p.m. (0.49)	19.11	21.33
Sleep onset latency, min	26.14 (18.48)	0.36	81.48	26.52 (18.26)	4.24	81.48	24.17 (20.50)	0.36	64.36
Wake-up time, clock time (min)	6:29 a.m. (0.45)	5:05 a.m.	7:53 a.m.	6:26 a.m. (0.44)	5:05 a.m.	7:53 a.m.	6:39 a.m. (0.47)	5:21 a.m.	7:47 a.m.
Get-up time, clock time (min)	7:06 a.m. (0.41)	5:43 a.m.	8:56 a.m.	7:06 a.m. (0.44)	5:43 a.m.	8:56 a.m.	7:07 a.m. (0.34)	5:58 a.m.	7:57 a.m.
Sleep efficiency, %	76.00 (8.06)	53.96	93.12	76.10 (7.47)	57.32	93.12	75.67 (10.14)	53.96	89.29
Activity mean	18.70 (5.48)	7.94	33.92	18.35 (5.12)	7.94	31.24	19.80 (6.65)	13.03	33.92
Sleep duration, min	527.11 (51.37)	341.24	625.48	531.48 (44.43)	419.48	625.48	512.52 (69.48)	341.24	600.36
Night awakenings, n (frequency)	4.81 (1.43)	1.20	8.00	4.80 (1.50)	1.20	8.00	4.86 (1.26)	3.00	6.40
Wake after sleep onset, min	105.05 (45.20)	11.00	224.24	102.51 (44.51)	11.00	224.24	112.01 (48.37)	53.00	173.48
Sleep fragmentation index	0.94 (0.31)	0.20	1.49	0.93 (0.31)	0.20	1.49	0.99 (0.29)	0.58	1.35

	Mother No CSP (n = 31)			Mother Yes CSP (n = 10)			Father No CSP (n = 28)			Father Yes CSP (n = 13)		
	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max	Mean (SD)	Min	Max
Bedtime, clock time (min)	7:25 p.m. (0.39)	5:44 p.m.	8:51 p.m.	7:50 p.m. (0.45)	6:51 p.m.	8:48 p.m.	7:34 p.m. (0.38)	6:43 p.m.	8:51 p.m.	7:26 p.m. (0.50)	5:44 p.m.	8:47 p.m.
Sleep start time, clock time (min)	7:52 p.m. (0.39)	6:19 p.m.	9:16 p.m.	8:14 p.m. (0.49)	7:11 p.m.	9:33 p.m.	8:00 p.m. (0.39)	7:01 p.m.	9:32 p.m.	7:52 p.m. (0.49)	6:19 p.m.	9:33 p.m.
Sleep onset latency, min	26.52 (18.26)	4.24	81.48	24.17 (20.50)	0.36	64.36	26.38 (16.10)	4.24	67.00	25.22 (24.16)	0.36	81.48
Wake-up time, clock time (min)	6:26 a.m. (0.44)	5:05 a.m.	7:53 a.m.	6:39 a.m. (0.47)	5:21 a.m.	7:47 a.m.	6:29 a.m. (0.44)	5:21 a.m.	7:53 a.m.	6:30 a.m. (0.48)	5:05 a.m.	7:47 a.m.
Get-up time, clock time (min)	7:05 a.m. (0.44)	5:43 a.m.	8:56 a.m.	7:07 a.m. (0.34)	5:58 a.m.	7:57 a.m.	7:11 a.m. (0.42)	5:58 a.m.	8:56 a.m.	6:55 a.m. (0.39)	5:43 a.m.	7:57 a.m.
Sleep efficiency, %	76.10 (7.47)	57.32	93.12	75.67 (10.14)	53.96	89.29	74.27 (7.81)	53.96	93.12	79.71 (7.59)	66.76	91.32
Activity mean	18.35 (5.12)	7.94	31.24	19.80 (6.65)	13.03	33.92	19.49 (6.04)	7.94	33.92	17.01 (3.65)	11.27	23.47
Sleep duration, min	531.48 (44.43)	419.48	625.48	512.52 (69.48)	341.24	600.36	517.55 (53.52)	341.24	592.36	547.08 (41.25)	495.48	625.48
Night awakenings, n (frequency)	4.80 (1.50)	1.20	8.00	4.86 (1.26)	3.00	6.40	4.98 (1.40)	1.20	8.00	4.45 (1.47)	1.71	6.40
Wake after sleep onset, min	102.51 (44.51)	11.00	224.24	112.02 (48.37)	53.00	173.48	111.27 (46.51)	30.00	224.24	91.23 (40.12)	30.00	224.24
Sleep fragmentation index	0.93 (0.31)	0.20	1.49	0.99 (0.29)	0.58	1.35	0.99 (0.30)	0.30	1.49	0.84 (0.31)	0.30	1.25

Note: All clock time variables are presented as hours and/or minutes as appropriate, all other variables are decimalised.
Abbreviations: CSP, child sleeplessness problem; PNCG, primary night-time caregiver.

RESULTS

Child sleep: parental perception and objective assessment

Of the 44 families, different proportions of mothers (25%) and fathers (34%, based on 43 responses) reported their child to have a child sleeplessness problem. In all, 35 mothers and eight fathers were primary night-time caregivers and when parental perception was based on primary night-time caregiver's report, 25% of children were reported as having a child sleeplessness problem.

Actigraphy analysis was conducted on 41 children, with data omitted for three children due to regular co-sleeping, which could impact reliability of actigraphy data (any statistical tests that include actigraphy variables are reported based on these 41 families). A mean (SD) number of 5.09 (0.54) nights of data were collected (minimum of 4 to a maximum of 7 nights data from individual children). See Table 2 for an overview of actigraphy variables. Of the 41 children for whom objective sleep data were available 24.4% were reported by primary night-time caregivers to have a child sleeplessness problem.

Associations between parental cognitions, parenting bedtime behaviours and sleep-related practices (relating to their own and their child's sleep)

Correlations were used to explore the relationship between maternal and paternal cognitions, parenting bedtime behaviours and sleep-related practices relating to their own and their child's sleep (Table 3). Increased dysfunctional parental cognitions about their own sleep,

were positively associated with higher levels of parental cognitions indicating concerns about their child's sleep, for both mothers ($r = 0.31$, $p = 0.043$) and fathers ($r = 0.45$, $p = 0.003$). Mothers' cognitions about their child's sleep were also positively associated with the bedtime behaviours used with their child ($r = 0.34$, $p = 0.026$), whereby more concerns about their child's sleep was associated with increased involvement in settling their child. Maternal sleep-related practices related to their own sleep were positively associated with the practices employed in relation to their child's sleep ($r = 0.45$, $p = 0.002$) with poorer maternal sleep-related practices used around their own sleep being associated with poorer parental seep-related practices in relation to their child's sleep.

Predictors of parental sleep-related practices with their child

Two hierarchical linear regression models were run (one for mothers, one for fathers) with sleep-related practices employed with their child (SPAQ-C) as the dependent variable and the following independent variables: parental cognitions about their own sleep (DBAS), cognitions about their child's sleep (PCISQ) and sleep-related practices related to their own sleep (SPAQ-P).

Mothers

The model to predict maternal sleep-related practices used with their child was significant at step 2 and 3 but not step 1. See Table 4 for summary. Across all steps, only mothers' sleep-related practices in

TABLE 3 Correlation coefficients of maternal and paternal sleep-related cognitions, practices, and parenting bedtime behaviours relating to their own and their child's sleep

	Cognitions about own sleep (DBAS)	Cognitions about child sleep (PCISQ)	Practices relating to own sleep (SPAQ-P)	Practices relating to child sleep (SPAQ-C)	Bedtime behaviours (PIBBS)
Maternal					
Cognitions about own sleep (DBAS)	1.00				
Cognitions about child sleep (PCISQ)	0.31*	1.00			
Practices relating to own sleep (SPAQ-P)	0.00	0.13	1.00		
Practices relating to child sleep (SPAQ-C)	0.01	−0.02	0.45**	1.00	
Bedtime behaviours (PIBBS)	0.06	0.34*	0.22	0.18	1.00
Paternal					
Cognitions about own sleep (DBAS)	1.00				
Cognitions about child sleep (PCISQ)	0.45**	1.00			
Practices relating to own sleep (SPAQ-P)	0.02	−0.00	1.00		
Practices relating to child sleep (SPAQ-C)	−0.10	0.18	0.16	1.00	
Bedtime behaviours (PIBBS)	−0.16	−0.22	−0.05	0.10	1.00

Abbreviations: DBAS, Dysfunctional Beliefs and Attitudes about Sleep Questionnaire; PCISQ, Parental Cognitions about Infant Sleep Questionnaire; PIBBS, Parental Interactive Bedtime Behaviour Scale; SPAQ-P, Sleep Practices and Attitudes Questionnaire-Parent; SPAQ-C, Sleep Practices and Attitudes Questionnaire-Child.

*$p<.05$, **$p<.01$, all other correlations non-significant.

TABLE 4 Summary of regression analysis variables to predict maternal practices relating to child sleep (SPAQ-C)

		Individual predictors				Overall models	
		B	SE *B*	β	*p*	Model	Variance explained % (R^2)
Step 1	Constant	32.96	4.51		0.000		
	Cognitions about own sleep (DBAS)	0.064	0.981	0.010	0.948	*F*(1, 42) = 0.004, *p* = 0.948	na
Step 2	Constant	10.39	8.18		0.211		
	Cognitions about own sleep (DBAS)	0.056	0.889	0.009	0.950		
	Practices relating to own sleep (SPAQ-P)	**0.362**	**0.114**	**0.445**	**0.003**	**F(2, 41) = 5.08, p = 0.011**	**19.9**
Step 3	Constant	11.42	8.43		0.183		
	Cognitions about own sleep (DBAS)	0.229	0.942	0.036	0.809		
	Practices relating to own sleep (SPAQ-P)	**0.372**	**0.116**	**0.457**	**0.003**		
	Cognitions about child sleep (PCISQ)	−0.080	0.134	−0.089	0.555	**F(3, 40) = 3.45, p = 0.025**	20.6

Note: Significant predictors and overall models are reported in bold.
Abbreviations: DBAS, Dysfunctional Beliefs and Attitudes about Sleep Questionnaire; PCISQ, Parental Cognitions about Infant Sleep Questionnaire; SPAQ-P, Sleep Practices and Attitudes Questionnaire-Parent.

relation to her own sleep was found to be a significant predictor of maternal sleep-related practices employed with their child. Specifically, increased maternal use of sleep-related practices not conducive to good quality sleep (in relation to their own sleep), predicted the use of more sleep-related practices used with their child that were not conducive to good quality sleep.

Fathers

For fathers, the hierarchical linear regression model to predict paternal sleep-related practices used in relation to their child's sleep was not significant, *F*(3, 39) = 1.43, *p* = 0.249. Nor were any of the individual steps or any significant predictors found. See Supplement 4 for summary.

Predictors of parental cognitions about child sleep

Two hierarchical linear regression models were run (one for mothers, one for fathers) with parental cognitions about their child's sleep (PCISQ) as the dependent variable and the following independent variables: parental cognitions about their own sleep (DBAS), sleep-related practices related to their own sleep (SPAQ-P) and sleep-related practices related to their child's sleep (SPAQ-C). The summary of individual predictor variables and models for mothers and fathers is presented in Table 5.

Mothers

The model to predict maternal cognitions about child sleep was only significant at step 1. Across all steps, maternal cognitions about

their own sleep was the only significant positive predictor of maternal cognitions about child sleep. Specifically, higher levels of dysfunctional maternal attitudes or beliefs about their own sleep predicted higher levels of concerns or worries about their child's sleep.

Fathers

The model to predict paternal cognitions about child sleep was significant across all steps. Across all steps paternal cognitions about their own sleep was the only significant positive predictor. Specifically, higher levels of dysfunctional paternal attitudes or beliefs about their own sleep predicted higher levels of concerns or worries about their child's sleep.

Predictors of child sleep

Regressions were run to explore if parental cognitions and practices relating to their own sleep (DBAS and SPAQ-P, respectively), their cognitions and practices relating to their child's sleep (PCISQ and SPAQ-C, respectively), and parenting bedtime behaviours (PIBBS) were predictive of: (i) subjectively (parental report of child sleeplessness problem) and (ii) objectively (sleep efficiency determined by actigraphy) assessed child sleep.

(i) Parentally reported presence of a child sleeplessness problem.

Two binary logistic regressions (one for mothers, one for fathers) were run with parentally reported perception of a child sleeplessness problem (Yes/No) as the dependent variable and the following independent variables: parental cognitions about their own and their child's sleep, sleep-related practices concerning their own and their

TABLE 5 Summary of regression analysis variables to predict maternal and paternal cognitions about child sleep (PCISQ)

		Individual predictors				Overall models	
		B	SE *B*	*β*	*p*	Model	Variance explained % (R^2)
Maternal							
Step 1	Constant	20.28	4.81		0.000		
	Cognitions about own sleep (DBAS)	**2.18**	**1.05**	**0.306**	**0.043**	**$F_{(1, 42)} = 4.34, p = 0.043$**	**9.4**
Step 2	Constant	12.92	9.64		0.187		
	Cognitions about own sleep (DBAS)	**2.17**	**1.05**	**0.306**	**0.044**		
	Practices relating to own sleep (SPAQ-P)	0.118	0.134	0.130	0.383	$F_{(2, 41)} = 2.55, p = 0.091$	na
Step 3	Constant	14.07	9.90		0.163		
	Cognitions about own sleep (DBAS)	**2.18**	**1.06**	**0.307**	**0.045**		
	Practices relating to own sleep (SPAQ-P)	0.158	0.151	0.174	0.301		
	Practices relating to child sleep (SPAQ-C)	−0.110	0.185	−0.099	0.555	$F_{(3, 40)} = 1.79, p = 0.165$	na
Paternal							
Step 1	Constant	19.53	3.07		0.000		
	Cognitions about own sleep (DBAS)	**2.26**	**0.702**	**0.449**	**0.003**	**$F_{(1, 41)} = 10.34, p = 0.003$**	**20.1**
Step 2	Constant	20.11	9.27		0.036		
	Cognitions about own sleep (DBAS)	**2.26**	**0.711**	**0.449**	**0.003**		
	Practices relating to own sleep (SPAQ-P)	−0.009	0.133	−0.009	0.947	**$F_{(2, 40)} = 5.05, p = 0.011$**	**20.1**
Step 3	Constant	13.71	9.86		0.172		
	Cognitions about own sleep (DBAS)	**2.38**	**0.699**	**0.473**	**0.002**		
	Practices relating to own sleep (SPAQ-P)	−0.044	0.132	−0.047	0.740		
	Practices relating to child sleep (SPAQ-C)	0.223	0.134	0.234	0.105	**$F_{(3, 39)} = 4.43, p = 0.009$**	**25.4**

Note: Significant predictors and overall models are reported in bold.
Abbreviations: DBAS, Dysfunctional Beliefs and Attitudes about Sleep Questionnaire; SPAQ-P, Sleep Practices and Attitudes Questionnaire-Parent; SPAQ-C, Sleep Practices and Attitudes Questionnaire-Child.

child's sleep and parenting bedtime behaviours. The summary of individual predictor variables and models for mothers and fathers is presented in Table 6.

Maternal perception

The binary regression to investigate predictors of maternal perception of a child sleeplessness problem was significant. Maternal sleep-related practices related to their child's sleep (SPAQ-C) and bedtime behaviours (PIBBS total score) were the only significant predictors. Specifically, and perhaps unexpectedly, increased maternal use of poor sleep-related practices relating to child sleep (represented by higher SPAQ-C scores) predicted mothers perceiving that their child did not have a child sleeplessness problem. Increased maternal involvement in settling (represented by higher total PIBBS score) predicted mothers reporting that their child had a child sleeplessness problem.

Paternal perception

The binary logistic regression model to investigate predictors of paternal perception of a child sleeplessness problem was also significant.

Paternal cognitions about child sleep (as assessed by PCISQ) and bedtime behaviours used with their child (PIBBS) were significant predictors. Specifically, increased levels of concerns about their child's sleep (represented by higher PCISQ scores) and increased involvement in settling (represented by higher total PIBBS scores) predicted fathers perceiving that their child had a child sleeplessness problem.

(ii) Actigraphically assessed child sleep

A hierarchical linear regression model to predict objectively measured child sleep (sleep efficiency determined by actigraphy) was run with the following independent variables, for both mothers and fathers: cognitions about their own sleep (DBAS), cognitions about their child's sleep (PCISQ), sleep-related practices related to their own sleep (SPAQ-P), sleep-related practices related to their child's sleep (SPAQ-C), and bedtime behaviours (PIBBS). The model was not significant, $F_{(10, 30)} = 0.648, p = 0.761$, and no significant predictors were identified. The summary is provided in Supplement 5.

DISCUSSION

The present opportunistic general population sample had parent-reported rates of child sleeplessness problems (mothers = 25%, fathers = 34%, primary night-time caregivers = 25% for the whole

TABLE 6 Summary of binary logistic regression variables to predict maternal and paternal perception of a child sleeplessness problem (BISQ)

		Individual predictors				Overall models	
	B	SE B	β	p	Beta (exp)	Model	Variance explained % (R^2)
Maternal							
Cognitions about own sleep (DBAS)	0.333	0.572	0.338	561	1.40		
Parental cognitions child sleep (PCISQ)	0.083	0.066	1.61	0.205	1.09		
Practices relating to own sleep (SPAQ-P)	−0.112	0.079	1.97	0.160	0.89		
Practices relating to child sleep (SPAQ-C)	**0.185**	**0.091**	**4.09**	**0.043**	**1.20**		
Bedtime behaviours (PIBBS)	**−0.145**	**0.053**	**7.48**	**0.006**	**0.865**	**$\chi^2 = 18.53$, $p = 0.002$, $df = 5$**	**34.4**
Paternal							
Cognitions about own sleep (DBAS)	0.222	0.355	0.391	0.532	1.25		
Cognitions about child sleep (PCISQ)	**−0.195**	**0.080**	**5.87**	**0.015**	**0.823**		
Practices relating to own sleep (SPAQ-P)	−0.080	0.065	1.50	0.221	0.923		
Practices relating to child sleep (SPAQ-C)	0.48	0.059	0.664	0.415	1.05		
Bedtime behaviours (PIBBS)	**−0.086**	**0.041**	**4.37**	**0.037**	**0.918**	**$\chi^2 = 12.02$, $p = 0.035$, $df = 5$**	**24.4**

Note: Significant predictors and overall models are reported in bold.

Abbreviations: DBAS, Dysfunctional Beliefs and Attitudes about Sleep Questionnaire; PCISQ, Parental Cognitions about Infant Sleep Questionnaire; PIBBS, Parental Interactive Bedtime Behaviour Scale; SPAQ-P, Sleep Practices and Attitudes Questionnaire-Parent; SPAQ-C, Sleep Practices and Attitudes Questionnaire-Child.

sample and for the 41 children included in actigraphy analysis = 24.4%) comparable with previously reported prevalence rates (10%–35%) (Byars et al., 2012; Sadeh et al., 2009). Novel findings included that, for mothers and fathers, higher levels of dysfunctional cognitions about their own sleep were associated with and predictive of increased levels of cognitions that reflected concerns about their child's sleep. The quality of maternal (but not paternal) sleep-related practices used in relation to their own sleep were predictive of the quality of practices they used with their child. Between mothers and fathers there was a different pattern of parental variables that were significant predictors of parental perceptions of a child sleeplessness problem. For mothers, increased use of poor sleep-related practices relating to child sleep predicted perceiving that their child did not have a child sleeplessness problem, whereas increased involvement in settling predicted mothers reporting that their child had a child sleeplessness problem. For fathers, increased levels of concerns about their child's sleep and increased involvement in settling predicted perceiving that their child had a sleeplessness problem. Objective child sleep efficiency was not predicted by any of the maternal or paternal factors.

In the present study, across mothers and fathers, dysfunctional cognitions about their own sleep were associated with, and predictive of, overall levels of concerns and worries about their child's sleep. This suggests that how parents think and feel about their own sleep may influence how they feel about their child's sleep. Parents' cognitions

about their own sleep may also need to be considered when exploring parental cognitions that play a role in child sleep (i.e., theoretical models that only include parental cognitions about child sleep may not be sufficient).

Currently, most child sleeplessness problems are considered to be behavioural in nature and the most common and successful interventions are behaviourally based (Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). However, parental bedtime-behaviours used with their child may, at least partly mediate the relationship between parental cognitions and child sleep (Johnson & McMahon, 2008; Sadeh et al., 2010; Tikotzky & Sadeh, 2009; Tikotzky & Shaashua, 2012). This cognitive-behavioural conceptualisation of child sleeplessness problems suggests that interventions (and prevention approaches) may benefit from addressing both cognitive and behavioural aspects more explicitly (Tikotzky & Sadeh, 2010). Addressing any dysfunctional parental cognitions (about their own and/or their child's sleep), may contribute to parents' behaviour changes (and the maintenance of any changes) (Mindell et al., 2006).

The present findings suggest that in addition to the bedtime settling strategies used by parents, other sleep-related practices, may also be important. For example, maternal sleep-related practices concerning her own sleep were associated with and predictive of the sleep-related practices used with their child. This suggests that mothers' own sleep behaviour, whether positive or negative in terms of how conducive it was for sleep, was reflected in the behaviours

they used with their child. A potential explanation for this relationship being identified in mothers but not fathers, could be that more mothers than fathers identified themselves as the child's primary night-time caregiver (81% in the present study). Our results may therefore be detecting a link, in primary night-time caregiver, between the sleep practices they use for themselves and those they use with their child, rather than a generalisable difference in the presence of this relationship between mothers and fathers. Nevertheless, the present results suggest that it may be beneficial to consider not just parental child settling strategies but also the broader sleep-related practices used with their child and that parents' use themselves.

Both maternal and paternal parenting bedtime behaviours were predictive of parental perception of a child sleeplessness problem. In line with previous research, this suggests that increased parental involvement in bedtime behaviours is related to poorer child sleep (Johnson & McMahon, 2008; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009; Touchette et al., 2005). However, the importance of considering both parents is highlighted in the present study, by the fact that the overall pattern of predictors of parentally reported child sleeplessness problems differed between mothers and fathers. For mothers, broader sleep-related practices they used with their child was also a significant predictor of perception of a child sleeplessness problem. However, the direction of this relationship was not as may have been expected. Poorer quality maternal sleep-related practices used with the child actually predicted that mothers did not perceive their child to have a sleeplessness problem. There is evidence that parentally perceived sleep problems reflect some aspects of the child's sleep but are also susceptible to reporter bias and can be influenced by a broad array of factors outside of the child's sleep (Dai & Liu, 2021). Therefore, it may be that maternal perceptions of child sleeplessness problems are not purely based on aspects of child sleep, but perhaps a lack of awareness of what constitutes good quality sleep practices extends to a lack of awareness of what aspects of child sleep could be construed as problematic.

For fathers, cognitions reflecting concerns about their child's sleep (PCISQ) were a significant predictor of classifying their child as having a child sleeplessness problem, which adds to the existing literature, which has found the same pattern in younger children of around a year old, based on maternal reporting (Morrell, 1999; Tikotzky & Sadeh, 2009). It is possible that in the present study of older children aged 12–24 months where mothers were more commonly the primary night-time caregiver that mothers' concerns about their child's sleep had reduced along with increased familiarity and practice with dealing with their child around sleep. For fathers who may be less familiar with dealing their child overnight as most were not the primary night-time caregiver, common parental concerns about child's sleep (such as those assessed by the PCISQ) may be longer lasting. Future studies should explore the role of the primary night-time caregiver, along with mother/father differences.

A range of combined parental variables (including cognitions, sleep-related practices and bedtime behaviours of both mothers and fathers) did not predict objectively assessed child sleep efficiency. However, the present sample was an opportunistic general population sample that did not target children who met specific sleep-disturbance criteria. Although the overall rates of parent-reported child sleeplessness problems were similar to other community samples (Byars et al., 2012; Morrell, 1999; Sadeh et al., 2009; Wake et al., 2006), any effects are likely to be more prominent in children with clinically severe child sleeplessness problems and future studies should target this group, as results would have potential implications for screening parents and children in relation to child sleeplessness problems, and for interventions. In the present study, total questionnaire scores were used (to represent broad sleep-related cognitions and behaviours) in analyses, whereas previous studies have tended to use specific subscales. It may be that relationships are strongest between specific subscales and child sleep.

The results of the present study need to be considered in the context of some relevant limitations, in addition to those already discussed. The method used to assess parents' broader sleep-related practices (SPAQ) was adapted specifically for use in this study as no alternative measure existed; the validity of this approach needs further exploration. Our analysis was based on co-habiting mothers and fathers, and this means that results may not generalise to families of different composition. The present study was cross-sectional in design but to identify any child age-dependent relationships and explore the persistence of any aspects, it would be useful for future longitudinal studies. In addition, the present sample size was relatively small (although inclusive of 44 mother–father-child dyads) and included children aged 12–24 months. During this period, children may have changing sleep patterns and problems, therefore future studies should explore relationships in larger sample sizes but with smaller age bandings. Finally, four children born preterm were included in the present sample and although none of these children had a parentally reported sleep problem at the time of participation, some studies suggest that premature birth can have an impact on child sleep beyond the neonatal period, although findings are complex and often conflicting (see Caravale et al., 2017).

In conclusion, present findings offer two main novel contributions to the literature. Firstly, higher levels of parental dysfunctional attitudes and beliefs about their own sleep were predictive of increased worries or concerns about their child's sleep. Secondly, notable differences between mothers and fathers were evident in the pattern of associations between parents' cognitions, sleep-related practices, and child sleep. These findings have theoretical/research implications, suggesting that parental dysfunctional cognitions about their own sleep may also need to be included in models of child sleep, along with the importance of including both parents (and identifying primary night-time caregivers) in future work. From a clinical perspective, there are implications for what aspects may need to be assessed in parents when child sleeplessness problems are screened for, and what help may be required. The present findings appear to suggest that interventions that address parental cognitions, as well as sleep-related parental behaviours and bedtime behaviours, may be helpful.

AUTHOR CONTRIBUTORSHIP

All authors contributed to the conception, design, analysis, and interpretation of data as well as drafting and critically revising the

manuscript for important intellectual content. Georgia Cook was also responsible for data collection.

CONFLICT OF INTEREST

All authors declare that this research was conducted in the absence of any commercial or financial interests that could be a potential conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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