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Sleep, Anxiety and Challenging Behaviour in Children with Intellectual Disability and/or Autism Spectrum Disorder

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Abstract

Children with an intellectual disability (ID) and/or Autism Spectrum Disorder (ASD) are known to suffer from significantly more sleep problems, anxiety and challenging behaviour (CB) than typically developing children (TD), yet little is known about the relationship between these factors in the child ID/ASD population. The study aim was to examine these relationships. We hypothesised that there would be significant positive correlations between the three factors and that sleep problems and anxiety would predict a significant amount of the variance in levels of CB. Parental measures of sleep problems, anxiety and CB were completed by 187 parents of children with ID and/or ASD. Significant positive associations were found between the three factors. A hierarchical multiple regression showed that medication, sleep problems and anxiety accounted for 42% of the variance in CB, with a large effect size. These findings suggest that these relationships should be considered during clinical practice, particularly in the case of CB interventions where sleep problems and/or anxiety are also present.

1. Introduction

Children with an intellectual disability (ID) and/or Autism Spectrum Disorder (ASD) suffer from significantly more sleep problems, anxiety and challenging behaviour (CB) than typically developing (TD) children, yet little is known about the relationship between these factors in the child ID/ASD population. The current study aimed to examine these relationships in a Scottish population.

1.1 The relationship between ID and ASD

There are difficulties determining the exact prevalence of children with ID and/or ASD due to differing diagnostic criteria and inclusion/exclusion criteria in studies, as well as the issue of children being unknown to services. There were estimated to be 28300 children with ID living in Scotland in 2004 (Scottish Executive, 2006). In terms of children with ASD, a recent UK study suggested a prevalence rate of 116.1 per 10,000 in primary school age children (Baird, Simonoff, Pickles, Chanders, Loucas, Meldrum, et al., 2006). As ASDs are evident across a range of IQ levels, a child can be diagnosed with both ASD and ID. Recent figures suggest up to 75% of children have a diagnosis of both ID and ASD (Croen, Grether, & Selvin, 2002).

1.2 Sleep problems

The multiple functions of sleep include physical and psychological rehabilitation, energy conservation, brain growth, and consolidation of memories (Stores, 2001). Unsurprisingly, sleep deprivation can have a range of negative impacts on children including impairments in memory, learning, vigilance, creative thought, verbal abilities and attention (Fallone, Acebo, Seifer, & Carskadon., 2005; Gozal, 1998). These may impact on academic performance and would be particularly detrimental to children who already had difficulties in

these areas (Blunden & Chervin, 2008). A child's sleep problems can also add to the stress of caring for a child with an ID and/or ASD (e.g. Hoffman, Sweeny, Lopez-Wagner, Hodge, Nam, & Botts, 2008).

Sleep disorders can be distinguished from sleep problems. Stores and Wiggs (2001) suggest that there are three primary categories of sleep problems: difficulty getting to sleep or staying asleep; sleeping too much; and disturbed episodes that interfere with sleep. There are also three primary classifications of sleep disorders: dysomnias are sleep disorders which cause difficulty getting to sleep, staying asleep, or excessive daytime sleepiness; parasomnias are sleep disorders which disrupt the sleep process once an individual is asleep; and sleep disorders which are associated with neurology or other medical disorders.

1.3 Sleep problems in children with ID and/or ASD

There is a high prevalence of sleep problems in children with both ID and ASD, with estimated prevalence rates being found by some authors to be as high as 77-86% (Bartlett, Rooney, & Spedding, 1985) and 73% respectively (Polimeni, Richdale, & Francis, 2005). Significantly more sleep problems have been found in the children with ID and ASD when compared to typically developing children (Allik, Larsson, & Smedje, 2006; Honomichl, Goodlin-Jones, Burnham, Gaylor, & Anders, 2002; Patzold, Richdale, & Tonge, 1998; Richdale, Francis, Gavidia-Payne, & Cotton, 2000). This may be because of the association with particular syndromes e.g. Down Syndrome (Miano, Bruni, Elia, Scifo, Smerieri, Trovato et al., 2008), Prader-Willi Syndrome (Clift, Dahiltz, & Parkes, 1994) and conditions such as epilepsy (Giannotti, Cortesi, Cerquiguni, Miraglia, Vagnoni, Sebastiani et al., 2008) or sensory difficulties (Carvil, 2001). Issues such as parental stress resulting in ineffective or inconsistent parenting strategies (Hoffman et al., 2008) and social/communication difficulties (Richdale, 1999) can also impact on sleep problems in these groups.

1.4 Anxiety

Anxiety has a negative impact on the child and their family, (Berg, Turid, Vikan & Dahl, 2002), however, there is limited research into anxiety in individuals with ID and/or ASD (Arthur, 2003). Prevalence rates can be as high as 84%, (e.g. Muris, Steerneman, Merckelbach, Holdrinet, & Meesters, 1998) and have been found to be significantly higher than in TD populations (e.g. Emerson & Hatton, 2007). As well as being associated with particular syndromes e.g. Fragile X syndrome (Bregman, Leckman, & Ort, 1998) or Williams Syndrome (Dykens, 2000), anxiety is also associated with a number of factors which are more common in the ID/ASD population. These include dysregulation of neurotransmitters (Corbett, Mendoza, Abdullah, Wegelin, & Levine, 2006); insecure attachment (Wallander, Dekker, & Koot, 2006); exposure to negative life events (Hurbert-Williams & Hastings, 2008) and limited social networks (Greenham, 1999).

1.5 Challenging Behaviour

Individuals displaying CB can be at an increased risk of abuse, inappropriate treatment, neglect and exclusion from community and social situations (Emerson, 2001). The term ‘challenging behaviour’ is used frequently in the literature to describe behaviour which is considered to be culturally abnormal, places the individual and/or others at risk, and results in the individual being denied access to ordinary facilities, (Emerson, 2001). Total population studies have shown prevalence of CB in ID to be around 10-15%, (Emerson, Kiernan, Alborz, Reeves, Mason, Swarbrick et al., 2001). When examining specific forms of CB in children, studies have shown prevalence rates of up to 60% (e.g. Adams & Allen, 2001).

Children can engage in multiple forms of CB (Emerson & Bromley, 1995; Lowe, Allan, Jones, Brophy, Moore, & James, 2007) from a young age (Hartley, Sikora, & McCoy, 2008), and a diagnosis of ASD in addition to ID has been shown to lead to increased risk of CB, (Murphy, Beadle-Brown, Wing, Gould, Shah, & Holmes, 2005). The exact prevalence is uncertain due to different assessments and definitions of CB (Emerson et al., 2001), but is significantly more common in children with ID/ASD compared to TD children (Baker, McIntyre, Blacher, Crnic, Edelbrock, & Low, 2003). CB is associated with particular syndromes such as Smith Magenis Syndrome, Down Syndrome and Prader-Willi Syndrome (Dykens, 2000; Dykens, 2007; Reddy & Pfeiffer, 2007) and is related to IQ levels (Emerson & Bromley, 1995); reinforcement (Emerson, 1998); parental stress (Baker et al., 2003); and communication difficulties (Hartley et al., 2008).

1.6 The relationships between sleep problems, anxiety and CB

A positive association between sleep problems and anxiety has been found in TD children (e.g. Alfano, Beidel, Tuner, & Lewin, 2006; Alfano, Ginsburg, & Kingery, 2007). It might be expected that a similar relationship, whether causal or bi-directional (Alfano et al., 2006), would exist between sleep problems and anxiety in children with ID and/or ASD. Anxiety is known to be accompanied by physiological and cognitive arousal (El-Sheikh, Buckalt, Granger, & Keller, 2008) neither of which provide a basis for restful sleep. Likewise, sleep deprivation for parents may impair the ability to effectively deal with the child's difficulties (Hoffman et al., 2008). Zarowski, Mojs, Mlodzilowska-Albrecht, & Steinborn (2006) found a positive relationship between sleep and anxiety in children with a low IQ, however, this research did not specifically address the relationship in an ID/ASD population. Likewise, while Patzold et al. (1998) suggest that psychological factors such as anxiety may be impacting on sleep problems and Allik et al. (2006) report a positive

correlation between high emotion and insomnia, neither address anxiety directly in children with ID/ASD.

A positive correlation between sleep problems and CB in children with ID and/or ASD has, however, been found (Wiggs & Stores, 1996; Richdale et al., 2000; Didden, Korzilius, van Aperlo, van Overloop, & de Vries, 2002). Brylewski and Wiggs (1999) suggest three possible reasons for this relationship: that sleep problems are a form of CB; that sleep problems cause daytime behaviour and/or contribute to their maintenance, for example, by impairing the learning process or that both are connected to the underlying pathology of ID and ASD.

The adult ID/ASD literature indicates a relationship between CB and ‘psychiatric disorder’ or ‘psychopathology’ (Hemmings, Gravestock, Pickard, & Bouras, 2006), although anxiety is not examined specifically. It has also been proposed (e.g. Hemmings et al., 2006) that CB may be an atypical presentation of psychiatric disorder, as in a behaviour equivalent of a psychiatric symptom or present as secondary to a psychiatric disorder (Allen & Davis, 2007). There is, however, limited research into the relationship between CB and anxiety in children.

In conclusion, there is strong evidence to suggest that sleep problems, anxiety and CB are more prevalent in children with ID and/or ASD than in TD children. Research suggests a strong relationship between sleep problems and anxiety in TD children, however, this relationship does not appear to have been examined directly in children with ID and/or ASD. Likewise, the research examining the relationship between anxiety and CB primarily relates to adults and does not specifically focus on anxiety. Associations between sleep and anxiety, sleep and CB, and anxiety and CB have been suggested in the research literature but all three factors have not been examined together.

1.7 Aims and hypotheses

The present study aims to investigate the possible interrelationship between the three clinical domains of sleep problems, anxiety and CB in the child and adolescent ID/ASD population. It is hypothesised that: there will be significant positive correlations between sleep and anxiety, sleep and CB, and anxiety and CB, in children with ID and/or ASD respectively and that sleep problems and anxiety will account for a significant amount of the variance in relation to challenging behaviour in children with ID and/or ASD.

2. Method

2.1 Design

This study used a cross sectional, quantitative, within subjects, questionnaire based design. Three variables were measured: sleep problems, anxiety and challenging behaviour (CB). A multiple regression analysis was performed with CB as an outcome, on the basis of predictors: medication use, sleep problems and anxiety. The study involved four health boards across Scotland. On-site representatives were recruited in each region to assist in the identification of potential participants. These individuals comprised professionals from Clinical Psychology, Child and Adolescent Mental Health Services, and Community Child Health

Ethical approval was provided by the University of Edinburgh and local NHS Committee on Research Ethics.

2.2 Participants

The participants were parents/guardians of children and young people with ID and/or ASD, from Scotland. All participants were over 18 and the main caregiver of a child aged 5-18 who attended the ID and/or ASD service in the participating NHS area. All participating

areas used identified good practice in relation to assessment and management of ASD (Scottish Intercollegiate Guidelines Network (SIGN, Guideline 98, 2007) i.e. the diagnosis of ASD would have been obtained using procedures recommended by SIGN, including the Autism Diagnostic Observation Schedule (ADOS) and/or Developmental, Dimensional and Diagnostic Interview (3DI) and assessment by a multi-disciplinary team (MDT).

In line with previous studies (e.g. Cotton & Richdale, 2006) information on children with medical conditions and syndromes and those on medication, were included in order to gain a realistic clinical sample. No children who met the inclusion criteria were excluded, unless an on-site representative felt that participation in the study was inappropriate (e.g. if the parents were already involved in other research studies).

2.3 Materials

Potential participants received a questionnaire pack containing a participant information sheet, letter of invitation, consent form, demographic information sheet and a questionnaire related to each factor of interest.

2.3.1 Demographic Information Sheet

Participants provided information regarding their relationship to the child, the child's gender, age, medical conditions, medication and known diagnosis i.e. ID and/or ASD.

2.3.2 Measures

Sleep Problems: These were measured using the Child's Sleep Habits Questionnaire (CSHQ), a 33 item parental report measure of sleep problems in children (Owens, Spirito, & McGuinn, 2000). The CSHQ has 8 subscales and has been found to be reliable and valid, however, as the authors do not provide norms or cut off points for the subscales and report variation in the internal consistency coefficients of the subscales, only the total score was

used in the present analyses. Owens et al. (2000) calculated that the sensitivity of the CSHQ as 0.80 and specificity as 0.72 using an overall cut-off score of 41. This score was found to correctly identify 80% of the clinical group of children attending a clinic for sleep disorders in their study. The cut-off score of 41 was, therefore, used in the present study to indicate sleep problems consistent with a clinical population. The CSHQ was not designed specifically for use with individuals with ID/ASD, but has been used in previous studies examining this clinical group (e.g., Hoffman et al., 2008; Honomichl et al., 2002).

Anxiety: This was measured using the Spence Children's Anxiety Scale – Parental Version (SCAS-P) which was developed by Nauta, Scholing, Papee, Abbott, Spence, & Waters (2004). This is a 38 item, parental report measure which yields 6 subscales. The SCAS-P has been found to have high validity and reliability, and consistency has been found between child and parent versions (Nauta et al., 2004). This measure was not designed for use with children with ID/ASD but has been used previously in studies of children with ASD (e.g. Sofronoff, Attwood, & Hinton, 2005).

Challenging Behaviour: This was measured by the Aberrant Behaviour Checklist – Community (ABC-C). This is a 58 item informant based measure of CB (Aman & Singh, 1994) which yields five factors. The authors report that scores falling within the 85th percentile can be defined as clinically significant. The ABC-C was originally designed for use in the ID adult population, although it has also been used with children and the factor structure, reliability and validity was maintained (Marshburn & Aman, 1992; Rojahn & Hesel, 1991).

2.4 Procedure

Potential participants were identified from existing NHS records and sent questionnaire packs. Those who chose to participate completed the questionnaire pack and returned it in a stamped addressed envelope. Participants provided signed informed consent. On return, the materials were marked with a corresponding number and the consent form was separated from the questionnaires, making the questionnaire data anonymous. On completion of the study all identifiable information was destroyed.

2.5 Data Analysis and Power Calculations

A power calculation indicated that, for power of 0.8, alpha level of 0.05, for a medium effect size, 85 participants were required overall for Pearson correlations and 76 participants for the multiple regression analysis (Cohen, 1992). The data were examined for normality of distribution and necessary transformations were performed. The CSHQ, SCAS-P and ABC-C were found to be reliable and showed internal consistency (Cronbach's alpha co-efficients of 0.759; 0.798; 0.797 respectively). An exploratory regression was carried out to identify any multivariate outliers. None were found using the ± 3 criteria (Tabachnick & Fidell, 2007).

3. Results

A total of 634 questionnaire packs were sent out and 187 were returned (return rate 29%), of which 20 were discarded due to excessive missing data, leaving 167 complete data sets

3.1 Demographic information

Demographic information regarding gender, relationship of respondent, co-morbid medical/developmental disorder, sensory problems, medication status, and group category are displayed in Table 1.

INSERT TABLE 1 ABOUT HERE

Insufficient information was provided about child IQ scores to allow for valid demographic information about this to be reported, however, at least 51% of the children had an IQ of 69 or less, due to having a diagnosis of intellectual disability. The co-morbid medical/developmental conditions and medications were examined to establish if the sample may be biased in any way due to the over inclusion of a particular condition or medication. The 5 most common conditions and medications are reported in Table 2

INSERT TABLE 2 ABOUT HERE

Specific medical/developmental conditions and medications were not included in the analyses due to the limited numbers for each individual medical/developmental condition or medication. Medical/developmental condition and medication were therefore included as a dichotomous ‘yes/no’ variable.

The total scores for CSHQ, SCAS-P, and ABC-C were examined. Means and standard deviations are shown in Table 3. The mean total score for the CSHQ was 51.57, indicating that, overall, the sample can be considered to have sleep problems consistent with a clinical sample. When examining cases individually, 129 (77.2%) scored above the cut off score for sleep problems in a clinical sample. In addition, 76 (46%) scored above the cut off for anxiety problems on the SCAS-P and 47 (28%) scored above the 85th percentile for one form of CB on the ABC-C.

INSERT TABLE 3 ABOUT HERE

3.2 Relationships between factors

One-way ANOVA found that children on medication scored significantly higher on all three measures compared to children not on medication. CSHQ: ($F_{1,165} = 14.059$, $p < 0.001$), indicating a medium to large effect size. SCAS-P: ($F_{1,165} = 4.835$, $p < 0.05$), indicating a small to medium effect size. ABC-C: ($F_{1,165} = 13.108$, $p < 0.001$), indicating a medium to large effect size. The results of this analysis suggest that medication needed to be taken into account in the further analyses in the study. No other significant relationships were found with demographic variables.

Pearson's correlations were used to test for associations between the factors. In relation to sleep and anxiety, a significant positive correlation was found between CSHQ and SCAS-P total scores ($r = 0.56$; $n = 167$; $p < 0.001$), with a large effect size (0.56) and power of 0.995. Likewise for Sleep Problems and CB, a significant positive correlation was found between total CSHQ and the ABC-C scores ($r = 0.61$; $n = 167$; $p < 0.001$), with a large effect size (0.61) and power of 0.995. Finally, a significant positive correlation was found between anxiety and CB as indicated by total SCAS-P and ABC-C scores ($r = 0.49$; $n = 167$; $p < 0.001$), with a medium to large effect size (0.49) and power of 0.995.

Partial correlations were run to examine the impact of medication use on CSHQ, SCAS-P and the ABC-C total scores. The significant correlations remained after factoring out medication: CSHQ and SCAS-P ($r = 0.54$; $p < 0.001$); CSHQ and ABC-C ($r = 0.58$; $p < 0.001$); SCAS-P and ABC-C ($r = 0.47$; $p < 0.001$).

3.3 Sleep problems, anxiety and CB

Hierarchical multiple regression was carried out to explore which of the variables predicted the observed variance in the ABC-C scores. Preliminary analyses showed that the assumptions of multiple regression were met. Medication was found to impact on the total

scores of the ABC-C and therefore was entered first into the regression model, followed by CSHQ (as this had a stronger correlation with the ABC-C), followed by the SCAS-P. The results of the hierarchical multiple regression are shown in table 4.

INSERT TABLE 4 ABOUT HERE

The results suggest that medication accounted for 7.4% of the variance ($R^2 = 0.074$) of CB, which was found to be statistically significant ($p < 0.001$). This indicates a small to medium effect size (0.074) and power of 0.64. When CSHQ is added to the model, the variance accounted for rises to 38.8% ($R^2 = 0.388$) which was also found to be statistically significant ($p < 0.001$). This indicates a large effect size (0.388) and power of 0.995. Finally, when SCAS-P was added to the model, the variance of CB explained rose to 41.9% ($R^2 = 0.419$), which was also statistically significant ($p < 0.05$). This indicates a large effect size (0.419) and power of 0.995.

4. Discussion

This study aimed to examine the relationships between sleep problems, anxiety and CB in a clinical sample of children and young people with ID and/or ASD. The results demonstrated significant positive correlations between sleep problems and anxiety, sleep problems and CB, and anxiety and CB. Additionally, the results of the hierarchical regression analysis demonstrate that sleep problems and anxiety predicted 42% of the variance in CB, with sleep being the stronger predictor.

The demographics of the sample were found to be consistent with previous studies, including a higher number of male children (e.g. Williams, Sears, & Allard, 2004), mothers being the most frequent respondents, (e.g. Honomichl et al., 2002) and the profile of the

children in relation to medication use and having a co-morbid medical or developmental diagnosis, (Courtman & Mumby, 2008). Only 7% of the sample, however, indicated sensory problems, which is lower than would be expected from this population (Carvil, 2001).

Sleep problems were reported by 77.2% of the sample, which is consistent with levels of sleep problems found in some previous studies (e.g. Polimeni et al., 2005), but higher than in others (e.g. Krakowiak, Goodlin-Jones, Hertz-Picciotto, Croen, & Hansen, 2008). These differences may be due to the fact that the present study examined a clinical sample. Anxiety was reported by 46% of the sample which, while consistent with levels of anxiety or emotional problems in children with ID/ASD reported in some previous studies (e.g. Einfeld & Tongue 1996a, 1996b), is more than that found in non-clinical samples (Emerson and Hatton, 2007). It is also less than that found by Muriset et al. (1998) who used interviews, which may have been more sensitive to anxiety symptoms than a questionnaire. Challenging behaviour was evident in 28% of the sample, which is higher than the 10-15% reported in the study by Emerson et al. (2001). The difference may be because the latter study included adults and was based on a non clinical population.

Significant positive correlations were found between sleep problems and anxiety, indicating that higher levels of sleep problems are associated with higher levels of anxiety in children with ID and/or ASD. This is consistent with research with TD children (Alfano et al., 2007) and supports suggestions made by Allik et al. (2006) that a link might exist between sleep problems and anxiety in the ID/ASD population. This relationship is perhaps unsurprising, given the interactions between developmental/biological, psychological and social factors for children with ID/ASD outlined above.

A significant positive correlation was also found between sleep problems and CB, indicating that higher levels of sleep problems are associated with higher levels of CB in

children with ID and/or ASD. This result is consistent with that found by previous authors (e.g. Didden et al., 2002; Wiggs & Stores, 1996). As noted previously, it is uncertain if sleep problems should be considered to be a form of CB, as contributing to the maintenance of CB, or if they are associated with an underlying pathology of both ID and ASD, such as a communication deficit (Brylewski & Wiggs, 1999; Wiggs & Stores, 1996). Further work is required to determine the nature of the relationship.

A significant positive correlation was also found between anxiety and CB. This suggests that higher levels of anxiety are associated with higher levels of CB and that the associations found between psychopathology and CB in the adult ID/ASD population are also evident in the child ID/ASD population. This raises the question of whether CB can be considered an atypical presentation of psychiatric disorder, as in a behavioural equivalent (Hemmings et al., 2006) as secondary to psychiatric disorder, or as providing a setting event in which CB may occur (Allen & Davis, 2007). Other factors such as communication and difficulty in understanding one's own thoughts and feelings (as is particularly the case in ASD) are also likely to contribute to this finding. Further work is required to establish the exact nature of the relationship.

Medication use was found to be related to increased scores on the CSHQ, SCAS-P and ABC-C. When the effect of medication was factored out, the significant correlations between sleep problems, anxiety and CB were still found to be present. The study also hypothesised that sleep problems and anxiety would predict a significant amount of the variance in relation to CB. Medication use was also included in the analysis due to its impact on ABC-C scores. Overall, medication, sleep problems, and anxiety were found to account for 41.9% of the variance in CB, with sleep problems being the strongest predictor. These results expand on previous research into the area of sleep problems, anxiety and CB by indicating that not only

are these factors related in the child ID/ASD population, but that sleep problems and anxiety can predict a significant amount of the variance in CB and that sleep problems are more predictive than anxiety.

This has implications for clinical practice. The sample of children involved were recruited from ID/ASD services, but were not specifically identified as having sleep problems, anxiety or CB. While it could be argued that the respondents would be more likely to be parents who felt that the factors being examined were pertinent to their child, the fact remains that a high prevalence on all three factors was found. The association between these factors, combined with the result that sleep problems and anxiety are predictive of challenging behaviour suggests that clinicians should consider all three factors when assessing a child with ID and/or ASD. Failing to do so, could result in significant factors being missed in the assessment, formulation and intervention stages of treatment.

A number of positive outcomes for CB have been highlighted in the literature (e.g. Braithwaite & Richdale, 2000), however, there is currently little evidence that sleep problems and anxiety are assessed or targeted as part of a CB intervention. Similarly, psychological and behavioural treatment interventions which target sleep problems or anxiety tend to focus on the specific factor identified for treatment, and do not seem to assess or monitor additional factors (e.g. Sofronoff et al., 2005). One exception was a study by Wiggs and Stores (1999) although the authors reported that the behavioural intervention for sleep problems was unsuccessful and the observed reduction in CB was not related specifically to the sleep intervention. The authors note that the study involved a small sample size and low statistical power which may have contributed to the lack of significant results. Further research is therefore required to examine whether interventions which target sleep problems, anxiety and CB are more effective than those which take account of the factors individually. This may

suggest the need for multi-component, multi-professional interventions possibly incorporating the short term use of medication, to target sleep problems, anxiety and CB.

Importantly, however, the present study found that children who were taking medication showed significantly higher levels of sleep problems, anxiety and CB than children who were not. The reason for this relationship is unclear. For example, it may be that medication was prescribed for children with more severe difficulties or that the side effect profile of certain medications resulted in this increase in difficulties. As medication use was a significant predictor of CB when entered on its own into the model, it is important to consider the effect of medication when formulating the child's difficulties.

The present study had a number of methodological strengths, including good statistical power, strong effect sizes, participants who represented a realistic clinical sample from across Scotland and who had been assessed and diagnosed according to good practice guidelines, suggesting that these results could be generalised with some confidence. In addition, to the authors' knowledge, this study is the first to investigate all three factors of sleep problems, anxiety and CB in the child ID/ASD population.

There were, however, also limitations. In terms of the measures used, the CSHQ and SCAP-P have not been specifically validated for children with ID/ASD and only the total CSHQ scores were examined, rather than the subscale scores. There is a potential response bias, in that it may be that only those parents/guardians who felt their child had a sleep problem, anxiety or CB decided to participate. There is also mixed evidence for the accuracy of parental report of the factors examined in this study, with Hering, Epstein, Elroy, Iancu & Zelnik. (1999) reporting that parents may overestimate children's sleeping problems, while Honomichl et al. (2002) found parental report to be reliable. There were also insufficient participants to allow individual analyses of the relationship between sleep problems, anxiety

and CB according to specific diagnosis i.e. ID alone, ID and ASD and ASD alone or in relation to specific demographic factors. Future research could explore these relationships further.

The study also identifies further areas for future research. The present study indicated that 41.9% of the variance of CB was predicted by sleep problems and anxiety, which leaves over half of the variance unexplained. Further research could identify which other factors, when added to the model, significantly predict CB and whether particular combinations of factors predicted particular types of CB.

5. Conclusion

In conclusion, the study found significant positive correlations between sleep problems, anxiety and CB in a clinical sample of children with ID and/or ASD. A hierarchical regression analysis revealed that sleep problems and anxiety predicted 42% of the variance in CB, with sleep problems being the stronger predictor, suggesting that clinicians should consider assessing for and addressing sleep problems when working with a child with ID and/or ASD with CB.

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Table 1: Demographic Information for the Sample (n=167)

Variable	Information	
Gender	Male	137 (82%)
	Female	30 (18%)
Relationship of Respondent	Mother	157 (94%)
	Father	8 (4.8%)
	Other	2 (1.2%)
Co-morbid medical/developmental condition	Yes	69 (41.3%)
	No	98 (58.7%)
Sensory Problem	Yes	13 (7.8%)
	No	154 (92.2%)
Medication	Yes	75 (44.9%)
	No	92 (55.1%)
Group Category	ID alone	31 (18.6%)
	ID plus ASD	55 (32.9%)
	ASD	81 (48.5%)

Table 2: Most common medical/developmental conditions and medication reported by the participants

Medical/developmental condition	Number of participants (%)
Asthma	18 (10.7%)
ADHD	16 (9.5%)
Epilepsy / seizures	10 (5.9%)
Down Syndrome	5 (3.0%)
Cerebral Palsy	4 (2.4%)
Medication	Number of participants (%)
Melatonin	23 (13.7%)
Inhaler	18 (10.7%)
Respiridone	9 (5.4%)
Methylphenidate	7 (4.2%)
Cetirizine	5 (3.0%)

Table 3: Means and standard deviations for total scores of the Child's Sleep Habits Questionnaire, Spence Children's Anxiety Scale – Parent Version and Aberrant Behaviour Checklist – Community.

Measure	N	Mean	Standard Deviation
CSHQ	167	51.57	10.66
SCAS-P	167	33.04	20.10
ABC-C	167	57.25	33.10

Non-transformed scores for the SCAS-P and ABC-C have been reported.

Table 4: Results of regression model for predicting CB

	Model Summary			ANOVA		Coefficients		
Variable	R²	Adjusted R	Sig value	F	Sig value	Std Beta	T Statistic	Sig value
Medication	0.074	0.068	0.0001	13.108	0.0001	0.105	1.684	0.094
CSHQ	0.388	0.381	0.0001	52.020	0.0001	0.466	6.317	0.0001
SCAS-P	0.419	0.409	0.004	39.230	0.0001	0.213	2.956	0.004