




Examining Sleep and Mood in Parents of Children with Sleep Disturbances

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Objective: The current study examined sleep and mood associations in parents of children with sleep disturbances across a sample of typically developing children and children with neurodevelopmental disorders. The mediating effect of children's sleep on the relationship between parents' sleep and mood was also assessed. The study explored differences in parents' sleep based on whether 1) the child had a sleep disturbance, and 2) the child was typically developing or had a neurodevelopmental disorder.

Methods: A total of 293 parents of children aged 2–12 years completed an online questionnaire. Parental sleep was examined using the Pittsburgh Sleep Quality Index, the Glasgow Sleep Effort Scale and the Pre-sleep Arousal Scale, and mood was assessed using the Profile of Mood States-short form. Measures for children included the Child's Sleep Habits Questionnaire (CSHQ) and the Strengths and Difficulties Questionnaire.

Results: Across the overall sample, children's sleep disturbances were associated with parents' sleep disturbances, accounting for 22% of the change in parental sleep quality. Children's sleep partially mediated parents' sleep and mood. Significant differences were observed for sleep and mood outcomes in parents of children with sleep disturbances (CSHQ scores ≥ 41). However, no significant differences were reported for children's sleep disturbances and parents' sleep quality based on whether the child was typically developing or had a neurodevelopmental disorder.

Conclusion: Parents of children with sleep disturbances experience poor sleep and high pre-sleep arousal, indicative of insomnia. Given that these parents experience cognitive arousal and insomnia, it is recommended that parents' sleep problems are addressed and treated in clinical settings.

Keywords: mother's sleep, parent sleep, children sleep, sleep quality, family

Introduction

As one of the three key pillars of health alongside diet and exercise, sleep plays an important role in cognitive processing, behavior, physical and mental health.^{1–3} Sleep is a family concept with reciprocal sleep interactions observed between family members, home and the external environment.⁴ For instance, children can experience sleep disturbances if their parents have insomnia.⁵ Likewise, sleep disturbances in children can play a role in poor sleep or mood in parents.^{6,7} Nevertheless, sleep associations between parents and their children are seldom examined beyond infancy.⁸ Research in this domain largely focuses on poor sleep outcomes in parents with children with neurodevelopmental conditions or children with sleep disorders. This is despite of evidence that sleep problems are reported in 25–40% of typically developing, general paediatric populations,⁹ making it

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a paediatric public health concern.¹⁰ Since parents play a pivotal role in a child's upbringing, their sleep difficulties can have negative consequences for their child's development. Given the high incidence of sleep disturbances in children, it is crucial to examine how children's sleep disturbances are related to their parents' sleep difficulties, and if clinicians can offer high-quality, evidenced-based for treating sleep within families.

Generally, poor sleep in adults is related to impairments in daily mood,¹¹ increased anger¹² and hostility.¹³ In particular, parents' sleep problems and mood are associated with increased stress levels,¹⁴ interactions with their child,^{15–17} which then relates to parenting behaviors¹⁸ that in turn affect children's sleep.^{15,19} This can create a cycle where a child's sleep may influence a parent's sleep, affect their mood and subsequently impact parent-child interactions. For instance, in their study on links between mother-child negative behavior, Atzaba-Poria and colleagues²⁰ suggested that children could disrupt the emotional states of their parents, thus affecting their behavior – a process called parent-child mutual regulation. However, parental mood in the context of their child's sleep is less examined and less understood. Assessing whether sleep in children mediates the relationship between their parent's sleep and mood can help break the cycle and could improve overall family outcomes.

Some of the previous studies that have examined sleep associations in parents and typically developing (TD) children acknowledge the associations between the child's sleep disturbances and that of their parents across a broad age range.^{7,21–23} Meltzer & Mindell's study indicated that sleep disturbances in children predicted poor sleep quality and increased stress in mothers, and the associations were not influenced by the age of the child. However, the majority of previous studies do not examine multiple aspects of sleep in parents. For instance, constructs such as sleep effort, which reflects performance anxiety around sleep, heightened need to control sleep or putting too much effort into sleep,²⁴ have not been examined in parents. Similarly, pre-sleep arousal, which is measured as excessive worries about falling sleep and experiencing intrusive thoughts before sleep²⁵ needs to be studied further in context of parents. Reporting on these sleep outcomes can outline the characteristics and nature of sleep difficulties in parents. It can also highlight which sleep-related variables in both children and parents are associated with largest changes in parents' sleep quality.

Furthermore, there is a need to distinguish parents' sleep outcomes based on whether their child is TD or has a neurodevelopmental disorder (NDD). TD children usually experience behavioral sleep difficulties, such as bedtime resistance, and difficulties falling or staying asleep.²⁶ However, sleep difficulties disproportionately impact children with NDD, affecting up to 80% of children with Autism Spectrum Disorder (ASD) and 50% of children with Attention Deficit Hyperactivity Disorder (ADHD).²⁷ While these children may exhibit behavioral sleep difficulties, the aetiology of sleep disorders in these can be due to a combination of disease related factors, comorbidities and circadian rhythm.^{28,29} In particular, children with NDDs, such as ASD, may exhibit circadian sleep-wake rhythm alterations with increased nocturnal and early morning awakenings.²⁹ A study by Lopez-Wagner et al (2008) revealed that children with ASD display heightened sleep disturbances than TD children. While parent-child sleep was correlated across both groups, parents of children with ASD were more likely to experience increased sleep difficulties. Similarly, parents of children with psychomotor disorders may be severely impacted, with increased sleep disturbances, reduced mental and social functioning.³⁰ This is possibly due to the severity of the child's sleep problems, increased parental worries or hypervigilance.³¹ However, studies usually draw comparisons between children with NDD and TD children with no sleep difficulties making it difficult to distinguish parents' sleep outcomes based on the nature of their child's sleep disturbance. Overall, the adverse effects of sleep problems in TD children and children with NDD, along with their parents remain underreported.

Accordingly, the current study examined parent-child sleep in both TD and NDD populations. Our primary aim was to examine the associations between children's sleep, behavioral difficulties and age, and parents' sleep and mood outcomes. An objective of the study was to investigate whether children's sleep disturbances mediated the relationship between their parent's sleep and mood. Secondly, we aimed to explore the differences in parent's sleep outcomes based on whether the child 1) had a significant sleep disturbance, and 2) was TD or diagnosed with NDD. We hypothesize that 1) parents' sleep and mood would be associated with their children's sleep, behavioral difficulties and age, 2) children's sleep will mediate the relationship between their parent's sleep and mood, 3), parents of children with sleep difficulties will

have poorer sleep and mood outcomes than parents of children without sleep difficulties, and 4) parents of children with NDD will have significantly poorer sleep and mood than parents of TD children.

Methods

Participants

A total of 415 primary caregiving parents consented to participate and 293 (either mothers or fathers in a single household) completed this cross-sectional, online survey study (completion rate 70.60%). Ethics was obtained from Royal Melbourne Institute of Technology (RMIT) University's Human Research Ethics Committee and Department of Education, Victoria, Australia. Informed consent was obtained from the participating parent. The age range was 18 years or above for parents, and 2–12 years for the child. A broader age range was selected to examine if sleep associations in parents and their children are influenced by the age of the child. Participants were recruited from the local community using geographically targeted online advertisements on social media websites, and through flyers posted at schools or community centers. Recruitment advertisements included 1) targeting parents who perceived their children as “poor sleepers,” 2) targeting parents who perceived their children as “good sleepers,” and 3) targeting parents of children diagnosed with NDD. The parent responses on the survey were excluded if 1) the parent was diagnosed with a mental health condition, 2) engaged in shift work, or 3) were breast-feeding or had another child below the age of two years. Participants did not receive any inducements for completing the study.

Measures

A demographic questionnaire was designed to obtain information such as the age, gender, health conditions and general lifestyle of the parent and the child/ren. To ascertain whether the child had a NDD the following question was used, “Does your child have any of the following conditions that impacts their sleep?” The options were: 1) autism spectrum disorder 2) attention deficit hyperactivity disorder, 3) motor disorder, 4) specific learning disorder, 5) intellectual development disorder, 6) cerebral palsy, 7) Angelman syndrome, 8) Down's syndrome, 9) any sleep disorder such as sleep apnea, periodic limb movement disorder, sleep paralysis, parasomnias, insomnia, restless leg syndrome, etc., 10) any chronic

condition such as asthma, diabetes, 11) any other disorder not listed here, 12) only behavioral issues surrounding sleep (ie, no diagnosed medical or neurodevelopmental disorder that may impact their sleep). Option 8 referred to sleep disorders and option 9 referred to clinical conditions that may impact sleep that can impact both groups. Hence, parents could choose multiple options. Based on the responses, those who responded yes to any of the options 1–8 were classified as children with NDDs, and those who responded yes to option 12 were classified as TD children.

Measures for Children

Children's Sleep Habits Questionnaire (CSHQ) is a retrospective, 45-item parent-rated questionnaire used as a screening instrument that identifies both behaviorally-based and medically-based sleep problems in children (Owens, Spirito, and McGuinn, 2000).³² Items on this questionnaire are divided into eight subscales to reflect key areas of sleep disturbances in children. This includes bedtime resistance, sleep onset delay, sleep duration, sleep anxiety, night wakings, parasomnias, sleep-disordered breathing and daytime sleepiness. The authors of the questionnaire determined that a score of ≥ 41 correctly identifies 80% of patients with a diagnosed sleep disorder. The psychometric properties of CSHQ have been evaluated in both community and clinical samples (Johnson, Turner, Foldes, Malow & Wiggs, 2012).¹⁹

Strengths and Difficulties Questionnaire (SDQ) is a parent-reported behavioral screening tool for children that measures emotional symptoms, conduct problems, hyperactivity and inattention, peer relationship problems, and prosocial behavior. Two versions of the scale were used, one for children aged 2–4 years and the other for children aged 4–17 years. Both versions are scored in an identical manner, providing a total difficulties score from 0 to 40 (Goodman, Ford, Simmons, Gatward, and Meltzer, 2000).³³

Measures for Parents

Glasgow Sleep Effort Scale (GSES) is a seven-item questionnaire that measures sleep control and worries or anxieties related to sleep (Broomfield & Espie, 2005).²⁴ While sleep is an involuntary process, individuals with insomnia may display heightened need for control on sleep (Broomfield & Espie, 2006).²⁴ Items on this scale include behavioral and cognitive elements such as, “I worry about sleeping if I cannot sleep,” and “I get anxious about

sleeping before I go to bed.” Score ranges from 0 to 14, with higher scores demonstrating greater sleep effort. Internal consistency is 0.77.

Pittsburgh Sleep Quality Index (PSQI) assesses adult subjective sleep quality over the previous month across seven components: subjective sleep quality, sleep duration, sleep onset latency, sleep disturbances and daytime dysfunction. A cut-off score of >5 discriminates good and poor sleepers, with higher scores indicating poorer subjective sleep quality.^{34,35}

Pre-sleep Arousal Scale (PSAS) is a 16-item questionnaire that includes two subscales measuring cognitive and somatic arousal prior to sleep.²⁵ Sample items in the cognitive scale include, “being mentally alert or active,” and in the somatic scale sample items include, “tight, tense feeling in your muscles.” The subscales successfully discriminate insomniacs from normal sleepers with the internal consistency of 0.76 and 0.81 for both scales.²⁵

Profile of Mood States (POMS)-Short form is a validated, 37-item psychological scale used to assess distinct and transient mood states.³⁶ The test provides scores on six subscales: fatigue, vigor, tension, anxiety, depression, anger, confusion and is internally consistent with original POMS. Total scores are calculated to reflect the mood, with higher scores indicating mood disturbance.

Data Analysis

Data were analysed using SPSS Statistics 26 (IBM, Chicago, IL, USA). Pearson’s correlations were used to assess sleep and mood associations between parent-child dyads. Stepwise regression analysis was used to determine how different sleep measures were associated with the variance in parents’ sleep quality scores. Mediation analysis was used to explore if children’s sleep disturbances mediated the relationship between sleep and mood in parents, using the SPSS macro PROCESS.³⁷ Parents’ response to a question in the demographics section of the questionnaire was used to classify children into TD group or NDD group. Independent samples *t*-tests were used to compare group differences.

Results

Participant Characteristics

Parent-reported participant characteristics and summary of all outcome measures are summarized in Table 1. NDD conditions were reported by 85 parents (ASD=59, ADHD=12, other=14). Significant associations were

reported for sleep and mood in parents and sleep disturbances in children, but not with the age of the child (Table 2). We did a supplementary analysis based on different age-groups in children (preschoolers – 2–5 years; school-age – 6–12 years) and observed no significant differences in parents’ sleep based on the age-range of the child.

Following this, a stepwise regression was conducted to examine which sleep measures in parents and children predicted overall sleep quality in parents (N=284, nine participants were excluded because of lack of responses on GSES). The PSAS and GSES (which were measures used with the parent group), and the CSHQ (one of the children’s sleep measures) were added as independent variables (Table 3). The overall model was significant ($F(1, 283) = 82.32, p < 0.001$) with children’s sleep disturbances predicting the highest variance of 22% in parents’ sleep quality. Parents’ pre-sleep arousal contributed an additional 7% of the variance, and sleep effort predicted a further 1% change in the variance.

Child’s Sleep as a Mediator of Parent’s Sleep and Mood

Significant associations were observed between mood disturbance in parents and 1) parents’ sleep quality, and 2) children’s sleep disturbances across the overall sample. Children’s sleep disturbances significantly mediated the relationship between parents’ sleep and mood ($\beta = 0.30, t(276) = 2.68, p = 0.007$; bias-corrected percentile bootstrap method), accounting for 49.1% of the total effect. After controlling for children’s sleep, parent’s sleep quality was also significantly associated with parents’ mood disturbance ($\beta = 1.6, t(276) = 4.12, p < 0.001$). Therefore, the children’s sleep disturbance partially mediated the relationship between poor sleep quality and mood disturbance in parents (Figure 1).

Next, sleep in parents was further examined from the context of the children’s sleep disturbances. Parents of children with sleep disturbances (N=194) scored poorly on all sleep indices and had higher scores for total mood disturbance in comparison with parents of children with no significant sleep disturbances (N=99). No differences were observed for behavioral difficulties in children with or without sleep disturbance (Table 4).

Differences in Parent’s Sleep Based on the Presence of a NDD Condition

Sleep in parents was compared based on whether the child was in the TD group (N=206) or had an NDD condition (N=85). No significant differences were observed for overall

Table 1 Participant Characteristics and a Summary of Scores for All Outcome Measures (N=293)

	Values
Parent characteristics	
Age (years)	35.96±5.28 (20–49) ^a
Gender	
Male	23 (7.8%) ^b
Female	265 (90.4%) ^b
Missing	5 (1.7%) ^b
Other	0
Marital status	
Married/De-facto	264 (90.1%) ^b
Unmarried	0 (0%) ^b
Divorced/Separated	14 (4.8%) ^b
Do not wish to disclose	15 (5.1%) ^b
PSQI (parental sleep quality)	8.22±3.79
GSES (parental sleep effort)	5.30±3.45
PSAS (parental pre-sleep arousal)	
Cognitive	14.85±4.63
Somatic	12.53±7.5
POMS-SF (parental total mood disturbance)	15.03±22.80
Child characteristics	
Age (years)	6.19±2.38 (2–12) ^a
Typically developing children	206 (70.3%) ^b
Children with neurodevelopmental disorders	85 (29%) ^b
Co-sleeping (sleeping in the same room more than twice a week)	30 (10.23%) ^b
CSHQ (child's sleep disturbance)	46.32±12.79
SDQ (child's behavioural difficulties)	12.04±5.90

Notes: Scores for all outcome measures presented as means and standard deviations; ^aIndicates actual age-range for the participants; ^bIndicates the percentage value for the sample.

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; GSES, Glasgow Sleep Effort Scale; PSAS, Pre-sleep Arousal Scale; POMS-SF, Profile of Mood States-short form; CSHQ, Child's Sleep Habits Questionnaire; and SDQ, Strengths and Difficulties Questionnaire.

children's sleep disturbances scores ($t(289) = -1.26, p = 0.20$). Within CSHQ subscales, children with NDD demonstrated significantly higher scores for night-wakings ($t(288) = -2.20, p = 0.03$), parasomnias ($t(288) = -1.96, p = 0.04$) and increased daytime sleepiness ($t(288) = -2.19, p = 0.02$) than TD children. However, no significant differences were noted for bedtime resistance, sleep onset delay, sleep anxiety and sleep disordered breathing ($p > 0.05$ for all) between NDD and TD groups. Significant group differences were

Table 2 Pearson's Correlation Between Sleep Quality in Parents, Sleep Efforts, Pre-Sleep Arousal, and Sleep Disturbances in Children (N=293)

	PSQI Parental Sleep Quality	CSHQ Children's Sleep Disturbances
Parent measures		
Global PSQI Scores		0.47**
Subjective sleep quality		0.51**
Sleep latency		0.40**
Sleep duration		0.40**
Habitual sleep efficiency		0.34**
Sleep disturbance		0.30**
Use of sleeping medication		0.08
Daytime sleepiness		0.06
GSES (parental sleep effort)	0.35**	0.21**
PSAS (parental pre-sleep arousal)	0.47**	0.46**
Somatic arousal	0.33**	0.31**
Cognitive arousal	0.39**	0.45**
POMS (parents' total mood disturbance)	0.33**	0.29**
Tension	0.34**	0.23**
Anger	0.26**	0.26**
Fatigue	0.32**	0.30**
Esteem related affect	-0.21	-0.04
Depression	0.22**	0.20
Vigour	-0.01	-0.14
Confusion	0.29**	0.22**
Child measures		
Total CSHQ scores	0.47**	
Bedtime resistance	0.28*	
Sleep onset delay	0.06	
Sleep duration	0.12*	
Sleep anxiety	0.23**	
Night waking	0.18*	
Parasomnias	0.39**	
Sleep-disordered breathing	0.19*	
Daytime sleepiness	0.32**	
SDQ (child's behavioural difficulties)	-0.03	0.05
Child's age	0.07	0.08

Notes: *p-value significant at <0.05; **p-value significant at <0.001.

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; GSES, Glasgow Sleep Effort Scale; PSAS, Pre-sleep Arousal Scale; CSHQ, Child's Sleep Habits Questionnaire; SDQ, Strengths and Difficulties Questionnaire.

Table 3 Results from Stepwise Regression Conducted to Examine How Various Parent or Child Sleep Measures Predicted Changes in Parents Sleep Quality Measured Using the Pittsburgh Sleep Quality Index (N=284)

Variables	β	t	R	R2	$\Delta R2$	p-value
Model 1 CSHQ (children's sleep disturbance)	0.47	9.07	0.47	0.22	0.22	<0.001
Model 2 CSHQ (children's sleep disturbance) PSAS (parental pre-sleep arousal)	0.31	5.65	0.55	0.30	0.07	<0.001
Model 3 CSHQ (children's sleep disturbance) PSAS (parental pre-sleep arousal) GSES (parental sleep effort)	0.14	2.45	0.56	0.31	0.01	0.15

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; GSES, Glasgow Sleep Effort Scale; PSAS, Pre-sleep Arousal Scale; CSHQ, Child's Sleep Habits Questionnaire.

found for behavioral difficulties in children with NDD ($M = 13.21, SD = 6.32$) and TD children ($M = 11.51, SD = 5.65$; $t(246) = -2.1, p = 0.03$).

No significant differences were observed for parents' sleep quality ($t(289) = -1.84, p = 0.06$), pre-sleep arousal ($t(289) = -0.86, p = 0.38$), and total mood disturbance ($t(275) = -0.88, p = 0.37$) between NDD and TD groups. Parents of children with NDD did demonstrate increased sleep effort ($M = 6.05, SD = 3.97$) compared to parents of TD children ($M = 4.98, SD = 3.36$; $t(289) = -2.41, p = 0.01$). Following this, we ran a secondary analysis for sleep outcomes in parents across NDD and TD groups using scores on CSHQ ≥ 41 as cut-off. No significant differences were found between TD children (N=126) and children with a NDD (N=60) for overall sleep disturbances, behavioral difficulties, and parents' sleep quality, pre-sleep arousal, sleep efforts or mood ($p > 0.05$ for all).

Discussion

This study examined sleep and mood associations between parents and their TD children or children with a NDD.

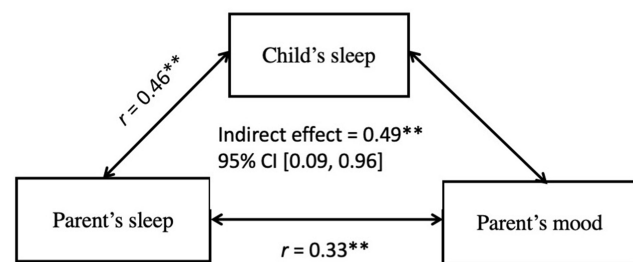


Figure 1 Mediation analysis (N=293) assessing if child's sleep disturbances mediated the relationship between parent sleep and mood. After controlling for parents' sleep quality, child's sleep disturbances accounted for 49.1% change in parents' mood. **p-value <0.01.

Across the overall sample, almost 80% of parents had poor sleep quality (PSQI scores >5), which suggests sleep problems endorsed by this sample of parents. A little over 65% of children had sleep disturbances (CSHQ ≥ 41). Sleep disturbances in children were associated with the largest variance in parents' sleep quality, accounting for 22% of the variance. In contrast, parents' own measures of pre-sleep arousal and sleep efforts predicted 8% and 1% variance in their sleep quality, respectively. Hence, the first hypothesis was partially supported as children's sleep disturbances were correlated to poor sleep quality, increased pre-sleep arousal and poor mood in parents, but children's age or behavioral difficulties were not related to parents' sleep and mood. These findings are similar to studies by Bacaro et al 2019, Boergers et al (2007), Meltzer et al (2007) and Urfer-Maurer et al (2017) that observed sleep associations between parents and their children regardless of the age of the child.

Children's sleep disturbances were also correlated with their parents' mood. Previous studies have revealed links between the child's sleep and mood,^{7,21} with research suggesting a further negative impact of parents' mood on parent-child interactions.^{14,16,17} However, to the authors' knowledge, this is the first study that shows how children's sleep partially mediates the relationship between the sleep and mood of their parents. Furthermore, increased scores on tension, fatigue and anger in parents were significantly related to children's sleep disturbances. This may be attributable to heightened stress in parents of children with sleep difficulties.^{7,21} Clinicians may consider monitoring parents' mood in the context of their child's sleep, offering resources and referrals when needed.

The hypothesis that parents of children with sleep disturbances would have poorer sleep outcomes compared to

Table 4 Differences in Parents' Sleep Quality, Pre-Sleep Arousal, Sleep Effort and Mood Based on Whether the Child Had a Sleep Disturbance

	Children with Sleep Disturbance (CSHQ ≥ 41)	Children without Sleep Disturbance (CSHQ < 41)	t	df	p	Effect Size Cohen's d
			Parent variables			
PSQI (sleep quality)	9.32 \pm 3.29	6.04 \pm 3.7	7.68	291	<0.001	0.93
PSAS (pre-sleep arousal)	36.53 \pm 10.66	28.71 \pm 10	6.06	291	<0.001	0.75
Cognitive arousal	22.43 \pm 7.35	15.07 \pm 6.73	6.06	291	<0.001	1.04
Somatic arousal	13.59 \pm 4.73	11.39 \pm 4.07	3.93	291	<0.001	0.49
GSES (parental sleep effort) ^a	5 \pm 3.5	4.51 \pm 3.22	2.83	282	<0.001	0.17
POMS (mood disturbance) ^a	17.43 \pm 23.45	9.75 \pm 20.73	2.62	282	0.009	0.34
Child variables						
SDQ (behavioral difficulties) ^b	12.06 \pm 5.61	12 \pm 6.55	0.07	247	0.94	0.00

Notes: ^aN=92 for children without sleep disturbances; ^bN=174 for children with sleep disturbances; N=75 for children without sleep disturbance.

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; GSES, Glasgow Sleep Effort Scale; PSAS, Pre-sleep Arousal Scale; POMS, Profile of Mood States; CSHQ, Child's Sleep Habits Questionnaire; SDQ, Strengths and Difficulties Questionnaire.

those without sleep disturbances was also supported. Similar to previous researches,^{7,21,23,31} this study noted that parents of children with sleep disturbances experienced poor sleep quality. It also observed greater sleep efforts and increased pre-sleep arousal in parents of children with sleep disturbances, both of which are considered indicative of insomnia. Parents of children with sleep disturbances had a cognitive pre-sleep arousal score of >20 , which is reportedly an indicator of sleep reactivity, reflecting vulnerability to stress-related sleep disturbances.³⁸ These high scores for cognitive and somatic pre-sleep arousal may be an indicator of chronic insomnia in these parents.

Group Differences Between TD Children and Children with NDD

Almost 30% of parents in the study reported that their child had a NDD. More than 70% of these children with NDD had CSHQ scores ≥ 41 , suggesting significant sleep difficulties in this population. ASD, ADHD and intellectual development disorder were commonly reported conditions. In comparison to TD children, children with NDD had significantly higher scores night-waking, parasomnias and daytime sleepiness, reflecting circadian abnormalities. Tordjman and colleagues have noted that children with autism or similar NDDs have disrupted sleep-wake rhythm and abnormalities in cortisol circadian rhythm that can explain their nocturnal awakenings and daytime sleepiness in this study.

While some key sleep differences were noted in children within TD and NDD groups, there were no significant differences in overall sleep disturbance scores across both groups.

Similarly, sleep in parents of children in TD and NDD groups did not differ, except for increased sleep efforts in parents of children with NDD. This largely contrasts with general consensus that parents of children with NDD have poorer sleep outcomes in comparison to parents of TD children. There are several explanations for these results. Firstly, parents experiencing significant distress about their child's sleep problems could be more likely to respond to the survey, and hence there were no differences in CSHQ scores between the two groups. Secondly, parents of children with an NDD may be more stressed by the child's diagnosis and managing that, rather than perceiving their child's sleep issues as problematic or disruptive. Thirdly, sleep issues in children are often underdiagnosed¹⁰, particularly in TD children. Hence, the severity of childhood sleep disturbances between the two groups may be unknown. There is a possibility that sleep disturbances in both NDD and TD groups are perceived as equally demanding or stressful by their parents. While there are resources for parents of children with NDD, there is a need to create more awareness about interventions available for sleep issues among TD children. Overall, parents in both groups must be encouraged to actively report their children's sleep disturbances. At the same time, clinicians must routinely inquire about role of children's sleep when treating sleep disturbances in adults.

Clinical Implications

This study adds to the current evidence that parent-child sleep is linked, reporting that parents of children with sleep disturbances may experience poor sleep outcomes.

It also shows that the age of the child may not be related to their parent's sleep, despite the differences in children's sleep patterns across different age groups. It is reported that untreated sleep disorders observed in infancy can transition to adulthood.³⁹ Hence, it is possible that younger children with untreated sleep difficulties may continue to have sleep difficulties as they get older, and parental involvement may continue. Therefore, clinicians must address parent-child sleep at the family level, regardless of the child's age.

Given that sleep is linked to daily functioning, poor sleep outcomes in parents can have negative consequences for the overall family environment, and their children's sleep or development.⁴⁰ Hence, intervening and treating parents' sleep difficulties can provide a conducive sleep environment for children. While children may continue to wake their parents, management tools such as cognitive behavior therapy for insomnia (CBT-I) can be used for parents. It has been shown that CBT-I helps with adult sleep by increasing sleep drive and altering maladaptive behaviors even when there are environmental factors outside the individual's control.⁴¹ Similarly, mindfulness-based sleep interventions can reduce cognitive arousal and improve insomnia severity.⁴² Both therapies may have potential utility for parents experiencing sleep disturbances or higher pre-sleep arousal. Considering that sleep problems may have ramifications for family functioning,⁴³ family-oriented sleep therapies may also be designed and tested within these populations.

Strengths and Limitations

One of the strengths of this current investigation is its broad sample population. While most of the past research has recruited control groups of TD children when examining sleep in children and parents with clinical conditions, it rarely compares sleep difficulties in TD and NDD paediatric populations. We quantified parent's sleep based on the nature of the child's sleep difficulties and suggest that all kinds of sleep difficulties in children are reported and effectively addressed.

The study also measures a wide range of sleep outcomes in parents (such as sleep quality, cognitive and somatic arousal, and sleep efforts). As discussed earlier, and sleep efforts and pre-sleep arousal have been largely ignored within the literature on parent-child sleep, despite the fact these factors may reflect chronic insomnia in adults. Systematic measurement of these outcomes can

help us understand the variables which should be targeted when addressing parents' sleep.

This research revealed an interesting potential mechanism, suggesting that children's sleep disturbances partially mediate the relationship between parents' sleep and mood. Given that this is a cross-sectional finding, future studies should consider incorporating a longitudinal approach to assess causal links between parents' mood and children's sleep.

Overall, parents of children with sleep difficulties have poorer sleep outcomes, including poor sleep quality, increased pre-sleep arousal and mood disturbances. Despite this, overgeneralizations should be avoided. Firstly, the results from this study reflect associations and thus it cannot ascertain causality. It is possible that while parent's sleep may be influenced by their child's sleep, children themselves can learn their sleep patterns from their parents.⁵ Hence, the mechanisms around parent-child sleep and its effect on family functioning requires further explication.

While the study population was drawn from the local community, there is a possibility of response bias. This is reflected in high rates of sleep disturbances in our sample of TD children (61%). The study relied on parental reports of their children's NDD diagnosis, and their child's sleep, allowing the possibility of attention bias, wherein poorly sleeping parents may overreport their child's sleep difficulties.

While all self-report measures in this study are valid and reliable, the inclusion of objective measures would help in verifying these subjective outcomes. Regardless, it is important to note that subjective measures such as poor sleep quality are defining features of chronic insomnia⁴⁴ and should not be ignored. Future studies should incorporate objective measures to investigate temporal associations between parent-child sleep, allowing both researchers and clinicians to implement treatments that respond to specific sleep-related issues.

A majority of participating parents in our study were married and most respondents were mothers, who are likely to be primary caregivers. Furthermore, determining the interplay between other environmental factors, such as co-sleeping, socio-economic status, housing situation, family chaos, and parent-child sleep was beyond the scope of this study. While the broader classification around the nature of child's sleep disturbance allowed clear analysis of parent's sleep outcomes, it needs further replication. Sleep issues in children with NDDs like ASD or

ADHD do stem from a range of biological factors, such as circadian rhythm abnormalities and low melatonin concentration.²⁸ However, they may be exacerbated by other poor sleep habits, poor limits on bedtimes and other family factors. Future research should account for these factors while characterizing different types of sleep disturbances in children.

Conclusion

Taken together, the results from this study reveal that parents may experience poor sleep quality and increased cognitive or somatic pre-sleep arousal when their children have sleep difficulties. These results also suggest that poor sleep outcomes may represent symptoms of chronic insomnia and sleep reactivity in these parents. Poor sleep in parents is linked to their mood and mediated by their children's sleep. Ultimately, poor sleep and mood in these parents can have pervasive consequences on the family's environment, which can exacerbate sleep disturbances in children and the impact a child's development. Hence, parents' sleep should be considered in the context of their child's sleep, with a particular focus on addressing sleep difficulties in parents. Family-focused sleep interventions or targeted parent's sleep interventions can have potential benefits for improved sleep health in parent populations with positive effects for the child. Future studies should use objective measures to corroborate these relationships and examine temporal associations in this dyad.

Disclosure

The authors report no conflicts of interest for this work.

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