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**Parent-Reported Psychological and Sleep  
Problems in a Preschool-Aged Community  
Sample: Prevalence of Sleep Problems in Children  
with and without Emotional/Behavioural  
Problems.**

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### Abstract

**Objective:** To examine (a) the prevalence of sleep problems among 4-year-olds in the general population, (b) the prevalence of sleep problems among children with emotional and/or behavioural problems, and (c) whether specific sleep problems are associated with particular emotional/behavioural problems. **Method:** Using The Preschool Age Psychiatric Assessment (PAPA), data about sleep and emotional/behavioural problems was obtained from 727 parents of 4-year-olds, recruited for a large-scale research project, Trondheim Early Secure Study (TESS). **Results:** 31, 7 % of the 4-year-olds had one or more sleep problems, of which bedtime resistance and sleep terror were the most prevalent. Significantly more children with emotional/behavioural problems had sleep difficulties, compared to children without such problems. The results indicate that children with different types of psychiatric problems may have dissimilar sleep problems. Anxiety was associated with primary insomnia and nightmares; depression with sleep terror, bedtime resistance, difficulty initiating sleep and nightmares; behaviour problems with bedtime resistance, sleep terror and restless sleep; and ADHD was associated with sleep terror, restless sleep, primary insomnia and nightmares. Nightmares and sleep terror were prevalent across all the disorder groups. **Conclusion:** Sleep problems are prevalent among 4-year-olds, especially in children with symptoms of psychiatric disorders. Certain sleep problems seem to be more strongly associated with some psychological problems than others.

### Prevalence of Sleep Problems in Children With and Without Emotional/Behavioural Problems

Sleep problems are common during childhood, and are one of the top five parental concerns presented to pediatricians (Owens, 2001). According to Mindell and Owens (2003) studies have reported an overall prevalence of a variety of parent-reported sleep problems ranging from 25% to 50% in preschool-aged samples. Typical sleep problems associated with this age group are difficulty initiating sleep, difficulty maintaining sleep, bedtime resistance, sleep walking, night terrors, and nightmares. Consensus exists that the most common problems are difficulties initiating and maintaining sleep (Owens, 2008; Tikotzky & Sadeh, 2001), and bedtime resistance (Thiedke, 2001).

Conclusions from several studies are that sleep problems can persist, become chronic, and have severe consequences for an individual and its family (Fricke-Oerkermann et al., 2007; Gregory & O'Connor, 2002; Lam, Hiscock, & Wake, 2003; Mindell & Owens, 2003). One potential consequence of sleep problems is reduced neuro-cognitive functioning. Sleep restriction leads to altered blood flow in parts of the brain, and frontal- and temporal lobe functions like attention, impulse inhibition, risk assessment and memory seem to be particularly vulnerable (Drummond et al., 2000; Wolfe, Reed, Eberling & Jagust, 1995). Behaviourally, inadequate sleep is associated with weakened impulse control (Grova, 2007), increased risk taking (Durmer & Dinges, 2005) and hyperactivity (Smedje, Broman & Hetta, 2001). Grova (2007) points out that symptoms like hyperactivity and irritability often are not recognized as insufficient sleep by caregivers. Effects on mood and daily functioning has also been reported; sleep restriction can lead to labile mood, reduced energy (Mindell & Owen, 2003), reduced daytime activity (Nixon et al., 2008), and poorer academic functioning (Gozal & Pope, 2001). Impact on physical health, e.g. on insulin resistance, blood pressure and weight, has also been found (van Cauter & Spiegel, 1999). Finally, in a broader context, sleep problems might be a significant source of distress for the family, as it affects the quality and quantity of parents' sleep. Disrupted sleep may lead to less functional parenting and has been described as a risk factor for child physical abuse (Sheldon, Ferber & Kryger, 2005).

Sleep problems frequently accompany psychological difficulties, such as ADHD, anxiety and depression (Ivanenko & Johnson, 2008). The coexistence of sleep problems is likely to worsen the symptoms of a psychiatric disorder. Furthermore, sleep problems themselves tend to be more common in children with psychiatric conditions (Mindell & Owens, 2003). Emerging evidence also suggests that sleep problems in early years may predict later development of emotional and behavioural problems. For example, Gregory, Thaila, O'Connor and Plomin (2004) found that sleep problems at the age of 3-4 years predict

anxiety, conduct disorder and hyperactivity at age 7. Other researchers have found that early sleep problems is a risk factor for later developing anxiety (Gregory et al., 2005; Johnson, Chilcoat & Breslau, 2000). Studies with children younger than 18 months have failed to find an association between sleep difficulties at this age and later psychopathology (Skovgaard et al., 2008).

All in all, the literature suggests that there is an important link between sleep disturbances in preschool - and school age and psychological problems. However, this association is poorly understood. For example, Ivanenko, Crabtree, O'Brien and Gozal (2006) claim that little is known about the prevalence of sleep problems in children with emotional and behavioural disturbances, and the relationship between specific sleep complaints and psychiatric disorders. Some studies suggest that children with different types of psychological problems tend to have different sleep problems. For example, Smedje et al. (2001) found hyperactivity to be associated with tossing and turning during sleep; conduct problems with sleep walking and bedtime resistance; and emotional symptoms with sleep terror, difficulty falling asleep and daytime sleepiness. In a review article, Ivanenko and Johnson (2008) reported that the most common sleep complaints in children with anxiety disorders include primary insomnia, bedtime refusal, nightmares and nocturnal fears. Common sleep complaints in children with depression are insomnia and hypersomnia. Finally, children with ADHD often have difficulties initiating and maintaining sleep, settling at bedtime and parasomnias.

As preschool children undergo an enormous cognitive, emotional, behavioural, and biological development, they may be particularly sensitive to the potential effects of insufficient sleep. Sleep problems are preventable and treatable (Mindell, Kuhn, Lewin, Meltzer & Sadeh, 2006; Mindell & Meltzer, 2008). Thus, early identification and treatment is important. El-Sheik, Keller and Granger (2008), however, point out that researchers and public health officials only recently have begun to acknowledge the importance of children's sleep as an understudied aspect of health.

Taken together, several studies have reported that 1) sleep problems are common and can affect the child's health, development and functioning, and 2) associations between sleep problems and behavioural/emotional problems exist, but are poorly understood. To our knowledge, there are no studies that investigate the prevalence of sleep problems and their relation to emotional and behavioural problems among Norwegian preschoolers. The aim of this study is (a) to examine the prevalence of sleep problems in the general population of 4-year-olds, (b) to examine the prevalence of sleep problems among children with different

emotional and/or behavioural problems, and (c) to study whether specific sleep problems are associated with particular psychological problems.

## **Method**

### **Participants and recruitment**

The subjects in this study were 727 4-year-olds recruited for the research project Trondheim Early Secure Study (TESS). With their scheduled appointment for the regular health consultation for 4-year-olds, an invitation to TESS and the Strengths and Difficulties Questionnaire (SDQ) was sent home to all caregivers (n=3456) of children born in 2003 or 2004 living in the city of Trondheim. The council for Official Norwegian Review (Norsk Offentlig Utredning, NOU) estimated that 94 % of all 4-year-olds in Norway met at the regular health consultation from 2005-2008 (NOU, 2009:22). Of the children who were referred to TESS, a majority presented at the city's clinics. The clinics' health nurses informed the parents about TESS using procedures approved by the Regional Committee for Medical and Health Research Ethics, and 2477 parents consented to participate.

The SDQ is a 31 item measure of psychiatric symptoms, competencies and impairment suitable to 4- to 18-year-old children. The SDQ scores on the four symptom subscales (emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship problems – 20 items) were divided into four strata (cut offs: 0-4, total n=1,096; 5-8, total n=731; 9-11, total n=455; 12-40, total n=194).

Using a random number generator, defined proportions of caregivers in each stratum were drawn to participate in a structured diagnostic interview concerning the child's mental health, The Preschool Age Psychiatric Assessment (PAPA). The drawing probabilities increased with increasing SDQ scores. This selection caused skewness in the sample, which was accounted for in the analyses by weighting the cases. Registration of all the PAPA data for TESS is not ready yet; therefore this study only includes a total N of 727. Of the total number of parents who have completed the interview at this point, 98,2 % were biological parents, 84,9 % were female, and 83,8 % of those interviewed were the child's biological mother. The same caregiver that filled in the SDQ was requested to take part in the interview, but in 14,2 % of the cases, another caregiver provided the information.

## Measures

The data used in this study is collected with The Preschool Age Psychiatric Assessment, PAPA (Egger & Angold, 2004). The PAPA is a structured parent interview for assessing psychiatric symptoms and disorders in children aged 2-5, focusing on the 3 months immediately preceding the interview. It includes sections on different topics, such as sleep behaviour, anxious affect, depression and ADHD. The PAPA is based on DSM-IV criteria (American Psychiatric Association, 1994), items in the Diagnostic Classification: 0-3, and the Research Diagnostic Criteria-Preschool Age. Behaviour and symptoms that are not a part of these diagnostic systems, but that are relevant for preschoolers, are also included. Moreover, the interview assesses the symptoms' impact on family environment and relationships, family psychosocial problems and life events (Egger & Angold, 2004).

## Procedure

All the children and their parents recruited for TESS went through extensive testing at the clinic at the Norwegian University of Science and Technology (NTNU). The PAPA was one of many measures used, and this interview was administered to the parents either at home, on the telephone or at the clinic, and was scored by research assistants.

## Definition of sleep problems

The PAPA contains items related to sleep behaviour responding to the diagnostic criteria for DSM-IV sleep disorders. The following sleep categories are included in the study: 1) *Difficulty initiating sleep*: the child spends 18 minutes or more to fall asleep, and has shown bedtime resistance 24 or more times the last 3 months; 2) *Difficulty maintaining sleep (Night wakings)*: the child has had 24 or more night wakings the last 3 months, and it must have spent 30 minutes or more falling asleep again after each awakening; 3) *Difficulty initiating or maintaining sleep (Primary Insomnia)*: difficulty initiating sleep or night wakings; 4) *Sleepwalking disorder*: sleep walking some time during the last 3 months; 5) *Sleep terror disorder*: some time, the child has appeared terrified at night *and* has seemed to have no recollection of the episode the next day; 6) *Nightmare disorder*: nightmares that has awakened the child at night, and dreams about separation that awakens the child, a total of 13 or more times the last 3 months.

Previous studies have indicated that restless sleep and bedtime resistance are common sleep problems in children with externalizing problems (Bos et al., 2009; Corcum, Tannock & Modolfsky 1998; Smedje et al., 2001). We also included the categories 7) *Restless Sleep*: the parents have described the child's sleep, as it usually appears, as restless (e.g., the child turns around several times during the night and moves legs or arms); and 8) *Bedtime resistance*: the

child has shown bedtime resistance 24 or more times the last 3 months. Finally, all these sleep problems were included in category 9) *Any sleep disorder*: the child has symptoms that respond to one or more of the sleep diagnoses and/or the symptoms of bedtime resistance and/or restless sleep.

### **Definition of emotional and behavioural problems**

The PAPA contains questions about a child's emotional and behavioural functioning. In this study we have looked at emotional and behavioural problems in general, rather than focusing on specific disorders (e.g. separation anxiety), using the following categories: 1) *Any anxiety disorder*: Agoraphobia; Agoraphobia without panic; Generalized anxiety; Panic attacks; Panic attacks with agoraphobia; Panic attacks without agoraphobia; Specific phobia; Separation anxiety; Post traumatic stress disorder; Presence of worries; and Social phobia; 2) *Any depressive disorder*: Major depression; Double depression and dysthymia; Depression with irritable mood and Depression NOS; 3) *Any internalizing disorder*: any anxiety disorder and/or any depressive disorder; 4) *Any behavioural problem*: Conduct Disorder and/or Oppositional Defiant Disorder; 5) *AttentionDeficit/Hyperactivity Disorder (ADHD)*: Any ADHD impairment in the home, in school and elsewhere; 6) *Any externalizing disorder*: any behavioural problem and/or ADHD.

Critics may correctly point out that some diagnostic criteria in certain anxiety diagnoses are related to sleep issues. This is e.g. the situation for PTSD. As no children in our sample met the criteria for PTSD, we did not consider this as a problem for our analyses.

Because having a co-morbid psychological problem often is the rule rather than the exception, we can expect that many of the children in the different diagnosis groups also exhibit other problems than what is associated with the category that is referred to. To account for this, we also made some analyzes for “pure” diagnosis groups, to see how sleep problems were expressed in these groups, compared to the groups that may have co-morbid conditions in them. These groups are called *Anxiety only*, *Depression only*, *ADHD only* and *Behaviour problems only*.

### **Analyses**

Based on the PAPA scores, the children either fell into one or more diagnostic category or not. To study the prevalence of sleep problems, and the relationship between emotional/behavioural problems and sleep problems, we have analyzed the data using frequencies and crosstabs for weighted material in the Statistical Package for the Social Sciences (SPSS) version 17. Because we found no significant gender differences, gender distribution is not presented.



## Results

### The prevalence of sleep disorders, restless sleep and bedtime resistance

Weighted prevalence estimates for the different sleep problems are presented in Table 1. 31,7 % of the 4-year-olds had one or more sleep difficulty: 5,3 % had symptoms of primary insomnia; 4,3 % of the children had difficulty initiating sleep; 1,2% had night wakings; 0,8 % had symptoms of sleepwalking disorder; 9,7 % had symptoms of sleep terror disorder; 2,4 % had symptoms of nightmare disorder; 4,1 % of the children had restless sleep; and 19,7 % had bedtime resistance.

**Table 1: Descriptive statistics, frequencies for complex samples.**

*Weighted percentage prevalence of sleep disorders, restless sleep and bedtime resistance among 4-year-olds (Total N=2297).*

Sleep Problem	Prevalence
Primary Insomnia	5,3 %
-Difficulty Initiating Sleep	4,3 %
-Night Wakings	1,2 %
Sleep Walking Disorder	0,8 %
Sleep Terror Disorder	9,7 %
Nightmare Disorder	2,4 %
Restless Sleep	4,1 %
Bedtime Resistance	19,7 %
Any Sleep Problem	31,7 %

### The prevalence of sleep problems in children with and without emotional/behavioural problems

The prevalence of sleep problems in children with and without emotional/behavioural problems is presented in Table 2. Overall, significantly more children with symptoms of a psychiatric disorder have sleep problems. 41,4 % of the children with emotional/behavioural problems also have sleep problems, compared to 29,5 % of children without such problems. Sleep problems was reported in 39,5 % of the children with symptoms of any anxiety disorder; in 61,2 % of the children with symptoms of any depressive disorder; in 42 % of the children with symptoms of any internalizing disorder; in 48,6 % of the children with symptoms of any behaviour disorder; in 47,4 % of the children with symptoms of ADHD; in 46 % of the children with symptoms of any externalizing disorder; and in 61,3 % of the children with symptoms of any internalizing and externalizing disorder.

**Table 2: Crosstabs for complex samples.**

*Weighted percentage prevalence of any sleep problem in children with and without emotional/behavioural problems.*

Emotional/Behavioural Problem:	Any Sleep Problem				P
	Yes:	N=	No:	N=	
Any Anxiety Disorder	39,5 %	96	30,8 %	632	.064
Any Depressive Disorder	61,2 %	25	31,2 %	704	.000*
Any Internalizing Disorder	42,0 %	113	30,4 %	616	.009*
Any Behaviour Problem	48,6 %	55	30,8 %	653	.002*
ADHD	47,4 %	70	30,6 %	659	.001*
Any Externalizing Disorder	46,0 %	105	30,2 %	624	.000*
Any Internalizing <i>and</i> Externalizing Disorder	61,3 %	37	30,9 %	692	.000*
Any Psychiatric Disorder	41,4 %	180	29,5 %	548	.001*

\* = 0.05

### **Specific sleep problems associated with particular emotional/behavioural problems**

The prevalence of different sleep problems related to the different groups of emotional/behavioural problems is presented in Table 3.1, 3.2 and 3.3. Nightmares and Sleep terror are prevalent across all disorder groups. Other problems are more specific to certain disorders. The percentages corresponding to the different sleep problems refer to the fact that *more* children with a certain kind of diagnosis/psychological problem experience the sleep problem in question, compared to children who does not have this problems. It does not mean that the sleep problem in question is the most common for specific diagnoses. The numbers must be viewed in relation to how many people in general, or without a certain psychological problem, that experience this kind of problem.

The most prevalent sleep problems in children with *Anxiety problems*, compared to other children, are Primary Insomnia and Nightmares. Children with *Depressive problems* more often experience Sleep Terror; Bedtime Resistance; Primary Insomnia, of which Difficulty Initiating Sleep seems to be the major problem; and Nightmares (Table 3.1.1). For children with *Behaviour Problems*, Bedtime resistance; Sleep terror and Restless sleep are the most reported problems. In the *ADHD* group, Sleep Terror; Restless Sleep; Primary Insomnia; and Nightmares are the most prevalent problems. (Table 3.1.2).

**Table 3.1.1: Crosstabs for complex samples.***Specific sleep problems associated with particular emotional/behavioural problems.*

Sleep Problem	Anxiety			Depression		
	Percentage	O.R	P	Percentage	O.R	P
Primary Insomnia	9,8 %	2,169	.041*	28,3 %	7,671	.000*
- Difficulty Initiating Sleep	6,9 %	1,779	.224	28,3 %	9,727	.000*
- Night Wakings	2,9 %	2,909	.063	0,0 %	0,000	.621
Sleep Walking Disorder	1,2 %	1,690	.564	0,0 %	0,000	.639
Sleep Terror Disorder	13,5 %	1,515	.134	47,0 %	8,891	.000*
Nightmare Disorder	5,0 %	2,523	.015*	9,9 %	4,819	.003*
Restless Sleep	6,4 %	1,703	.109	9,9 %	2,628	.081
Bedtime Resistance	23,5 %	1,285	.323	34,0 %	2,132	.034*
Any Sleep Problem	39,5 %	1,470	.064	61,2 %	3,477	.000*

\*= $0.05$ **Table 3.1.2: Crosstabs for complex samples.***Specific sleep problems associated with particular emotional/behavioural problems.*

Sleep Problem	ADHD			Behavioural Problems		
	Percentage	O.R	P	Percentage	O.R	P
Primary Insomnia	10,6 %	2,293	.034*	6,2 %	1,183	.688
- Difficulty Initiating Sleep	7,1 %	1,790	.095	6,2 %	1,487	.335
- Night Wakings	3,5 %	3,407	.174	0,0 %	0,000	.427
Sleep Walking Disorder	0,0 %	0,000	.464	1,9 %	2,671	.238
Sleep Terror Disorder	24,2 %	3,333	.000*	16,2 %	1,864	.031*
Nightmare Disorder	7,1 %	3,710	.000*	4,7 %	2,172	.095
Restless Sleep	11,7 %	3,548	.000*	9,6 %	2,668	.013*
Bedtime Resistance	24,3 %	1,333	.245	31,7 %	1,973	.011*
Any Sleep Problem	47,4 %	2,039	.001*	48,6 %	2,123	.002*

\*= $0.05$ 

If we look at the broader group of internalized children, these children more often have Primary Insomnia symptoms than the externalized children, who more often show Bedtime Resistance and have Restless Sleep (Table 3.1.3). In both these groups, Sleep Terror and Nightmares are relatively common.

**Table 3.1.3: Crosstabs for complex samples.***Specific sleep problems associated with particular emotional/behavioural problems.*

Sleep Problem	Internalizing			Externalizing		
	Percentage	O.R	P	Percentage	O.R	P
Primary Insomnia	12,3 %	3,068	.000*	8,5 %	1,798	.095
- Difficulty Initiating Sleep	9,7 %	2,866	.004*	6,3 %	1,573	.163
- Night Wakings	2,6 %	2,608	.098	2,2 %	2,080	.434
Sleep Walking Disorder	1,1 %	1,518	.648	1,0 %	1,298	.761
Sleep Terror Disorder	16,2 %	1,969	.006*	18,5 %	2,371	.000*
Nightmare Disorder	4,6 %	2,255	.034*	5,6 %	2,885	.002*
Restless Sleep	6,7 %	1,816	.065	9,8 %	2,992	.000*
Bedtime Resistance	25,6 %	1,477	.088	27,6 %	1,641	.018*
Any Sleep Problem	42,0 %	1,662	.009*	46,0 %	1,971	.000*

\*= $0.05$ 

Children with both an internalized and externalized problem seem to have the same sleep problems as the disorder groups they represent (Table 3.1.4). There is a tendency that more of these children have Any Sleep Problem than children with only internalized/externalized problems; respectively 61, 3 % and 42/46 % have some kind of a sleep problem.

**Table 3.1.4: Crosstabs for complex samples.***Specific sleep problems associated with particular emotional/behavioural problems.*

Sleep Problem	Internalizing and Externalizing		
	Percentage	O.R	P
Primary Insomnia	19,2 %	4,564	.000*
- Difficulty Initiating Sleep	19,2 %	5,788	.000*
- Night Wakings	0,0 %	0,000	.560
Sleep Walking Disorder	0,0 %	0,000	.638
Sleep Terror Disorder	34,5 %	5,258	.000*
Nightmare Disorder	12,4 %	6,620	.000*
Restless Sleep	16,3 %	4,922	.000*
Bedtime Resistance	35,4 %	2,298	.005*
Any Sleep Problem	61,3 %	3,537	.000*

\*= $0.05$ 

If we look at the different “pure” categories of psychological problems, there are only a few significant results (Table 3.2.1 and Table 3.2.2). In the group of children with *Anxiety only*, the only significant result is Night Wakings. This means that this is the only sleep problem that children with Anxiety only experience more often than children without anxiety

(only). For *Depression only*, Sleep Terror is the only significant problem that Depressed (only) children experience more often than other children. For *ADHD only*, the only significant problem is Night Wakings, and for *Behaviour problems only*, it is Sleep Walking and Bedtime Resistance.

**Table 3.2.1: Crosstabs for complex samples.**

*Specific sleep problems associated with particular emotional/behavioural problems without co-morbidity.*

Sleep Problem	Anxiety Only			Depression Only		
	Percentage	O.R	P	Percentage	O.R	P
Primary Insomnia	9,9 %	2,148	.076	0,0 %	0,000	.681
- Difficulty Initiating Sleep	6,3 %	1,561	.450	0,0 %	0,000	.713
- Night Wakings	3,6 %	3,760	.019*	0,0 %	0,000	.852
Sleep Walking Disorder	1,5 %	2,175	.388	0,0 %	0,000	.881
Sleep Terror Disorder	8,8 %	0,891	.777	56,5 %	12,182	.004*
Nightmare Disorder	2,4 %	1,040	.950	0,0 %	0,000	.785
Restless Sleep	4,2 %	1,017	.968	0,0 %	0,000	.718
Bedtime Resistance	23,2 %	1,257	.442	0,0 %	0,000	.384
Any Sleep Problem	36,2 %	1,248	.363	56,5 %	2,802	.334

\*=0.05

**Table 3.2.2: Crosstabs for complex samples.**

*Specific sleep problems associated with particular emotional/behavioural problems without co-morbidity.*

Sleep Problem	ADHD Only			Behavioural Problems Only		
	Percentage	O.R	P	Percentage	O.R	P
Primary Insomnia	7,6 %	1,492	.581	0,0 %	0,000	.225
- Difficulty Initiating Sleep	1,9 %	0,409	.179	0,0 %	0,000	.283
- Night Wakings	5,7 %	5,900	.037*	0,0 %	0,000	.580
Sleep Walking Disorder	0,0 %	0,000	.574	3,8 %	5,598	.027*
Sleep Terror Disorder	11,9 %	1,268	.544	7,8 %	0,776	.679
Nightmare Disorder	4,3 %	1,944	.235	0,0 %	0,000	.388
Restless Sleep	4,3 %	1,059	.918	8,7 %	2,300	.170
Bedtime Resistance	16,7 %	0,809	.610	36,8 %	2,437	.022*
Any Sleep Problem	33,4 %	1,081	.796	46,4 %	1,892	.090

\*=0.05

## Discussion

This is the first Norwegian study concerning the prevalence of sleep problems, and the associations between sleep problems and emotional/behavioural problems among 4-year-olds. The results indicate an overall prevalence of sleep difficulties of about 31,7 %. They also indicate that significantly more children with emotional/behavioural problems have sleep problems than children without such problems. Furthermore, the results indicate that children with different emotional/behavioural problems may have different sleep complaints. Nightmares and sleep terror, however, seem to be quite prevalent across all disorder groups.

### **The prevalence of sleep problems among 4-year-olds**

Overall, the prevalence of sleep problems found in this study, is in line with previously reported estimates of sleep problems in preschool-aged samples (e.g., Mindell & Owens, 2003). According to the literature, symptoms of primary insomnia and bedtime resistance are the most frequently reported sleep problems in this age group. In our sample, bedtime resistance was the most prevalent problem. Owens (2008) points out that development issues such as expanded language and cognitive skills may lead to increased bedtime resistance in preschoolers, as children at this age become more articulated about their needs and may engage in more limit-testing behaviour.

Sleep terror disorder was the second most prevalent sleep problem. Sleep terror and sleep walking are common as discrete episodes during childhood and usually decrease with age (Sadeh, 2005). Owens (2008) reports that sleep terror is considerably less common than sleep walking. In our sample, sleep terror was the more prevalent of the two. According to Thiedke (2001) and Ursin (2008), sleep walking is more common in school-aged children. This might explain the low prevalence of sleep walking in our preschool-aged sample. Furthermore, Ursin (2008) proposes that 2-3 % of all parents report that their children experience sleep terror, and that the actual prevalence rate might be higher because parents misinterpret the incidents as nightmares. Thus, a potential explanation for the high prevalence of sleep terror in our sample is that the PAPA fairly well distinguishes between nightmares and sleep terror. Besides, because of how sleep terror is expressed, parents are likely to wake up by the children's terror and thus report this in an interview.

According to Ursin (2008), half of the children between 3 and 5 have nightmares. In our sample, only 2,4 % have symptoms of nightmare disorder. This might indicate that occasional nightmares are common during childhood, but that having nightmare disorder is less common. Some parents might also underestimate the prevalence of their children's

nightmares, as the children do not necessarily call for parental attention when they experience them.

It was a relatively low prevalence of primary insomnia symptoms among the 4-year-olds, and the discrepancy between the reported prevalence of difficulty initiating sleep and night wakings. In line with these findings, Ursin (2008) reports that night wakings often cease at 4 years of age, and that sleep problems in 4- to 12-year-olds usually are related to difficulties initiating sleep and bedtime resistance. In contrast, a longitudinal study of 493 Swiss children found night wakings to increase to a maximum at the age of 4 years, when more than half of the children woke up at least once per week. In the same study, bedtime resistance and sleep-onset difficulties were relatively infrequent (Jenni, Fuhrer, Iglowstein, Molinari & Largo, 2005). Also contrary to our findings, Owens (2008) reports that 15 % to 30 % of preschoolers have difficulties falling asleep and have night wakings. The discrepancy between the reported prevalence of difficulty initiating sleep and night wakings in our study, might be related to the fact that whereas parents seem to be reliable reporters of patterns like sleep onset and duration of sleep, they tend to underestimate sleep quality variables such as frequency of night wakings (Tikotzky & Sadeh, 2001). Because older children are less likely to call for parental attention when they wake up at night, the parents are not always aware of it, and will not report disturbed or fragmented sleep (Sadeh, 2008). This underscores the limitation of only using parental reports as a measure.

Overall, symptoms of sleep disorders are common in this sample of 4-year-olds. One may discuss whether these symptoms really constitute sleep *problems*. Clinically, sleep problems may be placed along a continuum, ranging from small transient disturbances to a serious disorder of sleep. Transient sleep problems can be understood in the context of normal physical, cognitive and emotional development, and in relation to other child, parental and environmental variables (e.g., difficult temperament, parenting styles, parental psychopathology, family stress and household composition). However, intrinsic and extrinsic risk factors may predispose a given child for a more chronic sleep disturbance (Sheldon et al., 2005). No matter how the sleep problems are defined, we think it is important that they are paid attention to at an early age, and that sleep problems are recognized as a risk factor for a developing child.

### **The prevalence of sleep problems in children with and without emotional/behavioural problems**

The finding that children with emotional or behavioural problems more often have sleep difficulties than children without such problems is consistent with previously reported findings (e.g., Bates, Viken, Alexander, Beyers, Stockton, 2002; Gregory & O'Connor, 2002; Reid, 2008), although the number of studies investigating 4-year-olds is limited. It is also consistent with studies focusing on older children and adults (e.g. Alfano & Gamble, 2009; Gude, 2008; Hysing, Sivertsen, Stormark, Elgen & Lundervold, 2008; Ivanenko et al., 2006; Paavonen et al, 2000; Paavonen et al., 2002; Paavonen, Porkka-Heiskanen, & Lahikainen, 2009; Smedje et al., 2001; Stein, Mendelsohn, Obermeyer, Amromin & Benca, 2001). It is important to point out that our approach in no way aimed to provide information on the mechanisms mediating the interactions between sleep and psychological problems in children. The finding only supports the notion that there is a co-occurrence of these problems in 4-year-olds. This co-occurrence is important to notice, as children with psychiatric illness and sleep problems may represent a double risk group.

Sleep problems and psychiatric illness may interact in a number of ways. Traditionally, sleep problems have been viewed as a consequence or feature of underlying psychopathology, not as an independent aetiological factor (Paavonen et al., 2002). More recent research, however, points to a bi-directional relationship between sleep, emotional and behavioural functioning. Childhood psychiatric disorders may lead to or exacerbate sleep problems; sleep problems may interfere with a child's ability to regulate emotion and behaviour, and lead to mental health problems and disorders; and these problems may persist and impair a child's functioning on different areas (Alfano & Gamble, 2009).

Some researchers suggest that a common underlying mechanism may link sleep difficulties to emotional and behavioural disturbance. Grova (2007) states that all sleep problems to some extent is an expression of problems with self regulation, as the unregulated or dysregulated child alone is unable to obtain the level of activation at which sleep can be initiated. Alfano and Gamble (2009) also suggest that early sleep patterns in part are reflective of a child's ability to self regulate. Furthermore, they suggest that the appearance of a self regulation pattern is present before more complex behavioural or cognitive development, and that the presence of early sleep-related problems may help to identify children at risk for the later development of psychopathology. Thus, problems with self regulation may play a key role in both sleep problems and psychopathology.

Reid et al. (2009) criticise previous studies for not examining different factors that



may account for the relationship between sleep and psychopathology. However, after adjusting for known risk factors like the child's health status and temperament, parenting and parent depression, and family demographics, these researchers found that child sleep problems accounted for a small, but significant, independent proportion of the variance in internalizing and externalizing problems. Other researchers have also found that there is an association between sleep and emotional/behavioural problems after controlling for other factors (Hysing et al., 2008). Thus, the relationship between sleep and emotional/behavioural problems may be independent of other commonly identified risk factors. Still, this does not undermine the importance of looking for more complex connections and underlying mechanisms.

### **Specific sleep problems associated with particular emotional/behavioural problems**

Although the literature on the association between specific sleep problems and emotional/behavioural problems is sparse, some other studies have also found different psychological problems to be associated with different sleep difficulties in children (Bates et al., 2002; Bos et al., 2009; Ivanenko & Johnson, 2008; Paavonen et al., 2002; Smedje et al., 2001). To our knowledge, no other studies have investigated this extensively in preschoolers.

As to internalizing problems, Smedje et al. (2001) found internalizing symptoms to be associated with sleep terror and difficulty falling asleep. In a review article, Ivanenko and Johnson (2008) report that difficulty initiating and maintaining sleep, bedtime refusal and nightmares are the most common sleep problems in children with anxiety disorders. They also report that children with major depressive disorder often experience primary insomnia. Mindell and Owens (2003) report that difficulty falling asleep commonly is associated with childhood depression. This is in line with our findings.

Most of the studies that focus on the relationship between sleep and externalized behaviour indicate a higher prevalence of sleep problems in these children compared to control children. Commonly reported problems are increased bedtime resistance, difficulty initiating sleep, night wakings, and sleep related anxiety (Bos et al., 2009; Owens, 2005). The most consistent finding regarding children with ADHD, is that these children often display restless sleep. This has been supported both by objective and subjective measures (Corcum et al., 1998; Smedje et al., 2001). In line with this, Primary sleep disorders, such as obstructive sleep apnea, Restless Legs Syndrome (RLS) and Periodic Limb Movements (PLM) have been associated with ADHD (Chervin et al., 2002; Cortese et al, 2005; Owens, 2005).

As to children with oppositional problems, it has been found that these children more often than controls exhibit bedtime resistance (Bos et al., 2009; Smedje et al., 2001). These

findings are consistent with what we found in our sample of 4-year-olds. Our study does not include prevalence of RLS or PLM, as the PAPA manual does not include questions about these problems. Sleep problems like these may still, directly or indirectly, have an influence on the sleep problems reported in our sample.

Analyses of the “pure” diagnostic groups and their sleep problems, yield somewhat different results. The finding that there are few significant tendencies as to groups of children with pure psychological problems, does not necessarily mean that there are no significant differences between these children and children with co-morbid conditions. When excluding children with co-morbid problems, the sample sizes were considerably reduced. For example only 2 children (weighted 5 children) exhibited pure depressive symptoms. Even though it turned out that these 2 children had sleep terror, this does not necessarily mean that sleep terror is more prevalent in children with depression. Because of the small sample sizes, it is difficult to make conclusions based on the results regarding the pure diagnose groups.

If we do not take the results with the “pure” diagnostic groups into account, the results in this study are consistent with what other researchers have reported. This indicates that certain types of sleep problems are more strongly associated with certain types of psychological problems. As Smedje et al. (2001) propose, detailed knowledge about children's sleep may occasionally be of support when psychiatric diagnostic assessments are performed. For example, restless sleep in a child with conduct problems may be an indicator of co-morbid hyperactivity. However, the relationship between sleep disturbances and psychiatric problems is complex and should be examined further.

### **Methodological issues**

To our knowledge, no other studies have looked at the prevalence of preschool sleep problems in a Norwegian sample. The age range is narrow, and this may reduce the effects of developmental variation in sleep problems that occur from early to middle childhood. Further, the sample is randomized from a community, which probably makes the results generalizable to a general population. The fact that the study is community based, also made it possible to look at “normal” children's sleep, and not to view sleep problems only as a pathological phenomenon.

The study also relied on a measure designed for preschoolers. The PAPA is based on different diagnostic measures, and includes symptoms and aspects relevant for preschoolers. It has the advantage of providing details of severity, frequency and duration of the symptoms measured (Egger et al., 2006), and the screening for both sleep and other problems is more elaborate than many other measures commonly used. In a study by Egger et al. (2006), the

PAPA achieved levels of test-retest reliability similar to those of widely used and well-established measures for older children and adults. Thus, the PAPA is useful as researchers and clinicians study psychopathology in preschoolers, and when they try to identify the outcomes of early-onset disorders. The fact that the PAPA is based on DSM, ICD and DC: 0-3, makes it comparable to other measures (Egger et al., 2006). To our knowledge, there are still few studies on the validity of the PAPA.

As the TESS study is a longitudinal study, it will also later be possible to study how persistent the sleep problems reported in this study are, and to study whether sleep problems can predict later psychopathology, like other studies have found (Gregory et al., 2005; Gregory & O'Connor, 2002; Johnson et al, 2000).

Although the study has several strengths, it also has some methodological shortcomings worth mentioning. Because the PAPA is not exclusively designed to measure sleep problems, not all possible sleep problems were studied. We cannot rule out the possibility that there are some other significant differences in the way sleep problems are expressed in children with different psychological problems. Besides, we are not aware of how well the PAPA detects soft signs of sleep problems; children might have small, but significant sleep problems without falling into any of PAPA sleep categories.

The fact that the study is community based is useful in many ways, but it also gave us rather small samples of children with psychological problems. The results may therefore not be generalizable to clinical samples.

The study also exclusively relied on parental reports. Some studies indicate that parents are poor reporters of children's sleep problems (Sadeh, 2008; Tikotzky & Sadeh, 2001). Parent reporting may further affect the reporting of some symptoms more than others. For example, a child who does not want to go to bed may overtly show bedtime resistance, whilst a child at the same time has nightmares without telling the parents. How the parents interpret the interview questions, and in what degree they view the sleep problems as a *problem* may also vary. The study did not include any objective measures, and didn't ask the children about how they experience their sleep- or other problems. Using different measures and respondents can reduce the effect of biased results.

Last but not least, the study is not designed to find out anything about the mechanisms mediating the interactions between sleep - and psychological problems in children. The results can only say something about the co-existence of sleep problems and other psychological problems, and nothing about the reasons for the co-existence.

### **Implications**

Considering that there is a relatively high prevalence of sleep problems among 4-year-olds, and that there seem to be associations between sleep- and emotional/behavioural problems, preschool sleep problems should be given more attention. Promising prevention and treatment strategies exist, but still many studies and surveys indicate that sleep issues are inadequately addressed, and the level of knowledge about sleep and sleep problems is fairly low (Chervin, Archbold, Panahi & Pituch, 2001; Kotagal & Pianosi, 2006; Mindell & Meltzer, 2008; Owens, 2001; Pallesen, Nordhus, Sivertsen & Bjorvatn, 2007; Sørensen, 2003). The fact that there is a relationship between sleep and mental health underscores the importance of integrated evaluation and treatment approaches. Smedje et al. (2001) suggests that children with sleep problems should be checked for the presence of emotional and/or behavioural problems, and that children with psychological difficulties should be evaluated for sleep problems. In line with this, Ivanenko and Johnson (2008) claims that the recognition and management of sleep problems in children is an important step in improving treatment outcome and preventing relapse of mental illness. Given the fact that early sleep problems appear to predict the later development of psychological problems, and that sleep problems can become chronic, early identification and treatment is important. Research on the potential long-term effects of treating sleep problems in childhood is needed. Increased awareness about sleep problems in children can enhance the quality of life, for both the child and its family.

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