

## Sleep Problems, Anxiety and Cognitive Style in School-Aged Children

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Acknowledgements: The first author is supported by an ESRC Postdoctoral Fellowship.

This work is supported by a Career Development Award from the UK MRC to the second author. The authors wish to thank the pupils and teachers of Dulwich Hamlet School. They also thank David Clark, Patricia Huezso-Diaz, Jennifer Lau, Peter McGuffin, Maria Napolitano and Lucy Stirling for help with various aspects of the project.

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Resubmitted to Infant and Child Development.

The associations between sleep problems, anxiety, anxiety sensitivity and attributional style were examined in self-report data from 79 children aged 8-11 years. Total anxiety score was associated with different types of sleep problems (bedtime resistance, sleep anxiety and nightmares). Conversely, total sleep problem score was associated with different sub-scales of anxiety (from  $r(78) = .15$ ,  $p = \text{NS}$  to  $r(79) = .47$ ,  $p < .01$ ). Symptoms of anxiety correlated significantly with anxiety sensitivity, but not with attributional style. After controlling for other symptoms of anxiety, school phobias (Beta = .26,  $p < .05$ ), the mental incapacitation concerns scale of anxiety sensitivity (Beta = .26,  $p < .05$ ), and attributional style (Beta =  $-.31$ ,  $p < .01$ ,  $R^2 = .45$ ) predicted sleep problems. These results suggest that anxiety is associated with a range of sleep problems, and that sleep problems are associated with different types of anxiety. Furthermore, certain cognitive styles are associated with both anxiety and sleep problems and may be good candidates for further research into the association between sleep problems and anxiety in children.

*Key words: sleep, anxiety, attributional style, anxiety sensitivity*

Sleep problems and anxiety are common disturbances in children. For example, approximately 10% of children show signs of having an anxiety disorder by 16 years (Costello et al., 2003), and by adolescence around 25% of children demonstrate a sleep problem of major concern (Stores & Wiggs, 1998). Although these problems may occur singly, they are also associated with one another. In one study, according to mothers' report children aged 11 years with trouble sleeping were almost ten times more likely than others to show signs of anxiety/depression (Johnson et al., 2000). In order fully to understand sleep problems and anxiety, it is necessary to understand why these problems commonly co-occur.

While the association between sleep problems - especially insomnia - and anxiety in adults is well established (Breslau et al., 1996; Ford & Kamerow, 1989; Gillin, 1998), less is known regarding the association between sleep problems and anxiety in children, although studies exploring this area suggest that this association does occur in children of varying ages (e.g. Anders & Eiben, 1997; Gregory, Eley et al., 2004; for a recent review see Garland, 2001).

Some previous work addressing the association between sleep and anxiety has examined global sleep problem scales (e.g. Gregory, Eley et al., 2004), however, the association between sleep and anxiety is likely to be influenced by the type of sleep problem being examined. For example, one study demonstrated that while bedtime problems are associated with internalising problems, night wakings are associated with externalising problems (Bruni et al., 1999). Furthermore, although child literature has examined the association between sleep problems and generally defined anxiety, it is possible that sleep problems are more strongly associated with certain symptoms of anxiety than with others. Research is needed to examine this question.

Just as there is a need for more information concerning the *nature* of the association between sleep problems and anxiety in children, there is a matching paucity of research investigating the *origins* of this association. Behavioural genetic research suggests that genetic and environmental factors are both likely to be important in the association between sleep problems and anxiety (e.g. Gregory et al., 2004). Additional research from different perspectives is needed to provide a full understanding of this association; moreover, a further possibility is that cognitive factors mediate the association between sleep problems and anxiety. There is a growing interest in cognitive influences on both sleep problems and anxiety, especially in adults (e.g. Clark, 2001; Harvey, 2002); however, these influences have typically been examined in respect of sleep problems and anxiety *individually*.

Previous research has not specifically addressed aspects of cognition that mediate the association between sleep problems and anxiety. However, certain aspects of cognition have been associated with both sleep problems and anxiety individually and hence warrant further investigation. One such area of cognition is anxiety sensitivity (distorted beliefs regarding the threatening nature of normal physiological symptoms). Anxiety sensitivity is associated with both anxiety in children (for a review see Reiss et al., 2001) and sleep-related impairments in adults, even after accounting for comorbid-psychiatric problems and tendency to worry (Vincent & Walker, 2001). A further candidate is negative attributional style, which refers to a tendency to make internal, stable and global attributions for the occurrence of negative events, and external, unstable and general attributions for the occurrence of positive events. Although negative attributional style is most commonly considered in relation to depression, it has also been associated with anxiety in adolescents (Garber et al., 1993). Furthermore, the adult literature suggests a negative attributional style in individuals with sleep problems. For example, research has found that adult insomniacs

are more likely to endorse statements such as “I take things personally” and “When things go wrong I tend to get depressed” than are good sleepers (Regestein et al., 1993). More generally, insomniacs experience excessive negatively-toned cognitive activity as compared with good sleepers (Harvey, 2002). Previous research suggesting associations between anxiety sensitivity, attributional style and sleep problems has focused on *adult* participants. As age may be important in these associations, it is necessary to assess whether the associations between these cognitive influences and sleep problems are also found in children before examining whether anxiety sensitivity and attributional style are mediators of the association between sleep problems and anxiety in children.

Given the paucity of research into the structure and origins of the association between anxiety and sleep problems in children, the aims of this study were to: 1) replicate previous work by demonstrating an association between sleep problems and anxiety; 2) extend previous research by examining anxiety in relation to different types of sleep problems, and sleep problems in relation to different types of anxiety; 3) examine association between anxiety, sleep problems and aspects of cognition (anxiety sensitivity and attributional style).

### Method

The sample consisted of 79 children (43% male), aged 8-11 years ( $M = 9.76$   $SD = .84$ ) from a South London primary school. Children within this age range were selected for participation as the current focus is on childhood (as opposed to adolescent or adult) problems. Furthermore, it may not have been appropriate to include younger children who may have had difficulties with the self-report nature of the study. 70% of the children were Caucasian and the children came from families who were above the national average in terms of education level and occupational status. Children in four randomly selected classes (two year four, one year five, and one year six) were given a letter describing the study

together with a consent form, and asked to give these to their parents. An additional information sheet designed for the children was provided. Children who did not return their consent forms after one week were asked if they intended to participate in the investigation and, if so, reminded to bring back their consent forms. 63% of the children returned their consent forms and participated in the study. The children were tested individually by psychology graduates with research experience. Ethical approval was obtained prior to the onset of the study.

Parents of participants completed a 'background' questionnaire. This included items enquiring as to the occupations of both parents. In order not to overburden parents and to achieve an acceptable response rate, they were not asked to complete further questionnaires.

Sleep problems were assessed using the Sleep Self Report (e.g. Owens et al., 2000). This self-report measure was designed to assess common sleep problems in children. A 13-item sleep scale was developed from items inquiring about difficulties in going to bed and falling asleep, sleep duration, night wakings, and daytime sleepiness. Items include "Do you fall asleep in about 20 minutes?" (for a full list of the items in this scale see Owens et al., 2000). Each item was rated on a 3-point scale (1 = usually to 3 = rarely). Some items were reverse-coded and a higher score on this scale indicates more sleep problems.

Anxiety was assessed by means of self-report using the Screen for Child Anxiety Related Emotional Disorders (SCARED: Birmaher et al., 1997, 1999). This questionnaire consists of 41 items, including "I feel nervous with people I don't know well", rated on a 3-point Likert scale (0 = not true to 2 = often true). This measure has excellent concurrent face validity (Muris et al., 1998) and psychometric properties (Birmaher et al., 1999). Scales within the SCARED assess symptoms of somatic/panic (thirteen items), general anxiety (nine items), separation anxiety (eight items), social phobia (seven items) and

school phobia (four items). These scales were devised by taking the sum score of relevant items.

The Childhood Anxiety Sensitivity Index (Silverman et al., 1991) assesses distorted beliefs about the threatening nature of normal physiological symptoms. An 18-item version of this task was used, with each item rated on a three-point scale (1 = not true to 3 = often true). Three sub-scales were made from the sum of relevant items. The first scale focused on fear of physiological arousal (the physical concerns scale), and comprised eight items such as “It scares me when my heart beats fast”. The second scale focused on fear of losing mental control (the mental incapacitation concerns scale) and comprised four items such as “When I cannot keep my mind on my schoolwork I worry that I might be going crazy”. The final scale focused on fear of negative social evaluation (the publicly observable symptoms concerns scale), and comprised six items such as “It embarrasses me when my stomach growls (makes noises)”.

The revised-version of the Children’s Attributional Style Questionnaire (Kaslow & Nolen-Hoeksema, 1991) was used to assess causal explanations for negative and positive events. It includes 12 negative and 12 positive items (e.g. “You get an ‘A’ on a test”), with two possible causal explanations (e.g. “I am smart” or “I am good in the subject that the test was in”). Positive and negative scores were obtained by summing the number of positive and negative events for which internal, stable or global attributions were made; and a difference score was calculated by subtracting the negative from the positive composite scores. A lower score on this measure indicates a more depressogenic attributional style.

## Results

*Descriptive Statistics*

Descriptive statistics for each measure are presented in **Table 1**. Of note, the mean sleep problem score reported here falls within one standard deviation of that previously reported among normal participants (see Owens et al., 2000).

[Insert **Table 1** about here]

The correlation between sleep problem and age was not significant ( $r(78) = -.17$ ,  $p = \text{NS}$ ). Furthermore, the sleep problem score for males ( $M = 20.24$ ,  $SD = 3.92$ ) did not differ significantly from that for females ( $M = 21.11$ ,  $SD = 3.75$ ;  $t(76) = -1.00$ ,  $p = \text{NS}$ ). There were no mean differences for sleep problems scores between different SES groups, as defined by mothers' occupations ( $F(9, 74) = .758$ ,  $p = \text{NS}$ ) and fathers' occupations ( $F(8, 72) = 1.377$ ,  $p = \text{NS}$ ).

Similarly, the correlation between anxiety and age was not significant ( $r(78) = -.02$ ,  $p = \text{NS}$ ). However, anxiety was significantly higher in females ( $M = 32.49$ ,  $SD = 11.33$ ) than in males ( $M = 21.36$ ,  $SD = 14.98$ ;  $t(74) = -3.74$ ,  $p < .01$ ). Anxiety scores did not differ between the SES groups, as defined by mothers' occupation ( $F(9, 66) = 1.31$ ,  $p = \text{NS}$ ) and fathers' occupation ( $F(8, 65) = 1.14$ ,  $p = \text{NS}$ ).

*Correlations between Sleep problems, Anxiety and Cognitive Influences*

The correlation between the total anxiety score and the 13 items comprising the sleep problems scale are presented in **Table 2**. The association with anxiety appeared to be stronger for some types of sleep problems (e.g. sleep anxiety: afraid of sleeping alone,  $r(77) = .41$ ,  $p < .01$ ) than with others (e.g. short sleep duration,  $r(77) = .14$ ,  $p = \text{NS}$ ). However, anxiety was significantly associated with items indicative of bedtime resistance (e.g. fights with parents about going to bed,  $r(77) = .23$ ,  $p < .05$ ), sleep anxiety, and sleep behaviour problems (nightmares,  $r(77) = .34$ ,  $p < .01$ ). Given the association between anxiety and a

range of sleep problems, the absence of standardised sub-scales in the SSR and reasonable internal consistency for the sleep scale ( $\alpha = .59$ ), a total sleep problems scale score was developed (this scale is used in further analyses).

[Insert **Table 2** about here]

Correlations between total sleep problem score, anxiety scales and cognitive influences are shown in **Table 3**. Sleep problems showed moderate correlations with different aspects of anxiety (total scale:  $r(79) = .45, p < .01$ ), anxiety sensitivity (total scale:  $r(79) = .36, p < .01$ ) and attributional style. Anxiety correlated significantly with anxiety sensitivity (total scale:  $r(79) = .69, p < .01$ ), but not with attributional style ( $r(79) = -.10, p = \text{NS}$ ), although the latter association was in the expected direction.

[Insert **Table 3** about here]

Correlations between the different anxiety scales (not tabulated) ranged from  $r(78) = .38, p < .001$  for social phobia and school phobia, to  $r(78) = .72, p < .001$  for somatic/panic and general anxiety. Correlations between the different anxiety sensitivity scales (not tabulated) ranged from  $r(79) = .26, p < .05$  for mental incapacitation concerns and publicly observable symptoms concerns to  $r(79) = .47, p < .001$  for physical concerns and publicly observable symptoms concerns.

#### *Linear Regression Analyses: Predicting Sleep Problems*

The prediction of sleep problems, from the anxiety and anxiety sensitivity scales and attributional style, was examined using hierarchical linear regression analyses. Different scales of anxiety were included at step 1 and different scales of anxiety sensitivity and attributional style were included at step 2. **Table 4** provides the unadjusted and step-by-step statistics for these regression analyses. In the final model, after accounting for other symptoms of anxiety, school phobia was significantly associated with sleep problems (Beta

= .26;  $p < .05$ ). Furthermore, the mental incapacitation scale of the anxiety sensitivity measure (Beta = .26;  $p < .05$ ), and attributional style (Beta = -.31;  $p < .01$ ;  $R^2 = .45$ ) were significantly associated with sleep problems. As the correlations between predictor variables were moderate/high, the collinearity statistic tolerance was examined. This statistic represents the proportion of a variables' variance not accounted for by other independent variables in the model. In the final model, tolerance ranged from .32 for somatic/panic to .96 for attributional style.

[Insert **Table 4** about here]

### Discussion

The results of this study support the hypotheses by showing associations between sleep problems and anxiety, aspects of anxiety sensitivity, and attributional style. Anxiety was also associated with aspects of anxiety sensitivity – but not with attributional style. The results also suggest that anxiety is more strongly correlated with certain types of sleep problems (e.g. sleep anxiety) than with others; and, conversely, that sleep problems show a stronger association with certain types of anxiety (e.g. school phobias) than with others. Some limitations of this study are outlined before the results of this study are discussed.

The first limitation is that the data are based exclusively on self-report. While self-reports are important in assessing common childhood problems and are considered valid methods of assessing levels of affectivity (Merrell et al., 2002), their exclusive use here may exaggerate associations between measures. Future work may benefit from examining these associations using multiple raters, and including additional observational data and experimental tasks.

The use of self-report to assess sleep problems must also be specifically addressed. Although laboratory data is often considered the 'gold-standard' in research on sleep disorders, the present study was concerned with individual differences in commonly

reported general sleep problems, rather than with sleep disorders per se - such as insomnia. Whilst no self-report questionnaire-based assessments of childhood sleep problems has been subjected to extensive study, the measure used in this investigation has been used previously (Owens et al., 2000), and results from that study showed a similar mean score to that reported in the current investigation. Furthermore, the reliability (internal consistency) of the scale reported here was considered acceptable.

The final limitations concern the sample used in this investigation. First, the sample was fairly small and above-average in terms of SES and educational level. Given this, associations of smaller effect size may have been missed, and results reported here can be generalised only to children from families of above average SES and educational level. Second, there was a low response rate, and general information could not be obtained on children refusing to participate. This means that this study could not address the possibility of selection bias. Further work in this area would therefore benefit from the use of larger, more representative samples.

Despite these limitations, as expected there was an association between sleep problems and anxiety. Anxiety was associated with different types of sleep problems, and each anxiety sub-scale (with the exception of social phobia) was associated with the total sleep problem scale when examined without taking into account overlap with other factors. When the other anxiety sub-scales were controlled for, only school phobia was associated with sleep problems. Although mechanisms underlying the association between sleep problems and school phobia are not elucidated by this study, it is possible that experiencing bullying at school leads to both school phobia and sleep problems (both anxiety and sleep problems have been associated with peer relationships in previous research, see Deater-Deckard, 2001; Williams et al., 1996).

Other possible mechanisms include anxiety about school leading to sleep problems. Conversely, sleep problems may lead to anxieties (e.g. see Gregory, Caspi et al., 2004 for research demonstrating longitudinally the prediction of anxiety from earlier sleep problems). It is important to acknowledge that the results of the regression analyses reported here do *not* necessarily imply that there is a specific association between sleep problems and school phobias. This is because the correlation among the different anxiety scales is likely to explain partially why not all scales retained significant regression weights when examined simultaneously. However, the collinearity between the predictor variables, assessed using the collinearity statistic tolerance, was considered acceptable.

An association between anxiety and anxiety sensitivity was found, replicating previous research (e.g. Reiss et al., 2001). However, the association between negative attributional style and anxiety was not significant, although it was in the expected direction.

Independently, each sub-scale of the anxiety sensitivity measure was associated with sleep problems. After controlling for anxiety, however, only 'mental incapacitation concerns' were associated with sleep problems. Again, care should be taken to avoid strong conclusions regarding the specificity of this finding, as the anxiety and anxiety sensitivity subscales were correlated. However, the finding that aspects of anxiety sensitivity are associated with sleep problems fits well with certain adult literature (e.g. Vincent et al., 2001). The specificity of this association requires replication before the implications of this finding are clear. The association found here between negative attributional style and sleep problems also complements research in adults suggesting a relationship between negative cognitive style and sleep problems (e.g., Regestein et al., 1993). The general finding that certain cognitive factors are associated with childhood sleep problems is particularly interesting – as although associations between cognitive influences and sleep problems in adults are well-established, such associations have received limited attention in children.

Additionally, it is interesting to note that much of the adult literature has focused on cognitions during the pre-sleep period – although the importance of daytime cognitions on sleep problems is now being highlighted (Harvey, 2002). This study suggests that daytime cognitive styles may be associated with sleep problems in children as well as in adults.

While the results of this study allow for the possibility that anxiety sensitivity and attributional style are potentially important in helping to explain the association between sleep problems and anxiety, it is important to note that this study was not designed to provide information concerning the direction of effects, or to clarify which factors mediate others. Rather, this study simply describes the associations between these variables, and in so doing confirms these cognitive influences as good candidates for further research exploring the association between sleep problems and anxiety in children. Research using data collected at multiple time-points will help to clarify the nature and direction of these associations.

In conclusion, this study replicates previous research by showing an association between sleep problems and anxiety in school-aged children. It also adds to the literature by demonstrating relationships between different types of sleep problems and different types of anxiety. Furthermore, this study supports the suggestion that certain cognitive factors are associated with both childhood anxiety and sleep problems. This is particularly interesting given the dearth of research examining cognitive influences on childhood sleep problems and suggests that future work may benefit from examining cognitive influences on the association between sleep problems and anxiety. Understanding associations between sleep problems and anxiety and elucidating the origins of these disturbances are useful starting points from which to develop preventative methods and treatments for these common childhood problems.

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Table 1. Descriptive Statistics

Variable	Mean (SD)	Range
Sleep problems	20.73 (3.83)	13 - 31
Anxiety (total)	27.78 (14.04)	2 - 62
Anxiety (somatic/panic)	6.71 (4.70)	0 - 22
Anxiety (general)	6.22 (3.78)	0 - 15
Anxiety (separation)	6.67 (3.81)	0 - 16
Anxiety (social phobia)	5.78 (3.23)	0 - 13
Anxiety (school phobia)	2.41 (1.69)	0 - 6
Anxiety sensitivity (total)	29.76 (5.75)	18 - 47
Anxiety sensitivity (physical concerns)	12.85 (3.31)	8 - 22
Anxiety sensitivity (mental incapacitation concerns)	5.65 (1.66)	4 - 11
Anxiety sensitivity (publicly observable symptoms concerns)	11.27 (2.28)	6 - 17
Attributional style	4.70 (2.67)	-2 - 11

Table 2. Correlations between items in sleep problems scale and total anxiety score

Item in sleep problems scale	Correlation with total anxiety score
Hard for you to go to bed	.22 <sup>+</sup>
Fight with parents about bedtime	.23 <sup>*</sup>
Go to bed at same time every night	.08
Fall asleep in 20 minutes	.04
Fall asleep with family member	.22 <sup>+</sup>
Afraid of sleeping alone	.41 <sup>**</sup>
Afraid of dark	.40 <sup>*</sup>
Sleep too little	.14
Up late when parents think you're asleep	.07
Pain wakes you up at night	.08
Go to someone else's bed during the night	.17
Have nightmares	.34 <sup>**</sup>
Take naps during the day	-.02

<sup>+</sup> p<.10; <sup>\*</sup> p<.05; p<.01. Note. Items re-coded so higher scores represent a greater problem.

Table 3. Correlations: Sleep problems, Anxiety, Anxiety Sensitivity and Attributional Style

Measure	Sleep	Anxiety sensitivity (physical concerns)	Anxiety sensitivity (mental incapacitation concerns)	Anxiety sensitivity (publicly observable symptoms concerns)	Attributional Style
Sleep	1.00	.24*	.41**	.26*	-.38**
Anxiety (somatic/panic)	.41**	.55**	.54**	.37**	-.10
Anxiety (general)	.37**	.47**	.44**	.41**	-.08
Anxiety (separation)	.44**	.56**	.44**	.49**	-.07
Anxiety (social phobia)	.15	.45**	.24*	.35**	-.02
Anxiety (school phobia)	.47**	.34**	.28*	.32**	-.14

Note: \*p<0.05 ;\*\*p<0.01

Table 4. Predicting Sleep Problems: Summary of Linear Regression Analysis

Variable	Unadjusted			Step 1 (R <sup>2</sup> = .31)				Step 2 (R <sup>2</sup> = .45)			
	B(SE)	β	T	B(SE)	β	T	Tolerance	B(SE)	β	T	Tolerance
Anxiety (somatic/panic)	4.32(1.11)	.41	3.90**	1.21 (1.71)	.12	.71	.37	.24 (1.67)	.02	.14	.32
Anxiety (general)	3.33 (.97)	.37	3.42**	1.12 (1.34)	.12	.84	.44	.61 (1.25)	.07	.49	.43
Anxiety (separation)	3.56 (.83)	.44	4.29**	2.14 (1.13)	.27	1.90 <sup>+</sup>	.49	1.84 (1.11)	.23	1.66	.43
Anxiety (social phobia)	1.21 (.95)	.15	1.27	-1.98 (1.04)	-.24	-1.90 <sup>+</sup>	.62	-1.61 (.98)	-.19	-1.65	.60
Anxiety (school phobia)	4.22 (.92)	.47	4.57**	2.67 (1.11)	.30	2.41*	.64	2.33 (1.03)	.26	2.25*	.63
Anxiety sensitivity (physical concerns)	2.23 (1.02)	.24	2.18*					-1.01 (1.14)	-.11	-.88	.54
Anxiety sensitivity (mental incapacitation concerns)	3.75 (.97)	.41	3.87**					2.37 (1.04)	.26	2.28*	.65
Anxiety sensitivity (publicly observable symptoms concerns)	2.59 (1.11)	.26	2.33*					1.18 (1.11)	.12	1.07	.67
Attributional Style	-.54 (.15)	-.38	-3.52**					-.45 (.14)	-.31	-3.31**	.96

Note: Estimates reported are based on final regression equation. <sup>+</sup>p<0.1; \*p<0.05; \*\*p<0.01. Tolerance is a collinearity statistic that shows the proportion of a variables' variance not accounted for by other independent variables in the model.