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Sleep problems in childhood: Understanding and addressing sleep disturbances in neurodevelopmental disorders

Abstract

Sleep is a fundamental pillar of health, crucial for cognitive, emotional, and physical development in childhood, as well as across the lifespan. Sleep disturbances are prevalent in typically developing children, but they are significantly more common, severe, and persistent in children with neurodevelopmental disorders (NDDs), including autism spectrum disorder, attention deficit hyperactivity disorder, developmental language disorder, and dyslexia. These sleep problems often form a vicious cycle, where the core symptoms of the NDD disrupt sleep, and resulting sleep deprivation exacerbates the same cognitive, behavioural, and emotional challenges. This article provides a comprehensive review of the complex interplay between sleep and NDDs. The authors examine the unique sleep profiles associated with specific disorders, explore the underlying neurobiological and behavioural mechanisms, and detail the profound impact on child and family wellbeing. Furthermore, they synthesise evidence-based strategies for assessment and intervention, advocating for a tailored, multidisciplinary approach to manage these complex and often debilitating sleep disturbances.

KEY WORDS: Sleep health · Sleep problems · Public health · Autism spectrum disorder · Attention-deficit/hyperactivity disorder

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Sleep is not merely a passive state of rest; it is an active, highly organised process that is indispensable for healthy development. Sleep health is characterised by a number of features, including consistency, few disturbances, and sufficient sleep quantity, and requires sociocultural as well as individual support (Buysse, 2014). During sleep, the brain consolidates memories, regulates emotions, clears metabolic waste, and supports immune function (Stickgold, 2005). The authors recently provided an overview of common sleep behaviours in children, in this journal (Horton and Weighall, 2025). While a significant minority of typically developing children experience transient sleep problems, the prevalence among children with neurodevelopmental disorders (NDDs) is strikingly high, with estimates suggesting that up to 80% of this population experiences chronic and clinically significant sleep disturbances (Mazurek and Petrosky, 2015).

These are not minor difficulties. They encompass a wide range of issues, from profound difficulties initiating and maintaining sleep to parasomnias and circadian rhythm dysregulation. The relationship between NDDs and poor sleep is now understood to be bidirectional: the neurobiological and behavioural characteristics inherent to disorders such as autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD) predispose children to sleep problems, while the consequent sleep deprivation feeds back to worsen core symptoms, such as inattention, emotional dysregulation, and repetitive behaviours (Vélez-Galarraga et al, 2016; Souders et al, 2017; Kim et al, 2024a). This reciprocal relationship creates a significant barrier to a child's progress and places enormous strain on family resources and wellbeing, not least by disturbing the sleep health of carers and parents. Furthermore, its cyclical nature reflects how maladaptive behaviours may worsen over time, if not appropriately supported.

This article aims to provide a detailed exploration of this critical issue. The authors will first discuss the complex mechanisms underlying sleep disturbances in NDDs (Table 1), followed by an in-depth review of the specific sleep phenotypes observed in ASD, ADHD, developmental language disorder (DLD) and dyslexia. Finally, the authors will outline a framework for evidence-based interventions, highlighting the necessity of individualised, multi-component support for these children and their families, which aims to disrupt the cycle of poor sleep, leading to challenging behaviours in children with NDDs (Figure 1).

Complexities of sleep in neurodevelopmental disorders

The sleep problems seen in children with NDDs are multifaceted, stemming from an interplay of genetic, neurobiological, sensory, and behavioural factors.

Sleep disturbance as a core feature

While not always a formal diagnostic criterion, disturbed sleep is a pervasive associated feature across most NDDs. For instance, the *Diagnostic and statistical manual of mental disorders*, 5th edn (DSM-5) (American Psychiatric Association, 2013), notes that sleep problems are common in ADHD, often related to difficulty settling or an internal sense of restlessness. In ASD, while not a core diagnostic

symptom, sleep disturbance is one of the most frequently reported and challenging co-occurring conditions (Mazurek and Petrosky, 2015). The near-universal presence of sleep problems suggests shared underlying pathways, potentially related to arousal regulation, a core challenge in many of these conditions (Veatch et al, 2017).

Atypical sleep architecture and regulation

Research using polysomnography (PSG) has revealed subtle but significant differences in the sleep architecture of children with NDDs relative to neurotypical children. PSG is a comprehensive sleep assessment technique that records brain activity, eye movements, muscle tone, and other physiological signals. Children with ASD, for example, often show a reduced proportion of rapid eye movement (REM) sleep, which is critical for emotional regulation and memory consolidation (Kim et al, 2024b). Such findings highlight how alterations in REM sleep may contribute to the difficulties with emotional processing, learning, and daytime functioning often reported in children with neurodevelopmental disorders.

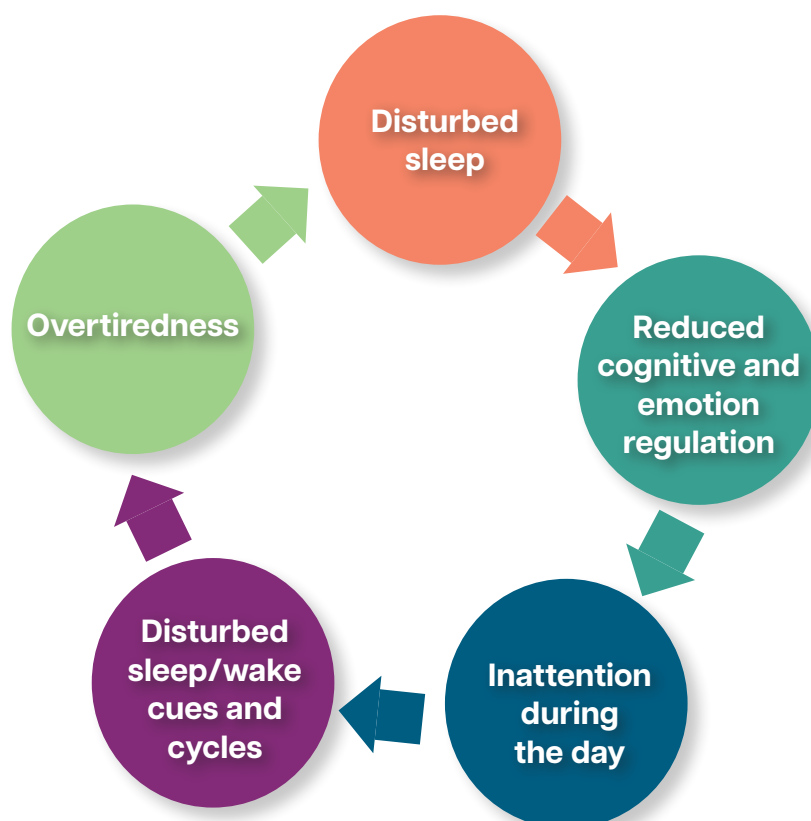
Furthermore, dysregulation of the circadian system is a prominent theory. Melatonin, the hormone that signals sleep onset, often has an atypical secretion profile in children with ASD and ADHD, with a later onset and lower peak levels (Bruni et al, 2025).

Table 1. Typical sleep disturbances associated with some neurodevelopmental disorders

Neurodevelopmental disorder	Commonly associated sleep disturbances
Autism spectrum disorder (ASD)	Extreme difficulty settling, prolonged sleep latency, frequent and prolonged night wakings, early morning waking. High rates of insomnia and parasomnias
Attention deficit hyperactivity disorder (ADHD)	Difficulties with sleep onset due to hyperactivity and restlessness, delayed sleep phase, restless sleep, more frequent night wakings. Often co-occurs with restless legs syndrome (RLS) and periodic limb movement disorder (PLMD)
Developmental language disorder (DLD)	Increased prevalence of behavioural sleep problems (e.g. bedtime resistance), nightmares, and sleep-disordered breathing. Sleep difficulties linked to memory consolidation
Dyslexia	Higher rates of reported sleep problems compared to typical readers. Potential link between sleep architecture and the consolidation of phonological skills.

This neurobiological difference provides a direct explanation for the common clinical report of children

Figure 1. The cycle of disturbed sleep and inattention



‘Melatonin, the hormone that signals sleep onset, often has an atypical secretion profile in children with autism spectrum disorder and attention deficit hyperactivity disorder, with a later onset and lower peak levels. This neurobiological difference provides a direct explanation for the common clinical report of children who simply do not appear tired at a conventional bedtime.’

who simply do not appear tired at a conventional bedtime. This may lead to difficulties with maintaining a consistent routine, or a routine that aligns with the bedtimes of siblings and others within the household.

The bidirectional relationship:

The interplay between NDD symptoms and sleep is a classic ‘chicken-and-egg’ scenario. For example, the sensory hypersensitivity common in autism can make a child acutely aware of minor noises, light changes, or the texture of their bedding, making it difficult to relax and fall asleep (Mazurek and Petrosky, 2015). Their preference for routine can be disrupted by daylight saving or a holiday, leading to significant sleep disruption. In turn, the resulting sleep deprivation lowers the threshold for sensory overload and increases insistence on sameness the following day.

Similarly, the hyperactivity and impulsivity of ADHD make it hard to wind down, while sleep deprivation dramatically worsens inattention and impulsivity in the classroom. Furthermore, both sleep disturbances and NDDs, especially ADHD and autism, frequently co-occur with anxiety. As above, the cyclical and bidirectional interplay between disturbed sleep and anxiety can exacerbate challenging behaviours, such as inattention, emotion dysregulation, and hypersensitivity (Mazurek and Petrosky, 2015).

Common sleep issues in specific neurodevelopmental disorders **Autism spectrum disorder (ASD)**

The prevalence of sleep problems in autistic children is estimated to be between 50% and 80%, a rate more than double that of their neurotypical peers (Mazurek and Petrosky, 2015). The most common issues are severe insomnia, characterised by a sleep latency of over an hour, and fragmented sleep with multiple, prolonged night wakings.

Underlying factors are diverse. Genetic studies have identified associations with genes involved in the melatonin signalling pathway (e.g. ASMT) (Veatch et al, 2017). Co-occurring anxiety is extremely common and directly contributes to bedtime fears and night-time wakings. Gastrointestinal issues, also prevalent in ASD, can cause physical discomfort

that disrupts sleep. Critically, sensory processing differences are a major contributor; a child may be bothered by a distant hum, a crack of light under the door, or the feeling of a pyjama seam (Mazurek and Petrosky, 2015).

Strategies for sleep-improvement must be highly individualised. Behavioural interventions based on applied behaviour analysis (ABA) for children with ASD have shown success, but must be modified to be sensitive to the child’s communication and sensory needs. The use of visual schedules for the bedtime routine can be highly effective. Melatonin supplementation has the strongest evidence base of any pharmacological intervention for sleep in ASD and is widely recommended by clinicians, often leading to significant improvements in sleep latency (Rossignol and Frye, 2011).

Attention deficit hyperactivity disorder (ADHD)

The relationship between sleep difficulties and ADHD, is complex, and bi-directional. Estimates of prevalence vary but consistently suggest they are common. In a large cohort of adolescents with ADHD ($n=262$) the majority (72%) were reported by parents to experience clinically significant overall sleep difficulties, (Langberg et al., 2020; assessed by the Children’s Sleep Habits Questionnaire (CSHQ; Owens et al, 2000). However, when individual sleep domains were examined, specific problems were relatively low, with the notable exception of daytime sleepiness, which affected between one-fifth and almost half of the cohort. This suggests that the high rates of ‘sleep problems’ in ADHD may be largely attributable to excessive daytime sleepiness. Further analyses indicated that reduced time in bed, bedtime resistance, and symptoms of inattention and sluggish cognitive tempo (SCT; defined as a cluster of behaviours characterised by daydreaming, mental foggiess, slowed thinking, and hyperactivity [Barkley, 2014]) were key predictors of this outcome.

Many children with ADHD exhibit a physiological tendency towards a later sleep-wake cycle, known as delayed sleep phase syndrome. This is not a behavioural choice, but a biological predisposition, making it exceptionally difficult for them to fall asleep

at a socially conventional bedtime required for school.

The core symptom of hyperactivity presents a major barrier to the calming state needed for sleep onset. This is often described as the child being 'tired but wired'. Restless legs syndrome (RLS) and periodic limb movement disorder (PLMD) also have a higher prevalence in this population, leading to fragmented, non-restorative sleep (Cortese et al, 2009). The impact of stimulant medication is also a key consideration; while important for managing daytime symptoms, if the dose is too high or administered too late in the day, it can substantially delay sleep onset.

Effective strategies include meticulous sleep hygiene, with a focus on a highly predictable, calming pre-sleep routine. Timed light exposure in the morning can help to advance a delayed circadian rhythm. For medication-related insomnia, consultation with the prescribing physician is crucial to adjust the timing or formulation of the stimulant. Parent-led behavioural interventions that establish firm bedtime boundaries are also highly effective.

Developmental language disorders and dyslexia

While less studied than in ASD or ADHD, a growing body of evidence indicates that children with specific learning disorders, including DLD and dyslexia, experience higher rates of sleep problems (Hysing et al, 2016). The relationship is thought to be intrinsically linked to the role of sleep in memory consolidation. Sleep, particularly non-rapid eye movement (NREM) sleep with its characteristic sleep spindles, is vital for consolidating newly learned information, including linguistic rules and phonological skills (Gais and Born, 2004; Stickgold, 2005).

For children with DLD, poor sleep may interfere with the consolidation of vocabulary and grammatical structures, hindering their language development. For children with dyslexia, disrupted sleep may impair the neural processes that support the mapping of sounds to letters. Furthermore, the daily academic struggle and associated anxiety can manifest as bedtime resistance and nightmares, further fragmenting sleep.

Interventions should focus on parent education about the critical link between sleep and learning. Creating a positive, language-rich and low-pressure bedtime routine (e.g. shared reading of picture books) can be beneficial. Relaxation and mindfulness techniques can help manage the anxiety that often fuels sleep difficulties in these children.

The broader impact on family and functioning

The impact of a child's chronic sleep problems extends far beyond the child themselves. Parental sleep deprivation is the norm, leading to significant maternal and paternal stress, anxiety, and depression (Meltzer and Mindell, 2014). The nightly battles over bedtime and frequent wakings can strain marital relationships and limit opportunities for social engagement, leading to family isolation.

In the educational setting, the effects are profound. A sleep-deprived child with an NDD will have even

greater difficulty with attention, working memory, and emotional regulation than they do at baseline. This can lead to increased classroom disruption, difficulty accessing the curriculum, and strained peer relationships, often resulting in misinterpretation of behaviour as 'oppositional' when it is, in fact, a physiological consequence of exhaustion (Souders et al, 2017).

Interventions and support for families

Despite these challenges, support can be available for children with NDDs, as well as their families.

Addressing sleep in children with NDDs requires a comprehensive, multi-component approach. Clinical guidance recommends that non-pharmacological, parent-directed interventions should be the 'first port of call', after medical and respiratory causes have been excluded (Scantlebury et al, 2018). However, a 'one-size-fits-all' model is likely to fail, as systemic sleep difficulties impact on waking activity in different ways for different individuals and may also have developed in response to differing cues. Systematic reviews and meta-analyses of sleep-improvement interventions in young people emphasise that cognitive as well as behavioural elements are more effective than behavioural, or education-based interventions alone. Complex, multi-component interventions are less effective than interventions with a single focus (Baron et al, 2021).

Prioritising sleep is in a carer's best interests, not as a selfish act, but as one that can ensure a carer is suitably equipped and resilient to support sleep for their child(ren) with NDDs. The authors recommend considering the following evidence-based aspects to maximise the likelihood of interventions being successful in improving sleep:

Awareness of and openness to sleep improvements

Although education campaigns about the importance of sleep alone may not be sufficient to empower carers, educators and parents to improve sleep in children with NDDs, it is an important backdrop to any intervention. Understanding the nature of sleep and its crucial contribution to a healthy overall system (along with eating well and being active) means that any explicit or implicit biases against sleep can be remedied – for instance, that sleep is for lazy people.

This awareness needs to be coupled with a motivation to support sleep health, and an openness to working to improve it. As with any element of behaviour change, it can take time for improvements to become adopted into a new routine, and persistence and positivity are required to assist with this.

Comprehensive assessment

The first formal step is a thorough assessment, including a detailed sleep diary, history of the problem, and screening for co-occurring medical issues such as sleep-disordered breathing, RLS, or epilepsy.

Behavioural interventions

Behavioural interventions are the cornerstone of

treatment. They include:

- Consistent routines: establishing a predictable, step-by-step bedtime routine using visual aids (for children with ASD or DLD). Routines promote consistency and a resistance to change them should there be occasional bad nights; and they help to form enduring habits
- Systematic fading: gradually making bedtime earlier, in small, manageable increments (15 minutes every few days)
- Positive reinforcement: using reward charts for staying in bed or following the routine
- Graduated extinction: this 'camping out' method, where a parent sits in the room and gradually moves further away over successive nights, can be effective, but must be implemented sensitively.

Environmental modification

Adapting the sleep environment to the child's sensory needs is critical. This may involve blackout blinds, white noise machines, weighted blankets, or ensuring pyjamas are seamless. Evidence suggests that electronic media use is negatively associated with sleep quality (Olaith et al, 2024), so reducing use of such media within 90 minutes before bed may reduce both pre-sleep cognitive stimulation and blue light exposure.

Medical interventions

When behavioural and environmental strategies are insufficient, medical intervention may be necessary. Melatonin is the most common and best-supported option, particularly for sleep-onset difficulties in ASD and ADHD (Rossignol and Frye, 2011). Other medications, such as alpha-2 agonists (clonidine, guanfacine) or iron supplements (for confirmed RLS), may be considered by a paediatrician or psychiatrist with expertise in NDDs.

Multidisciplinary collaboration

Optimal care involves a team approach. A paediatrician can rule out medical causes, a psychologist can guide behavioural therapy, an occupational therapist can provide sensory-based strategies, and close communication with the child's school ensures that daytime strategies are aligned with the goal of improving sleep.

Evidence-based programmes and support for families

Given the complexity of sleep problems in NDDs, structured, evidence-based programmes are often more effective than standalone advice. However, it is crucial to acknowledge the state of the research field. Non-pharmacological interventions have been evaluated; however, a recent umbrella review and meta-analysis concluded that the evidence base is hampered by clinical heterogeneity and poor study quality, with most studies being at high or unclear risk of bias. This makes it difficult to draw definitive conclusions on effectiveness and highlights an urgent need for more robust research. The review also noted a lack of consistency in outcome measures used, further complicating comparisons between studies (Hornsey et al, 2025).

Despite these limitations, the existing research points towards parent-directed psycho-educational programmes as a promising approach. Scantlebury and colleagues (2018) categorised these into a useful typology:

- Comprehensive, tailored interventions: these involve a detailed assessment that informs a specific sleep-management plan for the individual child and family. They include training on sleep hygiene and behaviour management, alongside ongoing implementation support for parents
- Comprehensive, non-tailored interventions: these use a standardised, comprehensive training curriculum, which may include support for parents to apply the general principles to their own child
- Non-comprehensive interventions: these focus on a single topic, such as bedtime routines or a specific behavioural strategy.

A leading approach that typically falls into the 'comprehensive tailored' category is cognitive behavioural therapy for insomnia (CBT-I), adapted for children and their specific needs.

Cognitive behavioural therapy for insomnia for children

Cognitive behavioural therapy for insomnia (CBT-I) is the gold-standard treatment for insomnia in adults, and has been successfully adapted for paediatric populations, including those with NDDs (Paine and Gradsar, 2011). It is a multi-component therapy that moves beyond simple sleep hygiene to address the maladaptive thoughts and behaviours that perpetuate sleep problems. For children, the therapy is delivered primarily through the parents, who act as co-therapists. Key components include:

- Cognitive restructuring: this involves identifying and challenging unhelpful thoughts and beliefs about sleep. For a child, this might be a fear of the dark, or a belief that they 'can't' fall asleep without a parent present. For a parent, it could be catastrophic thinking about the consequences of another bad night. The therapist helps the family reframe these thoughts into more realistic and positive ones (e.g. 'The dark is safe, and my body knows how to sleep'). Behavioural strategies are the core of the intervention and include several techniques:
- Stimulus control: the goal is to re-associate the bed/bedroom with sleep and sleep only. This means the bed should not be used for homework, playing on a tablet, or as a place for 'time out'. If the child is unable to fall asleep after a set period (e.g. 20 minutes), they are guided to get out of bed and do a quiet, calming activity elsewhere, returning to bed only when sleepy. This breaks the cycle of lying in bed feeling frustrated and anxious.
- Sleep restriction/compression: this technique temporarily limits the amount of time the child is allowed to spend in bed to more closely match their actual sleep time. For instance, if a child is in bed for 10 hours, but only sleeps for 8, their time in bed might be restricted to 8.5 hours initially. This mild sleep deprivation increases the homeostatic sleep drive, making it easier to fall asleep and stay asleep.

As sleep efficiency improves, the time in bed is gradually extended. This must be done carefully under professional guidance (Gradisar et al, 2014).

- Relaxation training: children are taught techniques to reduce the physiological and cognitive arousal that interferes with sleep. This can include diaphragmatic breathing (e.g. 'belly breathing'), progressive muscle relaxation, or guided imagery.

Adapting cognitive behavioural therapy for insomnia for neurodevelopmental disorders

For children with NDDs, standard CBT-I protocols require significant adaptation. For an autistic child, instructions must be concrete, literal, and often supported by visual aids. Sensory sensitivities must be paramount when implementing stimulus control (e.g. ensuring the 'quiet activity' space has appropriate lighting and low sensory input). For a child with ADHD, the behavioural components need to be highly structured and motivating, often incorporating more immediate rewards. Parent training is even more critical, focusing on consistency, patience, and managing their own stress.

Parent training programmes and key strategies

Beyond formal CBT-I, several evidence-based parent-training programmes have demonstrated efficacy in managing paediatric sleep problems. These programmes often package behavioural strategies into a structured curriculum for parents. Key strategies taught in these programmes include:

- Faded bedtime with response cost: a gentle but effective method, where bedtime is temporarily set to when the child naturally falls asleep, even if it is very late. Once the child is falling asleep quickly at this late hour, the bedtime is moved earlier by 15-minute increments every few days. 'Response cost' involves briefly and calmly removing a privilege or favourite object if the child leaves their room after being put to bed.
- The bedtime pass: a strategy for children who make frequent curtain calls after bedtime. The child is given a single 'pass', which they can exchange for one final request (e.g. a drink of water, one last hug). Once the pass is used, no further requests are granted. This gives the child a sense of control, while establishing clear limits (Moore et al, 2007).
- Developing positive routines: all evidence-based approaches emphasise the power of a predictable, positive, and calming bedtime routine. The key is consistency. The routine should last 20–30 minutes, move from more active to more calming activities, and end in the child's bedroom. This signals to the brain and body that sleep is approaching.

Supporting families involves not just teaching these techniques, but also providing emotional support and validation. Acknowledging the exhaustion and stress that parents are under is a crucial first step in building a therapeutic alliance and empowering them to implement strategies consistently (Meltzer and Mindell, 2014).

Conclusions

Sleep disturbances in children with neurodevelopmental disorders are not a peripheral issue, but a core challenge that profoundly impacts on child development, academic achievement and family wellbeing. The relationship is complex and bidirectional, requiring a nuanced understanding of the interplay between a child's neurobiology, their environment, and their behaviour. While the challenges are significant, effective, evidence-based interventions are available. By moving beyond generic sleep hygiene advice and adopting individualised, multi-component interventions that combine behavioural, environmental, and, where appropriate, medical approaches, meaningful support can be provided.

Many recommended treatments involve a component of education about the importance of healthy sleep for all members of the household, and the development of a robust and consistent sleep routine. The latter can create an enduring habit that is resistant to change, providing security for the child and reducing stress when sleep is a positive experience. However, those routines can only be developed when supported by other members of the household, both with a positive attitude to sleep, as well as a routine that works well for everybody. Addressing sleep therefore is not simply about ensuring a quiet night; it is a powerful therapeutic intervention that can unlock a child's potential for learning, regulation, and overall quality of life. Future research should continue to focus on longitudinal outcomes and the comparative effectiveness of different tailored interventions for specific NDD populations, using robust methodologies

Key Points

- Sleep is important for physical and mental health, development and wellbeing
- Sleep should be prioritised in the family routine
- Future research and policy initiatives need to consider the barriers to doing this and how these might be overcome
- High-quality intervention development and evaluation are needed.

CPD questions

- Parental expectations of infant sleep are influenced by history, culture and advice from many other sources. How might these factors contradict and cause confusion for new parents, and how would you advise them?
- Given the potential negative impact of 'extinction'-based sleep training, what alternatives are more in line with responsive parenting approaches?
- How can new parents be supported to develop realistic expectations that align with normal infant sleep biology?

and consistent outcome measures to strengthen the evidence base. **JFCH**

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