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Associations between parenting stress, parent mental health and child sleep problems for children with ADHD and ASD: Systematic review

Christina A. Martin[a,*], Nicole Papadopoulos[a], Tayla Chellew[a], Nicole J. Rinehart[a], Emma Sciberras[a,b,c]

[a] Deakin University, 1 Gheringhap Street, Geelong, Victoria, Australia 3220
[b] Murdoch Children's Research Institute, Royal Children's Hospital, 50 Flemington Rd, Parkville, Victoria, Australia 3052
[c] The University of Melbourne, Grattan St, Parkville, Victoria, Australia 301

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ABSTRACT

Background: Children with attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD) experience high rates of sleep problems. Their parents experience higher parenting stress and more mental health difficulties than parents of typically developing children.
Aim: To examine the association between child sleep problems, parenting stress and parent mental health for children with ADHD or ASD.
Methods: MEDLINE Complete, EMBASE, PsycINFO and CINAHL Complete databases were searched. Studies needed to include: children aged 5–18 with ADHD or ASD, a child sleep measure, and a parenting stress or adult mental health measure.
Results: Eleven studies were identified (four ADHD, seven ASD). Six studies examined parenting stress (five cross-sectional, one longitudinal) and five found associations, of varying strengths, with child sleep problems. Six studies examined parent mental health (four cross-sectional, two longitudinal) and five found associations, of differing magnitudes, with child sleep problems.
Conclusions: These studies demonstrate child sleep problems are associated with poorer parent mental health and higher parenting stress.
Implications: Future longitudinal research including multiple measurements of child sleep problems and family functioning is required to clarify the directionality of associations. Such knowledge is key in adapting sleep interventions to better meet the needs of children with ADHD or ASD and their families.

What this paper adds?

This paper is the first systematic review to assess whether sleep problems in children with autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD) are associated with poorer family functioning, more specifically, with higher parenting stress and increased parent mental health difficulties. For children with ASD, there was preliminary evidence of an association between parenting stress and child sleep problems. The strength of these associations varied, ranging from small through to large. To date, no studies have examined the association between parenting stress and child sleep problems for children with ADHD. There was also preliminary evidence of an association between parent mental health difficulties and child sleep problems for children with ADHD and ASD. The magnitude of the associations varied across studies, with effect sizes ranging from small through to medium-to-

* Corresponding author.
E-mail address: machri@deakin.edu.au (C.A. Martin).

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large. The majority of studies identified were cross-sectional, thus our results indicate a connection, but not a causal relationship, between parent mental health, parenting stress and child sleep problems for children with ADHD and ASD. Further research is needed to understand the specific types of child sleep problems which impact on specific parent mental health difficulties and parenting stress. Research is also needed to understand the possible bidirectional associations between child sleep problems and family functioning. Such knowledge is key to optimizing child sleep interventions and enhancing mental health interventions for parents. Changes to these interventions to take a family systems approach may better meet the needs of children with ADHD or ASD and their parents, with flow on benefits to the family unit as a whole.

1. Introduction

1.1. ADHD, ASD and sleep problems

Neurodevelopmental disorders are characterized by developmental impairments which interfere with personal, social or academic/occupational functioning (American Psychiatric Association, 2013). This systematic review will focus on two neurodevelopmental disorders commonly connected with sleep problems, namely attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD). ADHD is characterized by inattention and/or hyperactivity-impulsivity symptoms which interfere with social and academic/occupational activities (American Psychiatric Association, 2013) and affects 2–7% of children worldwide (Sayal et al., 2018). ASD is characterized by social communication deficits, social interaction deficits and restricted/repetitive patterns of behavior/activities or interests (American Psychiatric Association, 2013) and affects 1–2% of the population in Asia, Europe and North America (Centers for Disease Control and Prevention, 2019). The focus on both disorders is important given changes to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.) which permits clinicians to make a dual diagnosis of ADHD and ASD (DSM-5; American Psychiatric Association, 2013).

Children with ADHD and ASD experience sleep problems at a much higher rate than other children. Between 25–70% of children with ADHD and 40–80% of children with ASD experience sleep problems, compared to 25–40% of typically developing children (Cohen et al., 2014; Cortese et al., 2009; Sung et al., 2008). The types of sleep problems experienced are varied and include problems getting to sleep, problems staying asleep, reduced sleep duration, daytime sleepiness and bedtime resistance (Cohen et al., 2014; Cortese et al., 2009). The magnitude of sleep problems in children with ADHD and ASD persist throughout childhood, however, the types of sleep problems experienced change with age (Goldman et al., 2012; Lunsford-Avery et al., 2016). For example, young children with ASD experience problems with sleep anxiety, bedtime resistance, night waking and parasomnias, whilst adolescents with ASD are more likely to experience problems with sleep-onset delay, reduced sleep duration and daytime sleepiness (Goldman et al., 2012). This systematic review will include a wide child age range (i.e. 5–18 years) to provide a comprehensive review of existing studies, given the existing literature is relatively sparse.

Sleep problems can be assessed via subjective measures (e.g. parent-report or child-report using questionnaires) or objective measures (e.g. actigraphy), with the use of subjective measures being more common for practical reasons. The etiology of sleep problems in children with ADHD and ASD is complex with several different theories being proposed including: (a) experiencing a medical condition or comorbid psychiatric condition (e.g. epilepsy, depression), with both the condition and medication side effects potentially disrupting sleep; and (b) family or environmental factors, such a parenting style or poor sleep hygiene, that are not conducive to good sleep quality (Martin et al., 2018; Mazzone et al., 2018; Richdale & Schreck, 2009; Weiss & Salpekar, 2010). There are also a number of potential neurobiological causes. Children with ADHD may experience a delayed circadian rhythm as suggested by high rates of evening chronotype tendencies, a delay in dim light melatonin onset and genetic abnormalities/dysregulation in clock genes (van der Heijden et al., 2005; van der Heijden et al., 2017; Weiss & Salpekar, 2010). Children with ASD may experience (a) biological and genetic abnormalities that impact on brain biochemistry and subsequently impact the sleep-wake cycle (e.g. genetic mutations/dysregulation involving GABA, serotonin and melatonin systems); and (b) disrupted sleep architecture with shorter and denser episodes of REM sleep (Mazzone et al., 2018). Furthermore, sleep problems may be an inherent feature of ASD. That is, social communication skill deficits may result in children not understanding bedtime behaviors, hyperreactivity may impact on a child's ability to move from daytime to nighttime activities, and repetitive behaviors may require adherence to a strict bedtime routine (Mazzone et al., 2018; Veatch et al., 2015).

Sleep problems in children with ADHD and ASD have an independent negative impact on child functioning, including increased symptom severity, poorer quality of life, more emotional problems and also more behavioral problems for children with ASD (Delahaye et al., 2014; Mazurek & Sohl, 2016; Mulraney et al., 2016; Sung et al., 2008; Tudor et al., 2012). However, less is known about the impacts on family functioning.

1.2. Family functioning and sleep problems

Family functioning is multifaceted and includes many parent related factors such as attachment style, maternal sensitivity, parent engagement, parenting behaviors, parenting stress, marital/family aggression and parent mental health (El-Sheikh & Kelly, 2017). Families of children with ADHD and ASD often report negative family functioning outcomes, including reduced family flexibility, which refers to the 'quality and expression of the family's leadership, organization, roles, and relationship rules' (Marsac & Alderfer, 2010) ; reduced family cohesion; lower marital satisfaction; greater family conflict; a more disorganized family environment; and poorer parent mental health (Higgins et al., 2005; Kvist et al., 2013; Schroeder & Kelley, 2009; Walton, 2018). This systematic review will focus on two parent related family functioning constructs, namely parenting stress and parent mental health.

Parenting stress is defined as an 'aversive psychological reaction to the demands of being a parent' (Deater-Deckard, 1998). Parent mental health refers to a parents thoughts, emotional regulation and behaviors which reflect the psychological or biological processes underpinning their mental functioning (American Psychiatric Association, 2013). Parents of children with ADHD and ASD experience higher rates of parenting stress and mental health difficulties than parents of typically developing children (Cheung & Theule, 2016; Hayes & Watson, 2013; Schnabel et al., 2019; Theule et al., 2013).

Child sleep patterns are developed within the family context and are influenced by relationships within the family (El-Sheikh & Kelly, 2017). The association between child sleep problems and family functioning may be bidirectional, with parent behavior impacting on child sleep and child sleep impacting on parent mental health and therefore, family functioning (El-Sheikh & Kelly, 2017). Parents of typically developing children and parents of children with ASD report that in addition to being concerned about their child experiencing sleep problems, they are concerned about the negative impact these sleep problems are having on other family members and the wellbeing of the family overall (Cotton & Richdale, 2006). Research suggests typically developing children in families with higher rates of parent mental health difficulties are more likely to experience poor quality sleep (El-Sheikh et al., 2012). Furthermore, effects are also observed in the opposite direction, suggesting potential bidirectional effects, as mothers of typically developing children with sleep problems experience more depressive symptoms and greater parenting stress than mothers of typically developing children without sleep problems (Meltzer & Mindell, 2007). However, it is currently unclear how child sleep problems, parenting stress and parent mental health may be connected when the child has ADHD or ASD. To the best of our knowledge, this is the first systematic review to summarize the available evidence related to a potential association between the high rates of sleep problems experienced by children with ADHD and ASD and the high rates of parenting stress and mental health problems experienced by their parents.

1.3. Objective

This systematic review aimed to investigate for children with ADHD and ASD, whether there is an association between child sleep problems and both parenting stress and parent mental health.

2. Method

2.1. Search strategy

This systematic review was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement (Moher et al., 2009). The protocol was registered on PROSPERO (CRD42018100741) and is accessible at http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID = CRD42018100741.

The following electronic databases were searched from inception to 30th May 2019: PsycINFO, MEDLINE Complete, EMBASE, and CINAHL Complete. The search strategy included only terms related to ADHD, ASD, sleep, parenting stress and adult mental health (see Appendix A). The following database limiters were applied: PsycINFO - English, peer reviewed; MEDLINE Complete - English, human, academic journal; EMBASE - English, human, embase, article and article in press; CINAHL Complete - English, human, peer reviewed. The reference lists of eligible studies were also reviewed.

2.2. Study selection

To meet inclusion criteria, the study required:

- Children with a clinical diagnosis of ADHD or ASD aged 5–18 inclusive. The clinical diagnosis could be by parent- or clinician-report. Alternatively, the child could have been assessed for a clinical diagnosis prior to entering a study by using either diagnostic interviews or scoring above the clinical cut-off on an ADHD/ASD rating scale, with confirmation then required by a clinician. No exclusion criteria were applied for comorbid ADHD/ASD, other comorbid conditions or those taking medication.
- Caregivers of children with a clinical diagnosis of ADHD or ASD.
- Survey measure of child sleep by self- or parent-report; a self- or parent-completed sleep diary, a self- or parent-reported disclosure of a sleep problem; or an objective measure of sleep (e.g. actigraphy).
- Survey measure of parenting stress or adult mental health by self-report. A self-reported diagnosis was not sufficient.
- To be an empirical article, published in English and in a peer-reviewed journal. Exclusion criteria included case studies, review articles, qualitative studies and interventions where pre-intervention data was not available.

Two authors, CM and TC, independently screened all potential studies to eliminate those that did not meet inclusion criteria. Any disagreements were discussed and an agreement reached.

2.3. Data extraction

Data was extracted from eligible studies by CM and reviewed by TC. Any disagreements were discussed and an agreement reached. The following data was extracted for each study: (a) study and country of research; (b) study design; (c) child characteristics; (d) caregiver characteristics; (e) measures; and (f) findings and confounding variables controlled for. Missing data was not requested

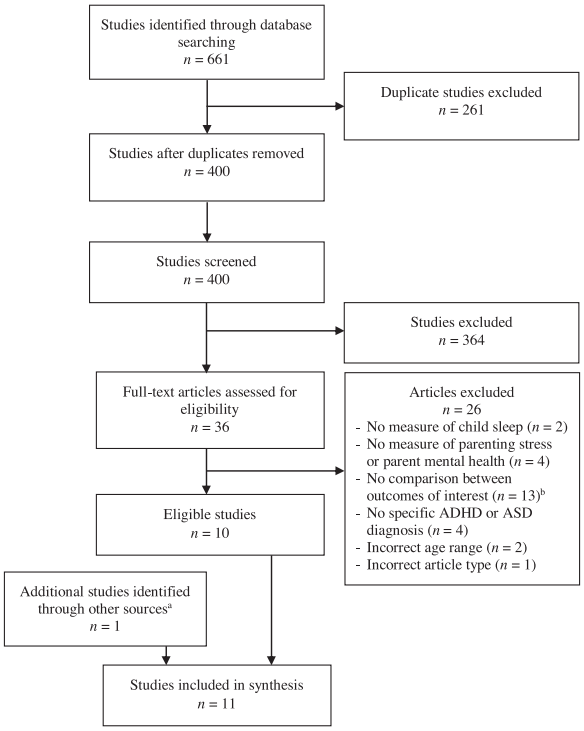

Fig. 1. Selection of eligible studies.
Note.
[a] Other sources include reference list searching of key articles.
[b] Includes three intervention studies which did not include preintervention data.

from study authors, however, one author was contacted to clarify a discrepancy between the results section text and table.

2.4. Quality assessment

The quality of each eligible study was evaluated using the Standard Quality Assessment Criteria for Evaluating Primary Research Papers (Kmet et al., 2004). The quality assessment included 14 criteria which evaluated whether: (a) study objectives were described and the study design was evident and appropriate, (b) sample selection criteria and sample size were appropriate, (c) sample characteristics were sufficiently described and the outcome measures well defined, (d) analytic methods were appropriate, (e) results were reported in sufficient detail and confounding variable were described, and (f) conclusions were supported by the results. Each criteria was rated as 2 = *fully met*, 1 = *partially met*, or 0 = *not met*. Three criteria were not applicable as this systematic review did not include intervention outcomes. The overall summary score was calculated by summing the ratings for each fully met and partially met criteria and dividing by the total possible score (i.e. 28 – (number of not applicable criteria * 2), with a higher overall summary score indicating a higher quality. The quality assessment was independently conducted by CM and TC. Any disagreements were discussed and an agreement reached.

3. Results

3.1. Literature selection

The outcome of the database searching and screening process is detailed in Fig. 1. Of the 11 eligible studies, 8 were cross-sectional, while 3 were longitudinal. Four studies refer to primary caregivers (e.g. parents, aunties, grandparents etc.) rather than parents. For the purpose of this systematic review, the four studies will be reported using the term parents.

< insert Fig. 1 here >

3.2. Parenting stress

The association between parenting stress and sleep problems in children with ASD was examined in six studies (n = 72–193) (see Table 1). Of the six studies, five (83%) reported an association between parenting stress and sleep problems in children with ASD. No articles examining the association between parenting stress and sleep problems in children with ADHD met the inclusion criteria of

Table 1
Summary of articles investigating the association between parenting stress and child sleep problems in children with ASD (n = 6).

Study and country	Study design	Child characteristics	Parent characteristics	Measures	Findings and consideration of confounding variables
Honomichl et al., 2002 USA	Longitudinal.	Clinical Sample n = 100 Age: 2-11 years (M = 5.6 years, SD = 1.8 years) Gender: males = 82, females = 18 Primary Diagnosis: ASD = 65 PDD NOS = 23 Asperger = 8 Other = 4 Parent-reported diagnosis confirmed via diagnostic report.	n = 100 Age:- Gender:- Education Status:-	*Child Sleep* Parent-Report: Question at screening-In your opinion, does your child currently have a sleep problem? Responses: yes/no. *Parenting Stress* Self-Report: PEQ at baseline, 4- and 12-weeks. PEQ summary scores: average of all three time points.	Parents whose child had a sleep problem reported more frequent daily stresses ($F(1,99) = 7.42$, $p \leq .01$) and more intense hassles ($F(1,99) = 5.27$, $p \leq .05$) than parents who child did not have a sleep problem. No adjustment for confounding variables.
Doo & Wing, 2006 China	Cross-sectional.	Clinical Sample n = 193 Age: 2-8 years (M = 3.5 years, SD = 1.4 years) Gender: males = 168, females = 25 Primary Diagnosis: Autism = 94 PDD NOS = 97 Asperger = 2 Pediatricians/clinical psychologist diagnosis using DSM-IV criteria.	n = 193 Age:- Gender: females = 144 Education Status: At least primary school = 193	*Child Sleep* Parent-Report: CSHQ-Chinese version Problem sleeper: at least one sleep problem behavior identified. *Parenting Stress* Self-Report: PSI-SF-Chinese version	Total parenting stress was positively associated with total sleep problems ($\beta = 0.35$, $t = 5.24$, $p < .001$). Problem sleepers (n = 62) had parents with higher total parenting stress $t(191) = 5.77$, $p < .001$; Parental Distress: $t(191) = 3.63$, $p < .001$; Parent-Child Dysfunctional Interaction: $t(191) = 4.79$, $p < .001$; and Difficult Child: $t(191) = 5.27$, $p < .001$, than non-problem sleepers (n = 131). More parents with problem sleepers had clinically significant parenting stress (89.3%) than non-sleepers (64.5%). No adjustment for confounding variables.
Hoffman, Sweeney, Lopez-Wagner, Hodge, Nam & Botts, 2008 USA	Cross-sectional.	Clinical Sample n = 72 Age: 4-16 years (M = 8.3 years, SD = 3.0 years) Gender: males = 59, females = 13 Primary Diagnosis: Autism = 72 Independent diagnosis by the referring agency using DSM-IV-TR criteria and a Gilliam Autism Rating Scale (2nd Edition) total score of ≥85 at study commencement.	n = 72 Age: 22-57 years (M = 38.8 years, SD = 6.6 years) Gender: females = 72 Education Status: High school not completed = 7 High school graduate = 9 College/Associate's degree = 32 Bachelor degree = 13 Postgraduate study/degree = 9 Missing data = 2	*Child Sleep* Parent-Report: CSHQ *Parenting Stress* Self-Report: PSI	Child Domain Stress was positively correlated with Bedtime Resistance ($r = .28$, $p < .01$), Sleep Anxiety ($r = .28$, $p < .01$), Sleep Disordered Breathing ($r = .24$, $p < .05$), Sleep Onset Delay ($r = .40$, $p < .001$), Sleep Duration ($r = .49$, $p < .001$), Night Waking ($r = .38$, $p < .001$) and Parasomnias ($r = .48$, $p < .001$). Daytime Sleepiness was not correlated with Child Domain Stress. In the adjusted model, total maternal parenting stress, Child Domain Stress and Parent Domain Stress were associated with total sleep ($\beta = .44$, $p < .001$, $\Delta R^2 = .15$; $\beta = .44$, $p < .001$, $\Delta R^2 = .14$; $\beta = .41$, $p < .01$, $\Delta R^2 = .13$). Confounding variables controlled for-Child: Age, gender, autism symptom severity; Parent: Sleep quality.
Hodge et al., 2013[a] USA	Cross-sectional.	ASD = Clinical Sample TD = Community Sample n = 180 Age: 4-12 years (M_{ASD} = 7.5 years) Gender_{ASD}: males = 71 females = 19 Primary Diagnosis: ASD = 90 TD = 90	n = 180 Age:- Gender: females = 180 Education Status:-	*Child Sleep* Parent-Report: CSHQ *Parenting Stress* Self-Report: PSI	In the adjusted model, for mothers of children with ASD, child sleep problems were associated with maternal parenting stress ($b = .31$). Confounding

(*continued on next page*)

Table 1 (*continued*)

Study and country	Study design	Child characteristics	Parent characteristics	Measures	Findings and consideration of confounding variables
		Independent diagnosis by a licensed mental health professional and assessed/reviewed by the referring agency.			variables controlled for-Child: Autism symptom severity.
Valicenti-McDermott, Lawson, Hottinger, Seijo, Schechtman, Shulman, Shinnar, 2015 USA	Cross-sectional.	Clinical Sample n = 100 Age: 2-18 years (M_{ASD} = 8.8 years, SD_{ASD} = 3 years) $Gender_{ASD}$: males = 47, females = 3 Primary Diagnosis: Autism = 50 Other DD = 50 Multidisciplinary team autism diagnosis using DSM-IV-TR criteria for autistic disorder and a Childhood Autism Rating Scale total score of ≥ 30 at study commencement.	n = 99 Age: M_{ASD} = 38 years, SD_{ASD} = 7 years Gender: females = 99 Education Status: High school not completed = 25 High school graduate = 29 Some college = 26 College = 18	*Child Sleep* Parent-Report: CSHQ Sleep problems: total CSHQ score ≥ 41 *Parenting Stress* Self-Report: PSI-SF Parenting stress: PSI-SF total score > 90th percentile	In the ASD group, there was no association between parenting stress and sleeping problems (p = .100). No adjustment for confounding variables.
Johnson, Smith, DeMand, Lecavalier, Evans, Gurka, Swiezy, Bearss, Scahill, 2018 USA	Cross-sectional.	Clinical Sample n = 177 Age: 3-7 years (M = 4.7 years, SD = 1.1 years) Gender: males = 155, females = 22 Primary Diagnosis: Autism = 116 PDD = 50 Asperger = 5 Diagnosis using DSM-IV criteria, confirmed by the Autism Diagnostic Observation Schedule and Autism Diagnostic Interview-Revised.	n = 170 Age:- Gender:- Education Status: High school not completed = 1 High school graduate = 7 Some college = 54 College = 57 Advanced degree = 51	*Child Sleep* Parent-Report: CSHQ–ASD version Poor sleeper: CSHQ total score = upper quartile; good sleeper: CSHQ total score = lower quartile. *Parenting Stress* Self-Report: PSI-SF	Poor sleepers (n = 52) had parents with higher total parenting stress t = 3.22, p = .002; Parental Distress: t = 2.91, p = .005; Parent-Child Dysfunctional Interaction: t = 3.96, p < .001; and Difficult Child: t = 2.54, p = .013, than good sleepers (n = 46). No adjustment for confounding variables.

Note. ASD = Autism Spectrum Disorder, CSHQ = Children's Sleep Habits Questionnaire, DD = Developmental Disability, DSM-IV = Diagnostic and Statistical Manual of Mental Disorders (4th edition), DSM-IV-TR = Diagnostic and Statistical Manual of Mental Disorders (4th edition, text revision), PDD = Pervasive Developmental Disorder, PDD NOS = Pervasive Developmental Disorder–Not Otherwise Specified, PEQ = Parenting Events Questionnaire, PSI = Parenting Stress Index, PSI-SF = Parent Stress Index-Short Form, TD = Typically Developing.
[a]reported in Table 1 and 3 as includes both parenting stress and parent mental health.

this systematic review.

3.2.1. Autism spectrum disorder

Two cross-sectional studies used both the Parenting Stress Index (PSI) and the Children's Sleep Habits Questionnaire (CSHQ) to examine the association between maternal parenting stress and parent-reported child sleep problems, both found a significant association. Hodge, Hoffman, Sweeney, and Riggs (2013) found parent-reported total child sleep problems in children with ASD (n = 90, age = 4–12 years, M = 7.5 years) were moderately associated with overall maternal parenting stress, after controlling for ASD symptom severity. Hoffman et al. (2008) found small associations between multiple aspects of maternal stress and parent-reported total child sleep problems (n = 72, age = 4–16 years, M = 8.3 years), after controlling for child age, child gender, ASD symptom severity and maternal sleep quality. Hoffman et al. (2008) also found seven of eight specific child sleep problem domains, all except daytime sleepiness, were associated with child domain stress (i.e. parenting stress resulting from the qualities of the child making them difficult to parent; Abidin, 2012). Bedtime resistance, sleep anxiety and sleep disordered breathing were associated with child domain stress with small-to-medium effect and sleep onset delay, sleep duration, night waking and parasomnias were associated with child domain stress with medium-to-large effect.

Four studies, three cross-sectional and one longitudinal, examined the association between parenting stress and parent-reported child sleep problems by grouping children with ASD into two sleep groups i.e. problem/poor sleepers and non-problem/good sleepers. Each study used a different approach to grouping and none controlled for potentially confounding variables. Three of the four studies found a significant association. Honomichl, Goodlin-Jones, Burnham, Gaylor, and Anders (2002) (n = 100, age = 2–11 years, M = 5.6 years) found parents of children with a parent-reported sleep problem (i.e. sleep problem yes/no; n = 54) experienced more frequent and intense daily hassles (i.e. Parenting Events Questionnaire) than parents of children without a parent-reported sleep problem (n = 46). In Doo and Wing (2006) (n = 193, age = 2–8 years, M = 3.5 years) parents of parent-reported problem sleepers (i.e. CSHQ, at least one sleep problem behavior identified; n = 62) experienced more overall and specific aspects of parenting stress (i.e. PSI–Short Form (PSI-SF)) than parents of parent-reported non-problem sleepers (n = 131), with large and medium-to-large effects. Johnson et al. (2018) (n = 177, age = 3–7 years, M = 4.7 years) found parents of parent-reported poor sleepers (i.e. CSHQ-ASD total upper quartile; n = 52) experienced more overall and specific aspects of parenting stress (i.e. PSI-SF) than parents of parent-reported good sleepers (i.e. CSHQ-ASD total lower quartile; n = 46), with medium-to-large and large effects. In contrast, an association was not found between overall maternal parenting stress and parent-reported total child sleep problems by Valicenti-McDermott et al. (2015) (n = 50, age = 2–18 years, M = 8.8 years). This may be due to strict clinically significant child sleep problems and parenting stress thresholds being used (i.e. CSHQ total $\geq$ 41, PSI-SF total > 90th percentile), meaning children with subthreshold sleep problems or mothers with subthreshold parenting stress were defined as having no sleep problems and experiencing no parenting stress, thus potentially watering down differences between groups.

3.2.2. Quality assessment

All six studies were of good quality, with overall summary scores ranging from 73 to 95% (see Table 2). Three main weaknesses were evident: i) limited reporting of parent characteristics, with four studies providing partial details (e.g. age of parents not specified); ii) limited reporting of estimates of variance in the main results, with one study not reporting and three studies partially reporting estimates of variance; and iii) potentially confounding variables were not controlled for in four studies and were partially controlled for in one study.

3.3. Parent mental health

The association between parent mental health and sleep problems in children with ADHD and ASD was examined in six studies (four ADHD, two ASD; n = 45–239) (see Table 3). Of the six studies, five (83%) reported an association between parent mental health and sleep problems in children with ADHD and ASD.

3.3.1. Attention-deficit/hyperactivity disorder

Four studies have investigated the association between parent mental health and sleep problems in children with ADHD (see Table 2). Three of the studies found poorer parent mental health was associated with child sleep problems.

Two studies were cross-sectional and found an association between overall parent mental health and parent-reported child sleep problems. Sung et al. (2008) (n = 239, age = 5–18 years, M = 11.7 years) found parents of children with moderate or severe parent-reported sleep problems (i.e. sleep problem yes–mild, moderate, severe/no; n = 107) were 2.7 times more likely to have mental health difficulties (i.e. Depression Anxiety Stress Scale (DASS)) than parents of children with no parent-reported sleep problems (n = 64), after controlling for multiple potentially confounding variables. However, there was no difference in parent mental health between the mild and no child sleep problem groups. Montgomery and Wiggs (2015) measured child sleep problems in two ways (n = 45, age = 3–14 years, M = 8.7 years). They found mothers who reported child sleeplessness (sleep problem yes/no; n = 33) had poorer overall mental health (i.e. General Health Questionnaire) than mothers who did not report child sleeplessness (n = 12), with medium-to-large effect. When child sleep information was obtained from mothers using the Simonds and Parraga Interview Schedule (i.e. widely used definitions were applied to determine whether sleeplessness criteria was met), the association between overall maternal mental health and parent-reported child sleeplessness was no longer evident. This study did not control for any potentially confounding variables. These findings suggest overall maternal mental health may be impacted by the mother's perception of, rather than more objectively verified, child sleep problems. Alternatively, mothers experiencing mental health difficulties may be more

Table 2
Quality assessment of articles.

Article	Objective sufficiently described?	Study design evident and appropriate?	Method of subject/comparison group selection described and appropriate?	Subject and comparison group characteristics sufficiently described?	Outcome measures well defined?	Sample size appropriate?
Parenting Stress						
Doo (2006)	2	2	2	1	2	2
Hodge (2013)[a]	2	2	1	1	2	2
Hoffman (2008)	2	2	2	2	2	2
Honomichl (2002)	2	2	2	1	1	2
Johnson (2018)	2	2	2	1	2	2
Valicenti-McDermott (2015)	1	2	2	2	2	2
Parent Mental Health						
Hodge (2013)[a]	2	2	1	1	2	2
Lycett (2014)	2	2	2	2	1	1
Lycett (2016)	2	2	2	1	1	1
Montgomery (2015)	2	2	2	1	2	1
Sung (2008)	2	2	1	2	1	2
Tilford (2015)[b]	1	2	1	2	2	2

Article	Analytic methods described/justified and appropriate?	Some estimate of variance is reported for the main results?	Controlled for confounding variables?	Results reported in sufficient detail?	Conclusions supported by the results?	Summary Score, %
Parenting Stress						
Doo (2006)	2	2	0	1	2	18/22 = 82%
Hodge (2013)[a]	2	1	1	2	2	18/22 = 82%
Hoffman (2008)	2	1	2	2	2	21/22 = 95%
Honomichl (2002)	2	0	0	2	2	16/22 = 73%
Johnson (2018)	2	2	0	2	2	19/22 = 86%
Valicenti-McDermott (2015)	2	1	0	2	2	18/22 = 82%
Parent Mental Health						
Hodge (2013)[a]	2	1	1	2	2	18/22 = 82%
Lycett (2014)	1	2	2	2	2	19/22 = 86%
Lycett (2016)	1	2	2	2	2	18/22 = 82%
Montgomery (2015)	2	2	0	2	2	18/22 = 82%
Sung (2008)	2	2	2	2	2	20/22 = 91%
Tilford (2015)[b]	2	2	0	1	1	16/22 = 73%

Note. [a]reported twice as includes both parenting stress and parent mental health. [b]author clarified discrepancy.

Table 3
Summary of articles investigating the association between parent mental health and child sleep problems in children with ADHD (n = 4) and ASD (n = 2).

Study and country	Study design	Child characteristics	Parent/Caregiver characteristics	Measures	Findings and consideration of confounding variables
Population: ADHD					
Sung et al., 2008 Australia	Cross-sectional.	Clinical Sample *n* = 239 Age: 5-18 years (*M* = 11.7 years, *SD* = 3.2 years) Gender: males = 216, females = 23 Primary Diagnosis: ADHD Diagnosis by pediatricians/child psychiatrists.	*n* = 239 Age: 27-73 years (*M* = 43.3 years, *SD* = 6.9 years) Gender: females = 208, males = 20 not specified = 11 Education Status: High school not completed = 93 High school completed = 33 College/ Postgraduate degree = 112	*Child Sleep* Caregiver-Report: Question-During the past 4 weeks, has your child's sleep been a problem? Responses-No, it was not a problem; yes, a mild problem; yes, a moderate problem; yes, a severe problem. *Caregiver Mental Health* Self-Report: DASS	In the adjusted model, caregivers of children with ADHD who had moderate or severe sleep problems were 2.7 times more likely to be clinically depressed, stressed or anxious than those with children without sleep problems (*OR* = 2.72, 95% CI: [1.33, 5.54]). This association did not hold for mild sleep problems (*OR* = 2.01, 95% CI: [0.94, 4.30]). Confounding variables controlled for-Child: Age, gender, comorbidities, ADHD symptom severity, medication use; Caregiver: Education level.
Lycett et al., 2014 Australia	Longitudinal.	Clinical Sample *n* = 195 Age: 5-13 years (*M* = 10.1 years, *SD* = 1.9 years) Gender: males = 170 Primary Diagnosis: ADHD Prior pediatrician diagnosis reassessed via parent-report on the ADHD Rating Scale-IV (off medication) and study specific questions, allowing a DSM-IV classification.	*n* = 195 Age: *M* = 41.2 years, *SD* = 6.2 years) Gender: females = 184 Education Status: High school completed = 101	*Child Sleep* Caregiver-Report at baseline, 6- and 12-months: Question-Has your child's sleep been a problem for you over the past 4 weeks? Responses-No, it was not a problem; yes, a mild problem; yes, a moderate problem; yes, a severe problem. Sleep problem groups: -No sleep problem – no problem and mild problem -Sleep problem – moderate and severe problem Sleep problem trajectories: -Never (No at all three time points) -Transient (Yes, at one or two time points) -Persistent (Yes, at all three time points) *Caregiver Mental Health* Self-Report: DASS at baseline.	In adjusted analyses, caregivers were 1.5 times more likely to have a child with transient sleep problems than no sleep problems for each SD increase in poor mental health (*OR* = 1.5, 95% CI: [1.0, 2.3], *p* = .05). This association did not hold for persistent sleep problems. Confounding variables controlled for-Child: Externalizing comorbidity alone, co-occurring internalizing and externalizing comorbidity, ADHD symptom severity, ADHD medication; Caregiver: Education, socioeconomic disadvantage.
Montgomery & Wiggs, 2015 United Kingdom	Cross-sectional.	Clinical Sample *n* = 45 Age: 3-14 years (*M* = 8.7 years, SD = 2.5 years) Gender: males = 41 Primary Diagnosis: ADHD Prior diagnosis by a child psychiatrist using ICD-10 criteria. Diagnostic confirmation via parent- and teacher-report using the ADHD Rating Scale-IV, allowing a DSM-IV-TR classification.	*n* = 45 Age:- Gender: female = 45 Education Status:-	*Child Sleep* Parent-Report: Maternally defined sleeplessness: Question-In your opinion does your child have a sleep problem? Responses-If yes, what would you say the problem is (open ended)? Sleeplessness = problem relates to settling difficulties, night waking or early waking. Quantitatively defined sleeplessness by parent-report: Simonds and Parraga Interview Schedule. Widely used definitions then applied to determine if criteria met for a sleeplessness problem. Sleeplessness = settling difficulties, night waking or early waking. *Parent Mental Health* Self-Report: GHQ	Mothers who reported child sleeplessness were more likely to have poorer mental (*Mdn* = 5.0) than mothers without a sleepless child (*Mdn* = 1.0), *U* = 103.5, *p* < .025. This association did not hold when sleeplessness was defined using standard criteria. No adjustment for confounding variables.
Lycett et al., 2016 Australia	Longitudinal.	Clinical Sample *n* = 186 Age: 5-13 years (*M* = 10.1 years, *SD* = 1.8 years)	*n* = 186 Age:- Gender:- Education Status: High school completed = 99	*Child Sleep* Caregiver-Report: baseline, 6- and 12-months Question-Has your child's sleep	In the adjusted model, the association between parent mental health and

(*continued on next page*)

Table 3 (*continued*)

Study and country	Study design	Child characteristics	Parent/Caregiver characteristics	Measures	Findings and consideration of confounding variables
		Gender: males = 161 Primary Diagnosis: ADHD Prior pediatrician diagnosis reassessed via parent-report on the ADHD Rating Scale-IV (off medication) and study specific questions, allowing DSM-IV classification.		been a problem for you over the past 4 weeks? Responses-No, it was not a problem; yes, a mild problem; yes, a moderate problem; yes, a severe problem. Sleep problem groups: -No sleep problem – no problem and mild problem -Sleep problem – moderate and severe problem Sleep problem trajectories: -Never (No at all three time points) -Transient (Yes, at one or two time points) -Persistent (Yes, at all three time points) *Caregiver Mental Health* Self-Report: DASS at 12-months.	sleep problems was not maintained (transient: $OR = 0.0$, 95% CI: [-0.3, 0.3], $p > .05$; persistent: $OR = 0.2$, 95% CI: [-0.3, 0.8], $p > .05$). Confounding variables controlled for- Child: Age, gender, ADHD medication use, ADHD symptom severity, co-occurring internalizing and externalizing comorbidities; Caregiver: Socioeconomic disadvantage, education.
Population: ASD					
Hodge et al., 2013[a] USA	Cross-sectional.	ASD = Clinical Sample TD = Community Sample $n = 180$ Age: 4-12 years ($M_{ASD} = 7.5$ years) $Gender_{ASD}$: males = 71 females = 19 Primary Diagnosis: ASD = 90 TD = 90 Independent diagnosis by a licensed mental health professional and assessed/reviewed by the referring agency.	$n = 180$ Age: - Gender: females = 180 Education Status:-	*Child Sleep* Parent-Report: CSHQ *Parent Mental Health* Self-Report: SA-45 *Parenting Stress* Self-Report: PSI	In the adjusted model, for mothers of children with ASD, child sleep problems significantly predicted maternal mental health ($b = .26$). Maternal parenting stress partially mediated the relationship between child sleep problems and maternal mental health ($b = .55$). Confounding variables controlled for- Child: Autism symptom severity.
Tilford, Payakachat, Kuhlthau, Pyne, Kovacs, Bellando, Williams, Brouwer, Frye, 2015[b] USA	Cross-sectional.	Clinical Sample $n = 224$ Age: 4-17 years ($M = 8.2$ years, $SD = 3.5$ years) Gender: males = 194, females = 30 Primary Diagnosis: ASD Diagnosis using DSM-IV-TR criteria.	$n = 224$ Age: 21-61 years ($M = 39.4$ years, $SD = 8.3$ years) Gender: females = 200, males = 24 Education Status: High school or lower = 19 Some college or higher = 205	*Child Sleep* Caregiver-Report: CSHQ *Caregiver Mental Health* Self-Report: CES-D	Total child sleep problems were positively associated with higher caregiver depression ($r_s = .26$, $p < .001$). No adjustment for confounding variables.

Note. ADHD = Attention-Deficit/Hyperactivity Disorder, ASD = Autism Spectrum Disorder, CES-D = Centre for Epidemiological Studies Depression Scale, CSHQ = Children's Sleep Habits Questionnaire, DASS = Depression, Anxiety and Stress Scale, DSM-IV-TR = Diagnostic and Statistical Manual of Mental Disorders (4th edition, text revision), GHQ = General Health Questionnaire, ICD-10 = International Statistical Classification of Diseases and Related Health Problems (10th Revision), PSI = Parenting Stress Index, SA-45 = The Symptom Assessement-45 Questionnaire, TD = Typically Developing.

[a]reported in Tables 1 and 3 as includes both parenting stress and parent mental health. [b]author clarified discrepancy.

likely to perceive some aspects of typical child sleep behavior as problematic.

There were two longitudinal studies which used the same dataset in different ways, each found different results. Lycett, Mensah, Hiscock, and Sciberras (2014) (n = 195, age = 5–13 years, M = 10.1 years) investigated whether baseline parent mental health difficulties (i.e. DASS) predicted child sleep problem trajectories (i.e. sleep problem yes–mild, moderate, severe/no) over a 12-month period. They found parents with poorer overall mental health were 1.5 times more likely to have children with transient parent-reported sleep problems (n = 96) relative to parents of children with no parent-reported sleep problems (n = 79), after controlling for potential confounding variables. There was no association between overall parent mental health and persistent parent-reported child sleep problems (n = 20). In contrast, Lycett, Sciberras, Hiscock, and Mensah (2016) (n = 186, age = 5–13 years, M = 10.1 years) investigated whether child sleep problem trajectories (i.e. sleep problem yes–mild, moderate, severe/no) were associated with parent mental health difficulties (i.e. DASS) 12-months later. They found no difference in overall parent mental health symptoms assessed 12-months later for parents with children who experienced parent-reported transient (n = 90), persistent (n = 18) or no child sleep problems (n = 78) after controlling for potentially confounding variables. It is important to note the number of children with persistent sleep problems in both studies was small (n = 18–20) and therefore, the studies may have been underpowered to detect associations. However, child factors were found to be predictors of persistent child sleep problems despite the small sample size.

3.3.2. Autism spectrum disorder

Two cross-sectional studies investigated the association between parent mental health and sleep problems in children with ASD, both found a significant association. Hodge et al. (2013) (n = 90, age = 4–12 years, M = 7.5 years) found parent-reported total child sleep problems (i.e. CSHQ) were moderately associated with overall maternal mental health (i.e. Symptom Assessment-45 Questionnaire), after controlling for ASD symptom severity and accounting for the partial mediating effects of parenting stress and maternal sleep quality. Tilford et al. (2015) (n = 224, age = 4–17 years, M = 8.2 years) found a small-to-medium association between overall parent depressive symptoms (i.e. Centre for Epidemiological Studies Depression Scale) and parent-reported total child sleep problems (i.e. CSHQ). Potentially confounding variables were not controlled for in this study.

3.3.3. Quality assessment

All six studies were of good quality, with overall summary scores ranging from 73 to 91% (see Table 2). Five main weaknesses were evident across the studies: i) limited reporting of participant selection criteria, with three studies providing partial details; ii) limited reporting of parent characteristics, with partial details provided by three studies (e.g. age of parents not specified); iii) outcome measures were not well defined in three studies; iv) three studies did not provide enough information to assess whether the sample size was appropriate; and v) potentially confounding variables were not controlled for in two studies and were partially controlled for in one study.

4. Discussion

4.1. Findings

The aim of this review was to systematically investigate the association between child sleep problems and both parenting stress and parent mental health for children with ADHD and ASD. For children with ASD, there were small to large associations between parenting stress and child sleep problems, however, no studies were identified examining parenting stress and sleep problems in children with ADHD. There was also evidence that particular child sleep problems (i.e. bedtime resistance, sleep anxiety, sleep disordered breathing, sleep onset delay, sleep duration, night waking and parasomnias) were associated with parenting stress, highlighting the importance of the field moving beyond consideration of child sleep problems as a unitary construct. For both children with ADHD and ASD, there were associations between overall parent mental health and child sleep problems. For children with ASD, there was additionally an association between child sleep problems and parent depression. The strength of these associations varied, with small through to medium-to-large effect sizes being evident. These findings are consistent with those for typically developing children, with significant associations reported between sleep problems and both parenting stress and parent mental health (Byars et al., 2011; Francazio et al., 2015; Hodge et al., 2013; Quach et al., 2012; Quach et al., 2016).

This discussion will focus on two key issues which have emerged from this review: (a) the dominance of cross-sectional studies, and (b) measurement considerations, followed by future research directions, clinical implications, strengths and weaknesses and a conclusion.

4.2. Dominance of cross-sectional studies

A number of mechanisms may connect child sleep problems, parenting stress and parent mental health (Doo & Wing, 2006; Hoffman et al., 2008), however, few studies have tested these mechanisms. It is possible that a child with sleep problems contributes to parenting stress and/or poorer parent mental health by regularly limiting their parents' opportunities for down time and interrupting their parents' sleep. The child's sleep problems may lead to increased child behavioral difficulties (Quach et al., 2018), which due to parent fatigue may lead to the use of less effective parenting strategies, perpetuating a vicious cycle. It is also plausible that stressed parents or parents with mental health difficulties may find it more difficult to set consistent bedtime rules and routines. Parenting stress and mental health difficulties may also influence how parents both perceive and manage their child's sleep difficulties. There is little doubt these are complex and likely bidirectional associations.

The evidence in this review was primarily driven by cross-sectional studies and a small number of longitudinal studies that analyzed unidirectional associations. Knowledge of the mechanisms connecting child sleep problems and family functioning would be enhanced by repeated measure designs, examining bidirectional associations. Repeated measure designs have been used successfully in a number of studies to identify bidirectional associations between child sleep problems and child functioning. For example, one study found bidirectional associations between child sleep problems and child emotional problems (but not behavioral problems) in children with ADHD. The study assessed child sleep and child mental health (n = 270, age = 5–13 years) at 3 time points over 12-months (Mulraney et al., 2016). In contrast, a large population-based study (n = 4983) found bidirectional associations between child sleep problems and child externalizing disorders, using data across 5 waves from children aged 4–5 to 12–13 years. However, bidirectional associations were not evident for child internalizing difficulties, with greater child sleep problems associated with child internalizing difficulties but not vice versa (Quach et al., 2018).

4.3. Measurement considerations

The evidence in this review was limited by the use of composite measures of child sleep problems and parent mental health difficulties. Composite child sleep measures combine many aspects of sleep, from sleep onset latency to parasomnias; and composite adult mental health measures include many types of mental health difficulties, ranging from somatic symptoms to depression. The use of these composite measures means it is unclear which specific child sleep problem domains are associated with parenting stress and with particular parent mental health difficulties. Identifying the impact of both specific child sleep problem domains and specific parent mental health problems is important in thinking through how to best help children and their parents. For example, sleep problems like bedtime resistance and sleep anxiety may benefit more from behavioral sleep interventions. These interventions could be adapted if associations were found with parenting stress or specific parent mental health problems. Sleep problems, which are more biologically based e.g. parasomnias, obstructive sleep apnea, are treated medically and thus educating families to know how to identify these and when to seek help may be the most fruitful approach.

The evidence in this review was also limited as the studies focused primarily on mothers. Given both mothers and fathers are impacted by child sleep problems, it is important the specific impacts on both parents are investigated so any differences are understood. Understanding the experiences of fathers would allow existing child sleep interventions, which are predominately aimed at mothers, to be adapted to cater for father's unique experiences, thus increasing the accessibility of child sleep interventions.

The majority of studies in this review included wide age ranges which spanned multiple developmental periods (i.e. toddlers, preschoolers, primary school children and adolescents), without controlling for child age as a potential confounding variable (Doo & Wing, 2006; Hodge et al., 2013; Honomichl et al., 2002; Johnson et al., 2018; Lycett et al., 2014; Montgomery & Wiggs, 2015; Tilford et al., 2015; Valicenti-McDermott et al., 2015). There is variation in sleep across developmental periods and it is also reasonable to expect that the association between child sleep and parent functioning will vary depending on the developmental stage examined. For example, primary school children and adolescents have to wake up at a specific time to get to school, whereas this may not be the case for toddlers and preschoolers. Therefore, the association between child sleep problems and parent functioning may be stronger when the child is attending school. Also, whilst the magnitude of sleep problems does not differ between primary school children and adolescents with ADHD or ASD, the types of sleep problems experienced do differ (Goldman et al., 2012; Lunsford-Avery et al., 2016). As such, the association between child sleep problems and parent functioning may differ depending on the age and therefore, the type of sleep problem the child is experiencing. Going forward, ensuring age ranges are aligned with developmental periods or controlling for child age as a potential confounding variable is important to ensure strategies designed to help families are appropriately aligned to the child's age.

All of the studies identified in this review used parent-reported measures to assess child sleep problems. Parent-reported measures are generally used in clinical practice and sleep problem research, however, there are both benefits and limitations in using parent-reported data. Benefits include obtaining data for children unable to self-report i.e. too young or with cognitive deficits (Upton et al., 2008). It also enables the perspective and experiences of parents to be captured. Limitations include: (a) differences in results when using parent-report versus self-report measures, as parents can accurately report their child's observable behavior but not their internalized thoughts and feelings (Galloway & Newman, 2017); (b) the perspective and experiences of the child are ignored; and (c) differences will occur as the child gets older and their behavior changes, e.g. the child still wakes during the night but no longer disturbs other family members. Where possible, multi-informant assessment of sleep is recommended. In addition, the majority of studies used similar questionnaires when measuring child sleep, parenting stress and parent mental health. The need to use multiple methods of measurement was highlighted by Montgomery and Wiggs (2015), when the association reported between maternal mental health and sleep problems in children with ASD was no longer evident when child sleep problems was measured in an alternative way.

Objective measures of sleep, such as polysomnography and actigraphy, should also be considered. Objective measures are considered the gold standard in measuring sleep continuity and sleep architecture (Cortese et al., 2009). Subjective sleep measures allow reporting of observable sleep problems, e.g. more bedtime and early morning problem behaviors in children with ADHD relative to controls (Cortese et al., 2009). However, objective measures enable sleep problem measurement e.g. more disrupted sleep and daytime sleepiness for children with ADHD relative to controls (Cortese et al., 2009), and day-to-day variations in sleep problems to be measured. However, there are complexities in using objective sleep measures for children with neurodevelopmental disorders, with issues related to device intolerance, non-compliant behavior and negative impacts on sleep with assessments conducted in unfamiliar environments (Moore et al., 2017).

4.4. Future research

As detailed above, the existing evidence was limited by a focus on cross-sectional studies, composite measures of child sleep and parent mental health, predominance of mothers and the use of parent-reported sleep measures. As a result, future research is needed to investigate which specific child sleep problem domains are associated with parenting stress and with which specific mental health problems for both mothers and fathers, with the use of multi-informant and objective measures of sleep. Future research is also needed to untangle the potential bidirectional associations between child sleep problems, parenting stress and parent mental health.

Going forward, future research needs to control for potential confounding variables, as the majority of identified studies did not do this, meaning other factors could be driving the observed associations between child sleep problems and family functioning e.g. child age, comorbid internalizing disorders.

4.5. Clinical implications

Behavioral sleep interventions focus on modifying parent and child behaviors which have a negative impact on child sleep (e.g. an inconsistent sleep-wake schedule), and have been shown to reduce sleep problems in children with ADHD and ASD (Corkum et al., 2016; Hiscock et al., 2015; Malow et al., 2014; Sciberras et al., 2018). Parents experiencing mental health difficulties or high levels of parenting stress may find it difficult to implement interventions (Sciberras et al., 2018), therefore, behavioral sleep intervention strategies may need to be modified or presented in ways which increase the likelihood of these parents being able to implement them. For example, offering home visits outside of standard business hours, delivering the intervention at a slower pace or simultaneously treating the parent's mental health difficulties. This may optimize the efficacy of interventions in relation to child sleep and in turn, may have a positive effect on parenting stress and parent mental health. In addition, adult mental health interventions could be adapted to include screening for child sleep problems when parents seek assistance for parenting stress or mental health difficulties, allowing behavioral sleep interventions to be incorporated into the program where required. However, it should be noted such an approach would be difficult to implement with many existing mental health service models dividing services into child and adult specific services.

4.6. Strengths and limitations

This review had a number of strengths such as the inclusion of two neurodevelopmental disorders. Examining both disorders, rather than each disorder in isolation, is important given: (a) the large overlap between ADHD and ASD, and (b) the DSM-5 permitting a dual diagnosis of ADHD and ASD (American Psychiatric Association, 2013). This review also used a wide range of definitions for child sleep problems and did not exclude studies based on measurement approach. However, a limitation was the narrow definition of family functioning, which meant other constructs such as maternal sensitivity, parent engagement and relationship satisfaction were not examined.

4.7. Conclusion

Evidence from these studies suggest child sleep problems are associated with poorer parent mental health and higher parenting stress. However, the evidence was limited and future research needs to explore the specific child sleep problem domains and the specific parent mental health problem domains for both male and female caregivers, to enable associations between child sleep problems, parenting stress and parent mental health to be more fully understood. Future research is also needed to untangle the bidirectional associations between child sleep problems and family functioning. Such knowledge is vital to optimizing child sleep interventions and enhancing adult mental health interventions for parents. Such changes to interventions would ultimately improve the lives of children with neurodevelopmental disorders, their parents and the family unit as a whole.

Appendix A

Search Strategy Key Terms.

ADHD and ASD	**Child Sleep Problems**
ADHD	Issue*[a]
ADD	Difficult*[a]
AD/HD	Problem*[a]
Hyperkinesis	Disorder*[a]
"Attention Deficit*"	Disturbanc*[a]
"Attention-Deficit*"	Qualit*[a]
Autis*	Disrupt*[a]
ASD	Sleep*
Asperg*	Sleeplessness
Pervasive*	"Bedtime Refusal"
PDD	**Parent Mental Health**[b]
"Autism spectrum"	Distress

Parenting Stress[b]	"Mental Health"
Stress*	Anxi*
Function*	Depress*
Burden*	*psychiatric*
Wellbeing	"Mental State*"
Well-Being	Psychopatholog*
Outcome*	"Mood disturbance*"

*Note:*Additional terms for each key term was obtained from: PsycINFO - thesaurus, MEDLINE Complete - MeSH 2018, EMBASE - Emtree and CINAHL Complete – CINAHL Subject Headings

[a]sleep must be within 1 word of this key term or additional term.

[b]Parent*, Maternal*, Paternal*, Famil*, Care*, Mother*, Father* must be within 3 words of this key term or additional term.

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