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Relationship between child sleep problems in autism spectrum disorder and parent mental health and well-being

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ABSTRACT

Sleep problems are a common comorbidity in children and adolescents with autism spectrum disorder (ASD). The aim of this study is to determine how sleep problems affect not only the child with ASD, but parents also. Parents of 409 children and adolescents with ASD completed the Children's Sleep Habits Questionnaire, Pittsburgh Sleep Quality Index, Parenting Stress Index-Short Form, World Health Organization Quality of Life Abbreviated Version (WHOQOL-BREF), Hospital Anxiety and Depression Scale, and the Multidimensional Scale of Perceived Social Support. The majority (86.6%) of parents presented with poor sleep. The majority (95.3%; $n = 387$) of children presented with sleep problems, while 4.7% ($n = 22$) did not have sleep problems. A cross-sectional within-subjects research design was utilised, with the following analyses conducted: Pearson correlations, chi-square tests, t-tests, and MANOVAs. Relationships were found between child sleep problems and parent sleep problems, specifically child parasomnias, sleep duration, night wakings, and sleep onset delay. Parents of children with sleep problems experienced more parenting stress, specifically on the Difficult Child and Parent-Child Dysfunctional Interaction subscales of the Parenting Stress Index-Short Form. Parents of children and adolescents with sleep problems had significantly higher levels of anxiety and depression than parents of children and adolescents who did not have sleep problems. A relationship between sleep problems and lower quality of life was found. Parents of children with sleep problems received significantly lower scores on the WHOQOL-BREF domains of Physical Health, Psychological and Environment than parents of children without sleep problems. There was no significant difference found between parents of children with or without sleep problems on perceived social support. The current study demonstrated how child sleep affects parental well-being. While sleep problems are one comorbid condition in ASD, future research is needed to determine the impact of other comorbidities in parents of children and adolescents with ASD.

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1. Introduction

1.1. Sleep problems in ASD

Sleep problems are a common comorbid disorder in children and adolescents with autism spectrum disorder (ASD) [1]. In a sample of 89 children, one study [2] found that 80.9% of children and adolescents with ASD had a sleep problem, as measured by the Children's Sleep Habits Questionnaire (CSHQ; Owens, Nobile, McGuinn, & Spirito, 2000). In a follow-up study of 56 children [3] it

was found that sleep problems persisted in 91.5% of participants over a two-year time period. Child sleep problems are associated with poorer quality of life, aggressive behaviour, sensory issues, gastrointestinal symptoms, and comorbid psychopathology [3]. However, little is known about the relationship between child sleep problems and parent well-being. An aim of the current study is to better understand the impact that child sleep problems have on the family unit in parents of children and adolescents with ASD.

1.2. Relationship between child sleep problems in ASD and parent variables

1.2.1. Parental sleep

A relationship between child sleep problems and parental sleep has been demonstrated in the literature [4,5]. A study [5]

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investigated sleep problems, using a sleep questionnaire, in 52 children with intellectual disabilities, and 25 typically developing children, and found that sleep problems were associated with the intensity and frequency of parenting hassles. Another study [4], used the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) with 67 parents of children with developmental disabilities, and 42 parents of typically developing children, and found that the strongest predictor of poor sleep quality was parental stress.

A study [6] examined the concordance of mother and child sleep patterns in 11 children with ASD and 6 typically developing children using actigraphy over 14 consecutive nights. Associations were found between mother and child sleep, and were also found between child sleep and mother daytime sleepiness. The finding of a relationship between child and maternal sleep is supported by previous research [7]. Another study [8] investigated sleep in mothers and fathers of 30 children with ASD and 30 typically developing children using the CSHQ and PSQI. It was found that the sleep quality of mothers was affected by child bedtime resistance, sleep anxiety, and sleep time, while the sleep quality of fathers was affected by child bedtime resistance only.

1.2.2. Stress

Previous research [9] demonstrated high levels of parental stress in 136 parents of children with ASD using validated scales. A study [10] analysed the relationship between child sleep problems and parental stress in 210 children with pervasive developmental disorders using the CSHQ. Parents of children with sleep problems experienced a higher level of stress than parents of children without sleep problems. In 46 mothers of 50 children with developmental disabilities, a study [7] found that greater sleep problems in children were associated with greater levels of parental stress in mothers. Another study [11] used ambulatory blood pressure monitoring and validated scales in 74 mothers of children with ASD and found that higher child daytime sleepiness was associated with lower maternal blood pressure. The authors commented that this may be due to an inactive child during the day because of daytime sleepiness.

1.2.3. Anxiety and depression

Previous research [12] demonstrated that high rates of anxiety and depression exist in parents of 152 children ASD using validated scales. One study [13] used a multi-method approach to examine sleep problems, including actigraphy, the CSHQ, and sleep diaries with 17 children with ASD, 17 typically developing children and their mothers and fathers, and found that child sleep quantity was a predictor of maternal depressive symptoms, and the sleep quality of fathers was a predictor of paternal depressive symptoms. Another study [14] examined the relationship between children's sleep, using the CSHQ, and mother's mental health for mothers of 90 children with ASD and 90 typically developing children. It was found that children's sleep significantly predicted maternal mental health, maternal sleep and maternal stress. Mothers of children with ASD reported more problems related to their children's sleep, their own sleep, greater stress and poorer mental health.

A study [15] investigated co-occurring psychiatric disorders in 101 young children with ASD. Night terrors were found to be associated with parental psychological distress. Previous research [7] found that greater child sleep problems were associated with increased depression and anxiety. Mothers' sleep problems significantly predicted poorer maternal psychological well-being. Research [11] found that higher rates of child parasomnias predicted higher anxiety in mothers of children with ASD. A study [16], investigated sleep problems using seven consecutive nights of actigraphy, CSHQ, and PSQI in nine children with ASD and nine

typically developing children and their parents, and associations were found between parental depressive symptoms and subjective sleep quality and child sleep disruptions.

1.2.4. Quality of life

A study [17] conducted both quantitative and qualitative analyses on quality of life for 224 parents of children with ASD. In their qualitative analysis, it was found that exhaustion and sleep problems were two of the most common issues experienced by parents. Therefore, sleep is having an important effect on parents' quality of life, yet little research has been conducted on establishing the impact that child sleep problems have on parental quality of life. A study [18] investigated the difference between child sleep problems on caregiver sleep and well-being in 62 caregivers of children with ASD using validated scales. It was found that caregivers with insomnia, non-restorative sleep, and insufficient sleep were more likely to report poorer mental health than caregivers who did not report these sleep symptoms. The current study aims to expand on this research by recruiting a larger sample size.

1.2.5. Social support

Previous research has found relationships between child behavior, specifically worry/depressed behavior, and parental perceived social support [12]. Previous research has examined perceived social support as an element of parental well-being with regards child sleep problems [16]. Little is known about the relationship between child sleep problems and parental perceived social support. An aim of the current study is to conduct an exploratory analysis of this relationship to determine if there is any relationship between child sleep problems and parental perceived social support.

1.2.6. Current study

While previous research has examined aspects of parent well-being in relation to sleep problems, the current study aimed to expand on these studies. Where often one aspect of parental well-being is researched, such as parental stress or mental health, the aim of the current study is to include an array of parental well-being and mental health measures. These include parental sleep, parental stress, anxiety, depression, quality of life, and social support. As well as investigating the relationship between parental sleep and parental mental health and well-being, the current study aims to explore the relationship between child sleep problems and parental well-being. The aim of the study is to provide data on how sleep problems affect the well-being of parents of children and adolescents with ASD. The current study greatly expands on the sample size of previous studies by including a much larger sample size of parents of children with ASD. The current study will provide data as in how both child and parental sleep problems have an impact on parental mental health and well-being. This has clinical implications in how to improve parent well-being in parents of children with ASD. Through the treatment of child sleep problems, this may have an impact on parental well-being, such as decreased stress, improved mental health and greater quality of life. In order to better understand sleep problems from a clinical perspective, it is important to understand how sleep problems affect not only the child with ASD but the entire family unit in terms of well-being.

2. Method

2.1. Participants

Participants were 409 parents of children and adolescents with a diagnosis of ASD in accordance with DSM-IV-TR criteria [19]. Diagnoses were provided by a licensed psychologist or pediatrician

independent of the study. The participants received their diagnosis as a result of the formal diagnostic protocol which employs multiple diagnostic measures. Caregiver information on professional diagnosis, diagnostic setting/organization and professional(s) who made the diagnosis was obtained. Of the parents, 95.4% ($n = 390$) were female while 4.6% ($n = 19$) were male. The mean age was 40.34 years ($SD = 6.82$), while the age range was from 24 to 62 years.

2.2. Child characteristics

The mean age of the sample was 9.19 years ($SD = 43.47$ months), ranging from 3 to 17 years. The majority (77%; $n = 315$) were males and 23% ($n = 94$) were female. It was reported that 44% ($n = 180$) of participants had an intellectual disability.

2.3. Parental measures

2.3.1. The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) [20] was used to assess parental sleep quality. It consists of 19 self-rated questions. Seven component scores are derived from the PSQI, which are Subjective Sleep Quality, Sleep Latency, Sleep Duration, Sleep Efficiency, Sleep Disturbance, Use of Sleep Medication, and Daytime Dysfunction. Each question in the component scores are scores 0 (no difficulty) to 3 (severe difficulty). The seven component scores are totalled to form a global score, which can range from 0 to 21. Higher scores indicate worse sleep quality. Acceptable measures of test-retest reliability and validity have been obtained [20].

2.3.2. Parenting Stress Index-Short Form (PSI/SF-4)

The Parenting Stress Index-Short Form (PSI-4-SF [21]; identifies parent-child problem areas in parents. It contains 36 items, and is divided into three domains; Parenting Distress (PD), Parent-Child Dysfunction Interaction (P-CDI), and Difficult Child (DC). These domains combine to form a Total Stress score. It is rated on a five-point Likert scale from 1 (Strongly Agree) to 5 (Strongly Disagree). Coefficient alphas for each PSI-4-SF are all above 0.90. The psychometric characteristics of the PSI-4-SF have been examined [22].

2.3.3. Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety and Depression Scale (HADS [23]; is used to assess anxiety and depression. It contains 14 items, and has two subscales; Anxiety and Depression. Responses are rated on a 4-point Likert scale ranging from 0 (Not at all) to 3 (Very Often Indeed). A score of 0-7 is classified as normal for each score, 8-10 is classified as borderline abnormal (borderline case) and 11-21 is classified as abnormal [24]. reviewed the validity of the HADS. Cronbach's alpha was found to be 0.68 to 0.93 (mean = 0.83) for the Anxiety subscale, while it was from 0.67 to 0.90 (mean = 0.82) for the Depression subscale. Correlation between the HADS and other commonly used questionnaires were in the range 0.49–0.83.

2.3.4. World Health Organization's Quality of Life Questionnaire-BREF (WHOQOL-BREF)

The World Health Organization's Quality of Life Questionnaire-BREF (WHOQOL-BREF [25]; was used to assess parent quality of life. It is a shorter version of the original instrument, the WHOQOL-100. It contains 26 items and has a number of different domains including physical health, psychological health, social relationships, and environment. Items are scored on a five-point scale. The WHOQOL Group (1998) found that the WHOQOL-BREF correlated highly with the domains of the original WHOQOL-100. WHOQOL-BREF domain scores demonstrated good discriminant validity, content validity, internal consistency, and test-retest reliability. The

WHOQOL-BREF has been used with parents of children with intellectual disabilities [26]. It has recently been validated for use with parents of children with ASD [27].

2.3.5. Multidimensional Scale of Perceived Social Support

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988) was used to assess perceived social support. It contains 12 items. Each item is rated on a 7-point Likert scale from 1 (Very Strongly Disagree) to 7 (Very Strongly Agree). The items are divided into factor groups relating to the source of social support, which are Family, Friends or Significant Other. High internal consistency has been demonstrated [28]. Good internal reliability and strong factorial validity has been demonstrated [29].

2.4. Child measures

2.4.1. Children's Sleep Habits Questionnaire (CSHQ)

The CSHQ (Owens et al., 2000) is a 52-item parental-report, sleep-screening instrument designed for typically developing children ages 4–10 years. However, it has been used with younger children with autism spectrum disorders [11,30], as well as with an older population of children with ASD [31]. Forty-two of the items are rated on a three-point Likert scale, with the responses being 'Rarely' (never or one time a week), 'Sometimes' (2 to 4 times a week), and 'Usually' (5 or more times a week). Each question was asked in relation to the previous week. The second column of questions is to determine if the item is considered a problem for caregivers. Beside each item, parents can choose 'Yes', 'No', or 'N/A' under the 'Problem?' column. Thirty-three of the items are used in deriving the total sleep disturbance score and the subscales of the questionnaire. There are 8 subscales of the CSHQ, including bedtime resistance, sleep onset delay, sleep duration, sleep anxiety, night wakings, parasomnias, day-time sleepiness, and sleep disordered breathing. The CSHQ is not intended to be used to diagnose specific sleep disorders, but rather to identify sleep problems and the possible need for further evaluation. While there are no established "norms" for the total subscale scores, a total CSHQ score of 41 has been reported to be a sensitive clinical cut-off for identification of probable sleep problems (Owens, Spirito, & McGuinn, 2000).

2.5. Procedure

Parents and guardians were made aware of the study through schools, ASD service providers, parent support groups and online forums. If parents wished to participate in the study, they were provided with a participant information sheet and a consent form to complete. Once consent was obtained, parents were provided with the battery of above questionnaires to complete in their own time.

Ethical Approval

Ethical Approval was obtained from the Research Ethics Committee of the University of Galway. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

3. Results

3.1. Analyses

Pearson correlations were conducted to determine if there were associations between variables. Correlations were tested between

the subscales of the CSHQ and the subscales of the PSQI. Chi-Square tests were used to determine associations between nominal variables (parent gender, parental level of education, marital status, and whether parent was currently ill) and whether parents of children and adolescents had sleep problems or not. *T*-tests or MANOVAs were conducted to assess differences of parents of children and adolescents who display sleep problems compared to those with no sleep problems. Bonferroni adjustment for multiple comparisons was applied.

3.2. Demographic information

Demographic information is included in Table 1. No association was found between parent gender and sleep problems ($p = .221$). No association was found between sleep problems and parental level of education ($p = .931$), marital status ($p = .937$), or whether parent was currently ill ($p = 1.00$). No significant difference was found between parent age ($p = .160$) and whether a child had sleep problems or not.

3.3. Relationship between child sleep problems and parent variables

3.3.1. Parent sleep problems and child sleep problems

The frequency of child sleep problems in this sample was 95.3% ($n = 387$), whereby a sleep problem was classified if a child presented with a score of 41 or more on the CSHQ. The frequency of poor sleep in parents was 86.6% ($n = 354$), whereby a poor sleep was classified if a parent presented with a score of 5 or more on the PSQI. A summary of significant Pearson correlations between child sleep problems and parent sleep problems are displayed in Table 2.

In summary, all of the CSHQ subscales of child bedtime resistance, sleep duration, sleep anxiety, night wakings, parasomnias, sleep disordered breathing and daytime sleepiness were associated with parental subjective sleep quality and sleep disturbance. The child variables of bedtime resistance, sleep duration, sleep anxiety, night wakings, parasomnias, and sleep disordered breathing were associated with parental sleep duration and sleep efficiency. The child variables of sleep duration, sleep anxiety, night wakings, parasomnias, sleep disordered breathing, and daytime sleepiness were associated with parental daytime dysfunction. The child variables of sleep onset delay, sleep duration, sleep anxiety, parasomnias, and daytime sleepiness were associated with parental

Table 1
Demographic information.

Variable	<i>n</i> (%)
Age	<i>M</i> (40.34 years) <i>SD</i> (6.82 years)
Gender	
Male	19 (4.6%)
Female	390 (95.4%)
Education Level	
No education	1 (0.2%)
Primary education	6 (1.5%)
Secondary education	141 (34.5%)
Tertiary education	261 (63.8%)
Marital Status	
Single	29 (7.1%)
Married	281 (68.7%)
Living as Married	39 (9.5%)
Separated	27 (6.6%)
Divorced	31 (7.6%)
Widowed	2 (0.5%)
Currently Ill	
Yes	76 (18.6%)
No	333 (81.4%)

sleep latency. Finally, the child variable of daytime sleepiness was associated with parental use of sleep medication.

3.3.2. Parenting stress and child sleep problems

On the PSI-SF, it was found that 2.2% ($n = 9$) of parents engaged in defensive responding. Defensive responding was significant if a participant scored a sum of 10 or less on a selected number of items of the PSI-SF. A summary of the PSI-SF subscale means, standard deviations, cut-offs across participants, and results of the *t*-tests are shown in Table 3. It was found that parents of children with sleep problems scored significantly higher on the subscale of Parent-Child Dysfunctional Interaction ($m = 31.91$) than parents of children without sleep problems ($m = 27.47$). It was also found that parents of children with sleep problems scored significantly higher on the subscale of Difficult Child ($m = 40.48$) than parents of children without sleep problems ($m = 34.53$).

3.3.3. Parent anxiety and depression and child sleep problems

A summary of the HADS subscale means, standard deviations, cut-offs across participants, and results of the MANOVA are displayed in Table 4. Parents of children with sleep problems experienced higher levels of anxiety ($m = 9.98$) than parents of children without sleep problems ($m = 7.74$). Similarly, higher levels of depression were found in parents of children with sleep problems ($m = 7.87$) than in parents of children without sleep problems ($m = 5.63$).

3.3.4. Parent quality of life and child sleep problems

It was found that 22% ($n = 88$) of participants rated their quality of life as very good, while 51% ($n = 204$) rated it as good. It was found that 19% ($n = 76$) considered their quality of life neither good nor poor, while 7.5% ($n = 30$) considered it to be poor, and 0.5% ($n = 2$) considered it to be very poor. It was reported that 13.3% ($n = 53$) were very satisfied with their health, 43% ($n = 172$) were satisfied, and 18.8% ($n = 75$) were neither satisfied nor dissatisfied. It was found that 20.5% ($n = 82$) were dissatisfied and 4.5% ($n = 18$) were very dissatisfied with their health. A summary of the WHOQOL-BREF domain means, standard deviation, and results of the MANOVA can be found in Table 5. It was found that parents of children and adolescents with sleep problems had significantly lower scores on the domain of Physical Health in the WHOQOL-BREF ($m = 64.88$) than parents of children and adolescents without sleep problems ($m = 74.21$). A similar relationship was found for parents of children with sleep problems in the Psychological domain of the WHOQOL-BREF with parents of children with sleep problems scoring significantly lower ($m = 59.67$) than parents of children without sleep problems ($m = 69.84$). Significantly lower scores were found in the WHOQOL-BREF domain of Environment for parents of children with sleep problems ($m = 62.93$) than parents of children without sleep problems ($m = 71.79$).

3.3.5. Parent social support and child sleep problems

A summary of the MSPSS means, standard deviations and results of the *t*-test are shown in Table 6.

4. Discussion

The frequency of poor sleep in parents of children and adolescents with ASD was 86.6%, whereby a poor sleep was classified if a parent presented with a score of 5 or more on the PSQI. A relationship was found between child sleep problems and parent sleep problems. Therefore, the sleep of parents is affected by their children's sleep problems. Specifically, the strongest relationship was between child parasomnias and parent subjective sleep quality. Parasomnias can include behaviours such as children talking in

Table 2
Correlations between parent sleep and child sleep on the CSHQ and PSQI.

Child Sleep Subscale	Parent Sleep Subscale	r	p
Bedtime resistance	Subjective Sleep Quality	.17	.001**
	Sleep Duration	.15	.002**
	Sleep Efficiency	.12	.013*
	Sleep Disturbance	.11	.033*
Sleep onset delay	Sleep Latency	.22	.000**
	Sleep Disturbance	.10	.049*
Sleep duration	Subjective Sleep Quality	.33	.000**
	Sleep Latency	.22	.000**
	Sleep Duration	.25	.000**
	Sleep Efficiency	.25	.000**
Sleep anxiety	Sleep Disturbance	.13	.007**
	Daytime Dysfunction	.16	.001**
	Subjective Sleep Quality	.19	.000**
	Sleep Latency	.14	.005**
	Sleep Duration	.15	.002**
	Sleep Efficiency	.16	.002**
	Sleep Disturbance	.16	.001**
	Daytime Dysfunction	.15	.003**
	Night wakings Subjective Sleep Quality	.27	.000**
	Sleep Duration	.28	.000**
	Sleep Efficiency	.24	.000**
	Sleep Disturbance	.12	.014*
Parasomnias	Daytime Dysfunction	.11	.031*
	Subjective Sleep Quality	.33	.000**
	Sleep Latency	.21	.000**
	Sleep Duration	.29	.000**
	Sleep Efficiency	.27	.000**
	Sleep Disturbance	.24	.000**
	Daytime Dysfunction	.14	.004**
	Sleep disordered breathing Subjective Sleep Quality	.17	.001**
	Sleep Duration	.19	.000**
	Sleep Efficiency	.16	.001**
	Sleep Disturbance	.13	.008**
	Daytime Dysfunction	.11	.022*
Daytime sleepiness Subjective Sleep Quality	.20	.000**	
Sleep Latency	.18	.000**	
Sleep Disturbance	.21	.000**	
Use of Sleep Medication	.11	.032*	
Daytime Dysfunction	.19	.000**	

*p<.05 **p<.01.

Table 3
PSI-SF Means, Standard deviations, and cut-off scores.

Subscale	M	SD	t	p	Normal		High Score		Clinically Significant	
					n	%	n	%	n	%
Parental Distress (PD)	36.13	10.12	-1.72	.086	231	56.5%	23	5.6%	155	37.9%
Parent-Child Dysfunctional Interaction (PCD-I)	31.68	8.81	-2.15	.032*	244	59.7%	30	7.3%	135	33%
Difficult Child (DC)	4022	942	-2.72	.007**	153	37.4%	34	8.3%	222	54.3%
Total Score	10773	2439			211	51.6%	34	8.3%	164	40.1%

*p<.05 **p<.01.

Table 4
HADS Means, Standard deviations and cut-off scores.

Subscale	M	SD	F	p	Normal		Borderline Abnormal		Abnormal	
					n	%	n	%	n	%
Anxiety	9.88	4.31	4.93	.027*	131	32%	98	24%	180	44%
Depression	7.76	4.12	5.38	.021*	193	47.2%	110	26.9%	106	25.9%

*p<.05.

their sleep, sleep walking and wetting the bed so it is understandable that these behaviours would have a larger effect on parental sleep. Parasomnias also were related with parental sleep duration, sleep efficiency, sleep latency, sleep disturbance, and to a

lesser extent, daytime dysfunction. Child sleep duration was associated with parental subjective sleep quality, sleep duration, sleep efficiency, sleep latency, and to a lesser extent, daytime dysfunction and sleep disturbance. If children have a shorter length of sleep

Table 5
WHOQOL-BREF Means and Standard deviations.

Subscale	M	SD	F	p
Physical Health	65.27	19.12	4.38	.037*
Psychological Health	60.08	19.06	5.22	.023*
Social Relationships	53.98	24.17	1.14	.286
Environment	63.28	17.98	4.43	.036*

*p<.05.

Table 6
MSPSS Mean and Standard deviation.

Variable	M	SD	t	p
MSPSS Total Score	54.46	18.35	-1.37	.171

duration, this is having a negative impact on parent sleep variables. Child night wakings were associated with parental sleep duration, subjective sleep quality, and sleep efficiency. If children are waking multiple times a night or having prolonged periods of waking, this is associated with reduced sleep efficiency for parents. Child sleep onset delay was associated with parental sleep latency. Therefore, if children are taking longer to get to sleep, it is also taking parents longer to fall asleep.

A relationship was found between parenting stress and sleep problems. Parents of children and adolescents who had sleep problems scored significantly higher on the Parenting Stress Index subscales of Parent-Child Dysfunctional Interaction and Difficult Child than did parents of children who did not have sleep problems. Having a child who has difficulties with sleep problems therefore has an impact on parent-child interactions. Sleep problems are seen as being a difficult child problem for parents. These findings of the relationship between child sleep problems and parenting stress are supported by previous research [7,10,16].

There was a significant difference in anxiety and depression in parents of children with and without sleep problems. Parents of children and adolescents with sleep problems had significantly higher levels of anxiety and depression than parents of children and adolescents who did not have sleep problems. The mean score for anxiety in parents of children with sleep problems reached borderline abnormal levels, in comparison to the mean score for anxiety in parents of children without sleep problems, which was at normal levels. The mean score for depression in parents of children with and without sleep problems was at normal levels. However, parents of children with sleep problems had higher levels of depression than parents of children without sleep problems. This finding is supported by previous research [7].

A relationship between sleep problems and lower quality of life was found. Parents of children with sleep problems received significantly lower scores on the WHOQOL-BREF domains of Physical Health, Psychological and Environment than parents of children without sleep problems. Therefore, the presence the sleep problems are affecting parental physical well-being. This is not surprising as the questions on the Physical Health domain ask about daytime functioning. If a parent is not getting enough sleep at night due to a child's sleep problems, this is likely to have an effect on their daytime functioning. The Physical Health domain includes a question on how satisfied one is with their sleep. It is possible that there is a correlation between this question and a child's sleep problems. The psychological well-being of parents is affected by a child having sleep problems. This is not surprising as a lack of sleep may affect a parent's ability to cope and their general psychological well-being. Parents of children with sleep problems have less satisfaction with their physical environment than parents of

children without sleep problems. More research is needed to better understand this finding.

The finding of no relationship between sleep problems and the WHOQOL-BREF domain of Social Relationships is supported by our finding of no relationship between sleep problems and lower perceived social support. There was no significant difference found between parents of children with or without sleep problems on perceived social support. A key aim of the current study was to explore whether there was a relationship between child sleep problems and parental perceived social support. Future research should examine this further.

The current study possessed a number of limitations that affect the validity, reliability and generalisability of the findings of the study. First, the majority of children presented with sleep problems, and a very small number did have sleep problems. Therefore, one should interpret the findings between these groups of children with caution. This may have been a result of a response bias. It is possible that more parents of children with sleep problems participated as parents may have more interest in research that is a current concern for them and their families. However, respondents were invited to participate regardless of whether their children had sleep problems or not. Second, parental report was used to investigate sleep problems, instead of objective measures such as actigraphy. However, research has found high concordance rates between parental report and clinical evaluation in terms of comorbid conditions, such as gastrointestinal symptoms in ASD [32]. Third, there was a very small number of fathers of children with ASD who participated. The majority (95.3%) of the sample were mothers. However, every effort was made to recruit fathers in the current research. Finally, there was no age and gender-matched control group of typically developing children and adolescents. While there was no typically developing children included in these studies, there was a Sleep Problems group and a No Sleep Problems group. This within-group analysis allowed for the investigation of the impact that sleep problems have on parents of children with ASD children and their parents, in comparison to those who do not present with sleep problems.

The current study has clinical implications. When children present with sleep problems, it has been demonstrated that parent sleep is also severely affected. Therefore, child sleep problems have an impact on the entire family unit. Parents are presenting with higher levels of stress, mental health issues, such as anxiety and depression, and poorer well-being. By implementing intervention programmes that target children's sleep, it is hypothesised that this may have an impact on parental mental health and well-being, which is very important from a clinical perspective.

In conclusion, parental sleep issues, higher levels of parenting stress, anxiety, depression, and poorer quality of life were more common in parents of children with sleep problems than in parents of children without sleep problems. However, there was no differences between parents of children with or without sleep problems on perceived social support. Future research is needed to determine the impact of child sleep problems and other comorbidities in parents of children and adolescents with ASD. Research is needed to understand the impact of sleep problems on fathers' well-being specifically. Use of objective sleep measures such as actigraphy are needed to better understand the impact of sleep problems on parental well-being.

Ethical Approval

Ethical Approval was obtained from the Research Ethics Committee of the University of Galway. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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[33–35]

CRediT authorship contribution statement

Arlene Mannion: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Geraldine Leader:** Conceptualization, Methodology, Supervision, Writing – review & editing, Visualization.

Declaration of competing interest

None

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