

What influences baby-sleeping behaviour at night?

A review of evidence

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This review considers the evidence on behavioural techniques and educational interventions designed to:

- minimise babies' dependence on their parents to settle to sleep at bedtime or when they wake at night
- extend the length of time babies will sleep between feeds at night.

The evidence on co-sleeping is also reviewed as a strategy to reduce disruption to parents' sleep, particularly waking associated with night-feeds.

Background

Night-waking in babies can be a concern for new parents, causing broken nights and a lack of sleep resulting in tiredness and fatigue.^{1,2} About 20% of babies in the UK are reported by parents to experience difficulties in sleeping at night in the first year.^{3,4,5} A systematic review of bedtime problems and night-waking in babies found that the most common problems reported by parents are that the baby needs:

- to be rocked or held to sleep
- the parent or caregiver to be present to go to sleep
- to be fed to sleep
- that the baby wakes several times at night or several nights during the week.⁶

Health professionals are hesitant to

apply the term 'problematic sleeper' to a baby less than three months old as frequent night-waking and feeding during this time is considered usual.^{7,8,9,10} At birth, babies are unable to regulate their sleep and wake cycles; however, as they develop during the first few months, they begin to gradually distinguish between night and day.^{11,12,13} Between three and six months most babies have established a clear sleep-wake cycle, with day-time sleep becoming increasingly shorter and night-time sleep longer.^{11,12,13,14} Human babies, like other primates, are physiologically adapted for frequent feeding in the first few months to satisfy the demands for growth and brain development.^{15,16,17} Consequently, newborn and young babies are accustomed to spreading their nourishment over a 24-hour period.¹⁵ During the early months, parents often use feeding as a way to settle the baby to sleep, or back to sleep when s/he has awoken at night. However, as the baby gets older, s/he may move away from the need to satisfy hunger towards a reliance on being fed at night to go to sleep or to return to sleep. Being fed at night may therefore be interpreted as a sleep-onset association by the baby, which may become problematic for the parent in terms of sleep disruption.^{18,19,11}

Parents who feel they are not getting enough uninterrupted sleep in the first few weeks and months after birth may

consider their baby's sleeping as difficult. Some parents report that family members or friends comment that their baby wakes or feeds too frequently at night, or compare the baby's behaviour unfavourably with other babies.^{14,20,21} As a result, parents may feel inadequate or anxious²² and look for help in getting their baby to sleep for longer at night. Concerns about night sleeping are also common among mothers who are returning to work, and fathers who are working and want to reduce disturbed sleep. Any of these reasons may prompt parents to seek help with their baby's sleeping at night.^{21,23}

Observational studies have shown that the expectation or desire to have a baby that sleeps for long stretches at night can conflict with the need for frequent feeding in breastfed babies under three months.^{18,24} Despite evidence that by 12 weeks of age 71-75% of babies (breastfed or formula fed) are reported by parents to 'regularly' sleep through the night,¹⁰ some parents of young babies may seek advice on how to reduce night-time feeds¹⁸ or decide to discontinue breastfeeding earlier than planned.^{1,18,25}

Advice on baby-sleeping is available in books and magazines and via the internet, and from health professionals, friends and family. Many parents report being confused by the volume of information on night-sleeping and by conflicting advice.^{5,26} A number of intervention

programmes have been developed to help parents manage night-time sleeping. These interventions can be taught regimes following attendance at a sleep clinic, or more informal interventions advised by health professionals, or taken from postnatal groups or self-help guides.

Attitudes towards night-time waking and the acceptability of strategies and techniques intended to modify babies' behaviour vary depending on the style of parenting different families prefer.¹⁹ Some parents will tend to expect their baby to adapt to the household routine and sleep at pre-determined times, whereas others are more inclined to see their baby as an individual with emotional needs, from the earliest days. For these parents, negotiation and adaptation seems more appropriate than expecting the baby to adopt imposed sleeping and feeding routines.²⁷

Search strategy

The information in this review has been derived from a number of sources. These include a search of electronic databases (Pubmed, Cochrane Databases, Ingenta Connect, Science direct and Elsevier), and a manual search of professional journals and relevant published books. The search terms included 'baby', 'infant' + 'sleep', 'night-waking', 'behaviour', 'intervention', 'guidance', 'night-time feeding', 'maternal + parental health' and 'well-being'. Interventions using drugs and studies looking at the relationship between day-time and night-time sleeping were excluded from this review.

Behavioural interventions to help the baby sleep at night

Results

Seven randomised controlled trials (RCTs), one longitudinal randomised-intervention study, five non-randomised intervention studies and five observational studies were identified. Two RCTs,^{28,29} one longitudinal randomised-intervention study,¹² four non-randomised intervention studies^{26,30,31,32} and one observational study¹¹ focused on education of parents and modifying

parental behaviour by encouraging babies to self-soothe, differentiation between night and day, and providing information on sleep-aids and bedtime routines. One observational study³² looked at the influence of daylight exposure on babies' night-time sleeping behaviour. One RCT²⁵ looked at a specific feeding intervention designed to reduce the number of feeds at night. Three observational studies^{33,18,2} looked at the influence of sleeping location on night-time sleeping in breastfed babies. Five RCTs^{34,35,36,37,38} and one non-randomised intervention study³⁹ looked at the use of 'controlled crying' to improve baby night-time sleeping. Three of the RCTs^{34,35,36} were included in a systematic review.⁴⁰ The acceptability and effectiveness of these interventions and techniques are reviewed below.

A Cochrane systematic review on interventions for influencing sleep patterns in breastfed infants was also found but it had been withdrawn by Cochrane for updating.⁴¹

Behavioural interventions

Various behavioural interventions with the aim of establishing 'positive sleep habits' in babies have been used as preventative techniques or adopted later with the aim of modifying babies' sleeping behaviour at night. The techniques aimed to encourage the baby to learn to self-settle at night, without a parent being present, and to self-soothe when s/he awakes during the night. They encourage parents to avoid behaviour that makes the baby reliant on their presence to go to sleep, for example holding or feeding the baby until they fall asleep. Instead parents are encouraged to develop techniques such as placing the baby in the cot while still awake, and introducing a bed-time routine or use of a favourite toy or comfort blanket.^{6,11,29,42,9} This type of intervention is found to be very acceptable to parents as the techniques generally do not leave the baby to cry or fuss for long periods of time. Instead, parents are encouraged to develop consistent ways of caring for and responding to their baby at bed-time and during the night.⁶ Parents planning to use a behavioural technique are reassured that it is necessary to maintain the

routine over several weeks in order to consolidate the behavioural response. It is argued that parents and babies who do not respond well to such a routine will learn to develop their own ways of establishing good sleep patterns which are acceptable to their lifestyle.²⁸

Evidence from randomised controlled trials

The two RCTs that introduced a behavioural programme to prevent sleeping problems in babies reported positive results. One study²⁸ recruited 610 mothers within 10 days of birth, and randomised them to one of three groups. The 'behavioural group' (n=205) received a home visit by a health professional, who recommended minimization of parental interaction at night by not holding, rocking or feeding the baby to sleep, differentiation between night and day by the introduction of a 'focal feed', which is a 'longer' breastfeed or larger formula feed between 10pm-midnight. After three weeks of age, and providing babies were gaining weight satisfactorily, parents were asked to gradually lengthen the interval between night feeds by resettling the baby without feeding. This information was endorsed in an A5 leaflet that detailed each stage. The 'educational group' (n=202) received a booklet about how to manage baby crying and promotion of good sleeping patterns. The control group (n=203) received standard information from health professionals. At 12 weeks, 61% of parents in the behavioural group compared with 53% and 50% in the educational and control groups, reported their babies to have had seven interruption-free nights (p<0.05). When mothers followed the behavioural programme, 10% more babies slept for a minimum of five hours at night at 12 weeks of age without disturbing their parents; however, no p value is provided so this may not be statistically significant. Babies in the behavioural group were said to have maintained the improved sleeping patterns at nine months of age. Parents in the behavioural group were also more likely to say that their baby had a bedtime routine.

The second RCT²⁹ involved 169 families who were allocated to an interven-

tion (n=86) or control (n=83) group when their baby was three months old. The intervention group received a home visit by a researcher, who discussed settling methods and the importance of routine. Parents were given an educational booklet consolidating the advice. The groups were followed up six months later when the babies were nine months old, when 39% of the control group reported settling difficulties compared with 21% of the intervention group (p=0.03). Significant results were also found for night-waking. Babies in the control group woke on average four nights per week compared to two nights in the intervention group (p=0.04), and 46% of babies in the control group woke two or more times a night, compared to 23% in the intervention group (p=0.02).

Evidence from non-randomised and observational studies

Findings from observational and intervention studies support the RCT results, suggesting that reduced parent interaction at night helps babies learn to go to sleep by themselves, and that babies placed in their cots awake need less parental intervention when they wake compared to those placed in their cots asleep.^{11,43,26,31,12,44,45,30}

A prospective cohort study³⁰ focused on a brief intervention consisting of information about settling techniques, including advice about putting babies into their cot partially awake, and discussion about sleep with a paediatrician. Parents were recruited when the baby was four months old and allocated to the intervention (n=164) or control group (n=128). At nine months of age, babies in the intervention group were reported by parents to experience 36% less night-waking per week compared with the control group (2.5 vs. 3.9 wakings per week p=0.02). Frequent night-waking was found to be twice as common in control babies (27% vs. 14%, p=0.01).

A longitudinal randomised intervention study¹² which followed 80 babies from birth to one year of age, found three variables were significant predictors of self-soothing at 12 months: being placed in their cot awake, parents who waited more than three minutes before responding to babies awakenings at three

months of age, and high levels of quiet sleep at birth. A before and after non-randomised intervention study²⁶ of 71 mothers with babies aged two weeks to seven months, which followed mothers who were given written information on self-settling techniques, found that three weeks post-intervention significantly fewer mothers reported that their babies' sleeping or night-time crying was still a problem. If the problem was felt to still exist it was rated as less severe.

Another before and after non-randomised intervention study involving 79 babies⁴³ that asked parents to reduce contact at bedtime, and when the baby awoke at night to encourage self-soothing in the baby, found that at two weeks post intervention the duration of sleep at night increased significantly from a mean of 10.2±0.9 hours to 10.5±0.7 hours (p<0.001). The average frequency of night-waking had significantly decreased from 4.5±1.9 times per night to 1.5±1.4 times per night (p<0.001). A further before and after non-randomised intervention study³¹ of 109 parents with babies less than 20 weeks recruited from a residential baby sleep clinic, found that parent-reported sleeping problems decreased significantly post intervention. Upon arrival, parents were given information about baby sleeping behaviour and shown settling techniques to encourage self-soothing. By day four of admission, the mean duration of unsettled behaviour had decreased significantly (p<0.001) and these changes were maintained one month after discharge.

Several studies and commentaries have suggested that bed-time routines help prepare the baby for sleep and overcome the anxiety of separation from parents.^{8,23,43,11} The aim of bedtime routines is to enable parents to settle their baby in his or her cot while still awake.

Intervention studies that introduce a bed-time routine often do so as part of a fuller behavioural programme.^{42,9,39,28} Routines may include a bath, reading or singing, a feed and general quiet time before bed. The use of sleep aids, such as a favourite toy, comfort blanket or dummy have been reported to help reduce the need for parental presence, though the quality of studies varies.^{8,23,39}

Clear differentiation between night and day has been associated with increased success when introducing a bed-time routine.^{28,9,39,25} In three studies, parents were recommended to spend lots of time interacting with the baby during the day, keep rooms light and ensure that daytime naps were in a room that was not too dark. In contrast, they were advised to make rooms dark at night, minimise noise and feed without interaction such as playing or talking, with lights dimmed.^{28,39,25}

One observational study³² explored a possible association between light exposure during the day and night-time sleeping. It appeared that babies who were exposed to more environmental light in the early afternoon slept better at night than those who were not. Exposure to daylight was monitored for three consecutive days in 56 babies at six, nine and 12 weeks of age using an environmental light sensor attached to a small toy. The toy had velcro fastening that could be fixed to a pram handle, cot or seating arrangement close to the baby. It was found that babies who slept well at night were exposed to significantly more light in the afternoon period. It was the timing of the exposure, rather than the intensity of the light that was felt to be important in increasing night-time sleeping.

Introducing a 'focal feed' or 'dream feed'

A feeding technique has been developed to encourage babies to sleep for longer stretches at night, designed for use in the early weeks and months when frequent feeding at night can be disruptive to parents. The 'focal feed' involves giving a longer breastfeed or larger formula feed in the late evening, sometime between 10pm and midnight, to help the baby sleep for an uninterrupted stretch of five hours or more.^{25,28} Similar techniques, where the parents give a 'top-up' feed before they go to bed without fully waking their baby, to encourage longer sleeping, are often called 'rollover' or 'dream feeds'.^{46,47}

Studies on the use of focal feeds as a technique to help babies sleep for longer stretches at night have shown some success. An RCT²⁵ of 26 parents and their

newborn were assigned to a treatment or control group (n=13 in both). Parents in the treatment group were instructed to offer a focal feed between 10pm and 12am every night. If the baby woke at night, parents were asked not to feed the baby and instead encourage the baby to self-settle after reswaddling or changing of their nappy. Parents were also asked to maximise the environmental differences between night and day. By three weeks of age, babies in the treatment group were sleeping for significantly longer stretches at night than the control. By eight weeks 100% of babies in the treatment group were sleeping for five hour stretches or more each night compared to 23% of control babies. A larger RCT of 610 mothers²⁸ which included a focal feed as part of a package of interventions also found statistically significant different results, with more babies sleeping for five hours or more by 12 weeks of age. However, it is not known how much of the improvement was a direct result of the focal feed as distinct from the other intervention in the package.

In the early days and first few weeks of breastfeeding, mothers are encouraged to feed on demand to establish a sufficient milk supply. It is argued that reducing night feeds at this time may reduce their milk supply,^{1,48} and may result in them stopping breastfeeding earlier than planned.^{1,48,22} Night-time feeding releases a higher dose of prolactin than day-time feeding, which is found to sustain milk production in the long-term.¹ Babies are found to make up for missed feeds at the morning feed and throughout the day.^{25,28}

Controlled crying and extinction methods

Although the use of 'controlled crying' is sometimes used as a preventative intervention, it is more commonly used to respond to sleeping difficulties.⁶ Having settled the baby for the night, controlled crying involves leaving the baby to cry for increasingly long periods of time before providing comfort. The intention of controlled crying is to help babies learn to self-soothe at night and settle back to sleep by themselves. Controlled crying is also known as graduated

extinction.

The use of extinction methods is found to be distressing for some parents who feel unwilling to leave their baby to cry.^{6,39} However, for other parents these methods can provide relief particularly when sleeping difficulties improve.³⁹ The use of controlled crying has been criticised by some commentators.^{16,22,15} It is argued that failure to comfort the baby and interact in an intimate, loving way may have long-term consequences for the development of the personality and the ability to form close social bonds. There is evidence that the vasopressin and oxytocin neuropeptide systems, important for the establishment of social bonds and the regulation of emotional behavior, are profoundly affected by early social experience.⁴⁹ Extinction methods are also viewed as detrimental to demand-led breastfeeding in young babies as they can include the restriction of night-feeds.^{22,16}

Evidence from randomised controlled trials

A systematic review⁴⁰ that included three different RCT studies found that extinction methods may be effective in reducing night-wakings in both the short-term and longer-term. One of these studies,³⁵ involving babies who were 18 months or older, found that the use of graduated extinction was more effective ($p < 0.001$) in reducing settling problems compared with the control. Another of the studies,³⁶ on babies who were nine months and older, looked at the number of wakings per night and found that graduated extinction resulted in large reductions in night-waking over the course of the trial. This study had two treatment groups, one using graduated extinction and another using graduated extinction with additional support in the form visits. There was no difference between the group with additional support and the group without. Unfortunately, there was no untreated control group with which to compare results. The last of the three studies included in the review, which looked at babies aged six months and older, also found that graduated extinction reduced the number of night wakings per week compared with the control group ($p < 0.05$).³⁴ At six weeks follow up,

two of the trials^{35,34} showed that treatment effects had been maintained. A meta-analysis was not undertaken as it was felt to be inappropriate due to the heterogeneity of the subjects, treatments and outcome measures.

A further two RCTs^{38,37} published after the systematic review and one non-randomised intervention study³⁹ have also provided evidence that extinction methods reduce night-waking. One small, poor quality RCT³⁸ of 67 babies with a mean age of 9.8 months found statistically significant results using a graduated extinction method. Initially babies were said to be randomly allocated to a treatment group (n=39) or control group (n=28); however, no details of the randomisation method are provided and the last eight babies to be recruited were all included in the treatment group, as parents were said to have heard about the treatment and requested it. The intervention was a two-step programme where, at first, the baby was taught to fall asleep by him/herself at bedtime. Once the baby had successfully achieved this, the baby was taught to go back to sleep alone after night-wakings. It was found that the number of night-wakings in the treatment group decreased significantly within two weeks after intervention. At the three month follow up, time awake during the night was reduced from 82 minutes before the intervention to 18 minutes ($p < 0.001$). At three months all parents in the treatment group, with the exception of one couple, reported that their baby's sleep had improved.

The other RCT³⁷ of 156 mothers with babies aged 6-12 months involved three sessions of parent education on controlled crying, with information on how to reduce night-feeds over a 7-10 day period if this was the reason for the night-waking. It was found that after two months more sleeping problems had been resolved in the intervention than the control group (53/76 vs. 36/76, $p > 0.005$).

Evidence from non-randomised and observational studies

The non-randomised intervention study³⁹ of a residential sleep clinic programme for babies aged 8-12 months using the controlled crying technique

found that after four nights stay at the clinic all babies' sleep had improved. Eleven of the twenty-three babies slept for long stretches without disturbance and the others woke briefly at night only once or twice. At one month follow up, there was a significant decrease in night-wakings, and at three months follow up, 20 out of 23 babies were sleeping well at night (as defined by the parent).

Despite the apparent success of controlled crying in improving babies' sleeping, many parents will still remain concerned about the use of such methods, and their wishes need to be respected.

Bed-sharing and breastfeeding

Another very different approach to minimising disturbed nights involves the baby being placed to sleep in a cot attached to the side of the parents bed or sharing the same bed so that night feeds can be given lying down with very little disturbance. This is often referred to as 'co-sleeping' or bed-sharing. Some parents' sleep with their baby throughout the night and others start the night with the baby in a cot but take the baby into bed when s/he wakes. In the UK, bed-sharing during the first few months is associated more with breastfeeding mothers (61%) than mothers who use formula (38%).^{50,18}

Bed-sharing is a way parents have been responding to their babies' and their own needs in cultures around the world for thousands of years. It is therefore debatable whether bed-sharing should be tested as an intervention or the historical norm from which other behaviours should be compared. Three observational studies have shown that bed-sharing is used by some breastfeeding parents as a solution to the disruption frequent night-feeding can cause.^{2,18,33} One observational study³³ of 33 mothers, evaluating whether mothers' sleep patterns change if they bed-share with their newborn, found that breastfeeding mothers who shared the same bed for any part of the night with their four week old baby slept for longer duration than those who did not ($p=0.003$). Both studies^{33,18} found the act of bed-sharing had a positive impact on the maintenance of breastfeeding. A small qualitative study about mothers'

experience of sleep in the first three months found that almost half ($n=8$, 40%) changed to bed-sharing to improve their own sleep and another 15% combined in-room and bed-sharing to improve their sleep.²

Current policy in the UK is to discourage parents from bed-sharing because of fears that cot death may be increased. However, evidence suggests that provided that the parents have not been smoking, drinking or using drugs, and are not obese, bed-sharing is no less safe than putting the baby to sleep in a separate room.⁵¹ An eight-year study of risk factors for SIDS found that bed-sharing was safer than falling asleep with a baby on a sofa or armchair.⁵² The main risk factors for bed-sharing were low birth weight ($p<0.001$), when the mean tog value of bedding is greater than 10 and if the parents smoked (6.6 times greater risk). Benefits of bed-sharing are that the baby is able to breastfeed without disturbing the mother and is soothed by the presence of a parent. As a result, the baby is likely to cry less, enabling the parents to get more sleep.⁵³ Around half of all UK mothers sleep in bed with their baby at some time (48%)⁵⁰ so it is important for parents to know how to share their bed as safely as possible, and to know about the circumstances when bed-sharing has been shown to involve increased risks.

The Department of Health advises that bed-sharing should be avoided if one or both parents:

- is a smoker
- has consumed alcohol
- has taken mind-altering drugs or drowsiness-inducing medication
- is excessively tired
- or the baby has a fever or any signs of illness.⁵⁴

Obesity has also been highlighted as a risk for co-sleeping.⁵⁵

Routine bed-sharing is thought by some to reduce a child's ability to sleep independently.^{15,23} There is limited evidence to suggest this; however, one study⁵⁶ of 83 mothers of preschool age children found that compared with solitary sleepers from birth, babies who routinely co-slept from birth either learnt or accepted sleeping alone about a year

later than babies who were placed to sleep in their own room from birth.

Conclusion

Frequent night-waking can be disruptive to parents and may result in tiredness and fatigue. There is a wide range of advice and information available to parents on night-time baby sleeping behaviour. Newborn and very young babies are unable to tell the difference between night and day and are likely to wake at night to feed. However parents may feel pressurised to have their baby sleeping through the night from a young age, as a consequence of their own needs or comments from others. A number of interventions are available to help parents, with varying levels of effectiveness and acceptability. Those who advocate behavioural interventions tend to recommend that the spontaneous offering of comfort in the early days needs to be balanced with a gradual setting of limits. This, they argue, will help the baby gradually learn how to settle to sleep alone and self-soothe when s/he awakes at night.¹⁹ A very different approach to reducing disturbed nights is to co-sleep with the baby. Different approaches appeal to different styles of parenting, with some parents preferring gentle techniques that develop expectations of separation for settling to sleep, some using controlled crying, and others opting for closer physical contact for longer, including bed-sharing.

Key points

- Night-waking in the early weeks and months is common. About 20% of parents in the UK say they experience difficulties with their baby's sleeping in the first year.
- In the early weeks and months, babies need to feed frequently to ensure adequate growth and development. For these reasons it is likely babies will sleep for shorter stretches at first, increasing in duration as they get older.
- Parental behaviour, such as holding, rocking or feeding the baby to sleep, can lead to the baby becoming reliant on this behaviour to go to sleep at

night, and when s/he awakes during the night.

- Babies can be encouraged to go to sleep without their parents present. Strategies include placing the baby awake in his/her cot at bedtime, introducing a bedtime routine and use of a favourite toy or comfort blanket. These techniques are found to increase the proportion of babies who go to sleep without parental presence and the length of time babies sleep at night. They are also acceptable to many parents.
- There is some evidence that introducing a focal feed between 10pm and midnight can help the baby sleep for longer stretches at night without waking. This method is acceptable to parents and can be used for both breastfed and formula fed babies.
- 'Extinction' methods that involve leaving the baby to cry before he or she goes to sleep are associated with babies sleeping for longer stretches at night. However, they are controversial among health professionals and many parents are unwilling to leave their baby crying.
- Co-sleeping is found to help maintain breastfeeding at night and result in reduced sleep disruption for both the baby and parents. It is important for parents who choose to co-sleep, to do so safely and to avoid the situations and circumstances that may lead to increased risk for babies.

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