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The relation between sleep and violent aggression

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Chapter 3

Sleep disturbances in a clinical forensic psychiatric population

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ABSTRACT

Poor sleep is known to exert detrimental effects on the course of diverse psychiatric disorders and is a putative risk factor for hostility and aggression. Thus, sleep may be crucial in forensic psychiatric practice. However, little is known about the prevalence of sleep disturbances in these complex psychiatric patients. In this study we investigated the presence of sleep disorders and subjective sleep quality by means of the Sleep Diagnosis List (SDL), the Pittsburgh Sleep Quality Index (PSQI), an interview concerning the causes of sleep problems and file information on sleep medication in 110 patients admitted to a forensic psychiatric hospital. Almost thirty percent of the participants suffered from one or more sleep disorders, especially insomnia. An even larger proportion of the participants (49.1%) experienced poor sleep quality. Interestingly, patients with an antisocial personality disorder or - traits were particularly dissatisfied with their sleep. The most common causes for sleep problems were suboptimal sleep hygiene, stress and/or ruminating, negative sleep conditioning and side effects of psychotropic medication. Of the poor sleepers, 40.7% received a hypnotic drug. Despite intensive clinical treatment, sleep problems are experienced by a large part of forensic psychiatric patients. It would be worthwhile to examine the effects of pharmacological and non-pharmacological sleep interventions on both psychiatric symptomatology and reactive aggressive behavior in forensic patients.

INTRODUCTION

Sleep disturbances are very common in people suffering from psychiatric disorders (Abad and Guilleminault, 2005). For example, sleep problems are present in approximately 80% of patients with a Major Depressive Disorder (MDD) (Tsuno et al., 2005), in 30-80% of patients with schizophrenia (Cohrs, 2008) and in at least 55% of individuals with active substance abuse (Mahfoud et al., 2009; Liao et al., 2011). Although these sleep disturbances are often secondary to the psychiatric illness, recent observations strongly suggest that sleep disorders should actively be treated parallel to the psychiatric disorder. The few studies regarding this matter indicate that separate treatment of comorbid sleep disturbances exerts positive effects on the course of the psychiatric disorder and may prevent relapses (Smith et al., 2005). For instance, in female sexual assault survivors imagery rehearsal therapy with a focus on nightmares was found to alleviate both insomnia as well as other symptoms of a post traumatic stress disorder (PTSD) (Krakow et al., 2001). In schizophrenic patients music relaxation played at bedtime has been shown to reduce subjective and objective insomnia complaints as well as total psychopathology score on the Positive and Negative Syndrome Scale (Bloch et al., 2010). Moreover, studies in patients with MDD show that pharmacological and cognitive behavioral treatment of sleep disturbances may enhance the antidepressant response to psychopharmacological drugs (Londborg et al., 2000; Fava et al., 2006; Manber et al., 2008).

Since a lack of sleep is associated with emotional instability, short-temperedness, hostility and aggression (Kamphuis et al., 2012), sleep disturbances may be particularly detrimental for aggressive populations, such as forensic psychiatric patients. Anecdotal evidence suggests that treatment of sleep disturbances can reduce aggression (Pakyurek et al., 2002; Booth et al., 2006; Haynes et al., 2006). Although clinical observations suggest that sleep complaints are very common in forensic psychiatric patients, epidemiologic studies on this topic are lacking. The aims of this study, therefore, were to examine in a clinical forensic psychiatric population *i*) the prevalence of sleep disorders, *ii*) sleep quality and sleep problems, *iii*) the association between poor sleep and psychiatric disorders, *iv*) perceived causal and perpetuating factors of sleep difficulties, including sleep hygiene behavior and *v*) the treatment of sleep disturbances.

METHODS

Subjects and procedure

Participants were recruited from two forensic psychiatric hospitals in the Netherlands, the Forensic Psychiatric Centre Dr. S. Van Mesdag (FPC) in Groningen and the Forensic Psychiatric Hospital (FPH) in Assen. Patients who were present on the regular weekly group meeting on their unit received written and oral information from the first author. It was made clear to them that they had the right to refuse participation and that this would not affect future treatment. After two weeks of consideration, participating patients gave written informed consent. The participants completed questionnaires that assessed the presence of sleep disorders and sleep quality. Each participant also underwent a semi-structured interview to obtain additional information on their sleep problems, possible causes and sleep hygiene behavior. Participants received a financial compensation of € 5,-. The research proposal was approved by the local ethics committee (Hospital Ethics Committee of the Isala Clinics in Zwolle, Netherlands).

Of the 205 patients who were approached, 110 agreed to participate and completed all required questionnaires (total response rate 53.7%).

Questionnaires

The Sleep Diagnosis List (SDL) was used to assess the presence of the following sleep disorders and sleep related problems: insomnia, hypersomnia, periodic leg movements (PLMs) / restless legs syndrome (RLS), sleep-related breathing disorders, and negative sleep conditioning. The SDL is derived from the Sleep Diagnostic Questionnaire (Douglass et al., 1994; Sweere et al., 1998) and consists of 75 randomly distributed questions regarding sleep during the last 6 months. The questions are answered on a 5-point scale ranging from 1 (never) to 5 (very often or always). A category score ≥ 3 indicates the presence of the sleep disorder (Douglass et al., 1994; Sweere et al., 1998). The SDL has been validated in Dutch subjects with sleep disorders (Sweere et al., 1999).

The Pittsburgh Sleep Quality Index (PSQI) was used to assess subjective sleep quality and sleep problems over the preceding month. It has been shown to be a reliable and valid instrument in psychiatric populations (Buysse et al., 1989). The 19 individual items of the PSQI are grouped to 7 component scores: subjective appreciation of sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbing factors, use of sleep medication, and daytime dysfunctioning. Each component obtains a value between 0 (no difficulty on this particular component) to 3 (severe difficulty). We considered a score of 3 as clinically relevant. All component scores are summed to generate a global score

between 0 and 21, with higher global scores indicating worse sleep quality. A cut-off global score of 5 (PSQI>5) was used to identify participants who were dissatisfied with their sleep (poor sleepers) (Buysse et al., 1989).

Semi-structured interview

The semi-structured interview took 30-45 minutes. In this interview the participant was asked whether he or she currently experienced sleep problems. If a sleep problem was present, inquiries were made with respect to its history, the type of sleep problem, frequency of occurrence, possible causal factors and earlier interventions. Sleep hygiene was assessed in a semi-structured way asking about daytime napping, behavior during the hour preceding bedtime, caffeine usage and smoking.

Medical file information

Information concerning socio-demographic data, mental health (DSM-IV classification) and medication were collected from files. With respect to diagnostics, in both hospitals psychiatric disorders are diagnosed based on clinical interviews by experienced forensic psychiatrists and psychologists and lengthy observations on the wards by multidisciplinary teams. In the majority, (part of) the diagnostic process, including DSM-IV classification, is already performed elsewhere as a part of the criminal trial, and re-evaluated when admitted to the hospital. Psychological tests are not performed in every patient, only on indication to support the clinical diagnostic assessment. With regard to medication, we categorized hypnotics (especially prescribed for sleep), sleep promoting medications (prescribed for other purposes than sleep) and medications with a sleep disrupting effect. Benzodiazepines, the so-called Z-drugs (zolpidem and zopiclone) and antipsychotics/antidepressants with sedating properties (such as clozapine, risperidone, olanzapine, quetiapine, mirtazapine) were considered as sleep promoting medications or hypnotics, depending on the indication (Gursky and Krahn, 2000; Krystal et al., 2008; Monti, 2004). Melatonin was included in the group of hypnotics. Serotonin-reuptake inhibitors and stimulant drugs (such as methylphenidate and dextroamphetamine) were considered to have a sleep disrupting effect (Gursky and Krahn, 2000; Krystal et al., 2008; Efron et al., 1997; Wilson and Argyropoulos). We also took other well-known side effects of psychopharmacological drugs into account when exploring possible causes of sleep problems. Many atypical antipsychotics and some antidepressants produce weight gain (Allison and Casey, 2001; Serretti and Mandelli, 2010), which increases the risk of a sleep-related breathing disorder (Peppard et al., 2000). In addition, these drugs may cause or exacerbate RLS (Rottach et al., 2008; Kang, 2009; Bolaños-Vergaray et al., 2011).

Statistical analyses

Descriptive analyses and chi-square tests were performed to describe the study group and their scores on the different outcome measures. Logistic regression analyses were used to investigate whether or not poor sleep was related to certain psychiatric disorders. PSQI_{>5} was the outcome variable and presence of the different psychiatric disorders were used as predictors. Use of sleep promoting (including hypnotics) and sleep disrupting medication were also added as predictors, since these constitute potential confounders for the association of certain psychiatric diagnostic categories with a good or poor sleep quality. When a psychiatric disorder significantly predicted sleep quality, we investigated the differences on the PSQI component scores with two-sided, independent Student t-tests to analyze in more detail how the sleep differed from that of participants without such a diagnosis. As a final step, we explored perceived causal and perpetuating factors of sleep difficulties, including sleep hygiene behavior, and the treatment of sleep disturbances in patients reporting sleep problems. Alpha levels of $p < .05$ were used to define statistical significance. All analyses were conducted with use of PASW Statistics 18.

RESULTS

Participant characteristics

Characteristics of the participants are shown in Table 1. The majority of the sample was male (97.3%). The mean age of the sample was 36.6 ± 10.2 (SD) years, ranging from 21-77 years. Nearly all participants were sentenced by the criminal court for a violent offence. More than 40% did not enter or finish high school. At the time of the investigation the average duration of admission in the hospital was 28.9 ± 32.1 months, ranging from a few days to over 14 years. With regard to psychiatric diagnoses, the majority of the study sample had a primary diagnosis on Axis-I ($n=71$; 64.5%), i.e., schizophrenia spectrum ($n=44$; 40.0%), autism spectrum disorders ($n=25$; 22.7%), pedophilia ($n=16$; 14.5%), attention deficit hyperactivity disorder (ADHD) ($n=13$; 11.8%), MDD ($n=5$; 4.5%) and PTSD ($n=4$; 3.6%). Most participants had 2 or more psychiatric disorders on Axis-I ($n=72$; 65.5%), with substance use disorder as the most frequent comorbidity ($n=78$; 70.9%). Concerning Axis-II, many participants ($n=91$; 82.7%) had a (comorbid) personality disorder (PD) or traits of a PD, most often within cluster B ($n=75$; 68.2%). Antisocial traits/PD were most prevalent ($n=66$; 60.0%), but borderline traits/PD ($n=30$; 27.3%) and narcissistic traits/PD ($n=31$; 28.2%) were also present. Cluster A - and C traits/PD were diagnosed in respectively 6 (5.5%) and 30 (27.3%) participants.

Sleep disorders

As assessed by the SDL category scores, one or more sleep disorders were present in 32 participants (29.1%) of the total study group. Twenty participants (18.2%) suffered from chronic insomnia. Eleven participants (10.0%) experienced hypersomnia. PLMs / RLS (n=7; 6.4%) and sleep-related breathing disorders (n=6; 5.5%) were less prevalent. Negative sleep conditioning played a significant role in 13.6% (n=15).

Table 1. Sociodemographic characteristics of the study sample (N = 110).

	Number	Percentage
Legal status		
Admitted under criminal legal system	102	92.7%
Admitted under mental health act	6	5.5%
Voluntarily admitted	2	1.8%
Index offence		
Violent non-sexual offence	75	68.2%
Violent sexual offence	28	25.5%
Non-violent offence	5	4.5%
Not applicable	2	1.8%
Ethnic origin		
Caucasian	88	80.0%
Other	22	20.0%
Marital status		
Single	95	86.4%
Married	2	1.8%
Unknown	13	11.8%
Highest educational degree		
Elementary	48	43.6%
Highschool	35	31.8%
Graduate studies	6	5.4%
Unknown	21	19.1%

Sleep quality

Mean global score on the PSQI was 7.1 ± 4.6 (min-max: 0-19). Nearly half of the participants ($n=54$; 49.1%) had a global PSQI >5 , indicating that these participants were poor sleepers. Table 2 shows the number of participants who experienced severe difficulty on the different PSQI components.

Table 2. Number of participants with a maximum score on Pittsburgh Sleep Quality Index components ($N = 110$).

	Number	Percentage
Poor subjective sleep quality appreciation	11	10.0%
Sleep latency (falling asleep > 60 minutes)	28	25.5%
Sleep duration (< 5 hours)	14	12.7%
Habitual sleep efficiency (< 65%)	13	11.8%
Sleep-disturbing factors (more than 3 times a week)	5	4.5
Daytime dysfunctioning	8	7.3%

Note. The component use of sleeping medication is left out here, since more detailed data on medication usage were collected from the medical files.

In the group of poor sleepers sleep disorders, as assessed by the SDL, were more prevalent than in the group of good sleepers, 48.1% vs. 10.7% respectively ($\chi^2 = 18.7$, $p < .0001$).

Sleep quality of patients with specific psychiatric diagnoses

No axis-I disorder, including a substance abuse disorder, significantly predicted poor sleep quality (PSQI >5). In contrast, having antisocial traits/PD significantly predicted whether or not a participant was a poor sleeper. Poor sleep quality was present in 57.6% of antisocial individuals as opposed to 36.4% of non-antisocial participants ($\chi^2 = 4.8$, $p < .05$). The use of sleep promoting medication was also a significant predictor of poor sleep. Of sleep promoting medication-users, 60.0% had a PSQI >5 , compared to 36.0% in participants without sleep promoting drugs ($\chi^2 = 6.3$, $p < .05$). The interaction term between antisocial traits/PD and the use of sleep promoting medication was significant as well (Table 3). To investigate this interaction effect, the number of poor sleepers was analyzed for the group of participants with and without antisocial traits/PD, after splitting the participants in sleep promoting medication users and non-users. In the non-antisocial participants the prevalence of poor sleep depends on the use of sleep promoting medication: while poor

sleep is present in merely 10% of the non-users, the percentage is significantly higher in the group of users (58.3%, $\chi^2 = 11.0, p < .001$). However, poor sleep is very common in antisocial participants regardless of sleep promoting medication use (53.3% for the non-users vs. 61.1% of the users ($\chi^2 = 0.4, p = .52$).

Table 3. Summary of logistic regression with antisocial traits/personality disorder predicting poor sleep quality (PSQI > 5) (N = 110).

	Logistic coefficient	Odds ratio	95% CI	p
Antisocial traits/PD	2.31	10.06	1.97-51.42	0.006**
Sleep-promoting medication	2.37	10.67	1.96-58.02	0.006**
Sleep-disrupting medication	0.59	1.81	0.70-4.71	0.223
Antisocial traits/PD * sleep-promoting medication	2.13	8.37	1.19-58.90	0.033*

Abbreviations: PD, personality disorder

* $p < .05$

** $p < .01$

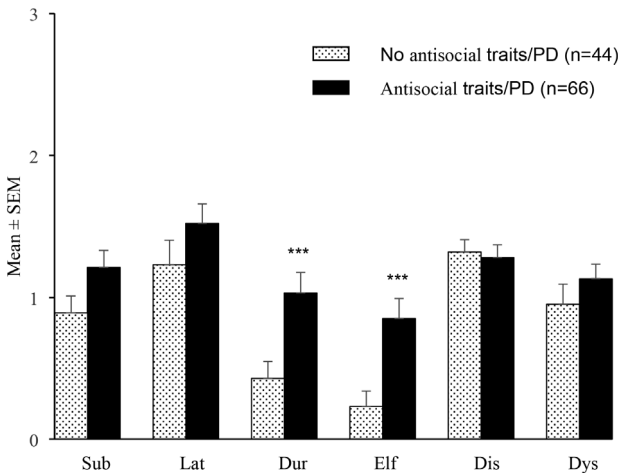


Figure 1. Scores on Pittsburgh Sleep Quality Index components compared between participants with and without antisocial traits/personality disorder (PD). Abbreviations: Sub, subjective appreciation of sleep quality; Lat, sleep latency; Dur, sleep duration; Eff, sleep efficiency; Dis, sleep-disturbing factors; Med, sleep medication; Dys, daytime dysfunctioning. *** $p < 0.001$.

Analysis of the different PSQI components revealed that in general, participants with antisocial traits/PD had a significantly lower sleep efficiency ($t(93.9)=-3.3, p<.001$) and shorter sleep duration ($t(93.1)=-3.2, p<.01$) than participants without antisocial traits/PD (Figure 1). No other Axis-II disorder was significantly associated with poor sleep quality.

Perceived causes of sleep problems and sleep hygiene

Of the total study sample 38.2% ($n=42$) stated that they currently experienced sleep problems. Of these participants, 78.6% had a poor sleep quality according to the PSQI. The reported causes for these sleep problems were diverse: (psychiatric) medication ($n=9$; 21.4%), stress / ruminating ($n=9$; 21.4%), traumatic childhood with the experience of an unsafe sleep environment ($n=7$; 16.7%), being imprisoned and not being able to do as they please ($n=3$; 7.1%), physical pain ($n=2$; 4.8%), ADHD ($n=2$; 4.8%) and/or other/unknown ($n=10$; 23.8%). In 6 participants (14.3%) the sleep disturbances started during the first imprisonment – either in detention or within the forensic hospital. Eight participants (19.0%) claimed that their current sleep problem was already present before the age of 10 and 19 participants (17.3%) of the total study sample reported poor sleep as a child.

We will only describe sleep hygiene characteristics of the poor sleepers as defined by the PSQI, as bad sleep hygiene may constitute a causal or contributing factor. Of the poor sleepers, 46.3% habitually napped during the day. The majority of the poor sleepers (72.2%) watched television during the hour preceding bedtime. Twenty poor sleepers (37.0%) left the television, radio and/or light on while trying to fall asleep. Forty-five poor sleepers (83.3%) drank coffee on a regular basis, on average 4.7 ± 4.2 cups per day with some also drinking coffee shortly before going to bed ($n=14$; 25.9%). 81.5% of the poor sleepers smoked, 43.2% of them more than 20 cigarettes per day. The majority of the poor-sleeping smokers (75.0%) habitually smoked shortly before bedtime and 52.3% also upon awakening during the night. In summary, many poor sleepers reported poor sleep hygiene behavior that may have caused or contributed to their sleeping problems.

Treatment of sleep complaints

Among participants with one or more SDL-sleep disorders, 31.3% ($n=10$) received one or more hypnotic drugs. Of the poor sleepers ($PSQI>5$), 40.7% ($n=22$) received one or more hypnotic drugs, which was significantly more than in the good sleepers ($n=7$; 14.3%; $\chi^2 = 11.3, p<.001$). Hypnotics included benzodiazepines ($n=8$), antipsychotics ($n=5$), antidepressants ($n=3$), melatonin ($n=3$) and also the so-called Z-drugs (zopiclone and zolpidem; $n=3$). In addition to the hypnotic drugs, a large proportion of these participants did use one or more other drugs with sleep interfering properties (Table 4).

Table 4. Use of sleep-disturbing medication among participants with sleep disorders (SDL) and poor sleep quality (PSQI > 5) (N = 110).

	n	Type of medication, n (%)		
		Hypnotic	Sleep promoting	Sleep disrupting
1 or more SDL \geq 3	32	10 (31.3%)	22 (68.8%)	12 (37.5%)
Insomnia	20	7 (35.0%)	14 (70.0%)	6 (30.8%)
Hypersomnia	11	3 (27.3%)	9 (81.8%)	6 (54.6%)
PLMs/RLS	7	2 (28.6%)	3 (42.9%)	4 (57.1%)
SBD	6	2 (33.3%)	4 (66.7%)	3 (50.0%)
Negative sleep conditioning	15	4 (26.7%)	11 (73.3%)	8 (53.3%)
PSQI > 5	54	22 (40.7%)	36 (66.7%)	18 (33.3%)

Abbreviations: SDL, Sleep Diagnosis List; PLMs/RLS, periodic leg movements/restless legs syndrome; SBD, sleep-related breathing disorder; PSQI, Pittsburgh Sleep Quality Index.

Since this may possibly lead to unpredictable interaction effects on their sleep we further explored this finding. As can be seen in Table 4, the majority of the hypersomniacs used sleep promoting medication (n=9, 81.8%). This was in most cases clozapine (n=5). All of the sleep promoting drugs in the participants with sleep related breathing disorder are compounds with weight gain as a side effect, namely clozapine (n=3) and risperidone (n=1). Surprisingly, a large part of the participants with insomnia, 70.0% (n=14) used sleep promoting medication not specifically prescribed for their sleep, which were in most cases atypical antipsychotics (n=11). Despite this, they experienced disturbed sleep. Five out of the 6 insomniacs with sleep disrupting medication, also used some kind of sleep promoting drug. This overlap makes it difficult to assess the potential causal contribution of these drugs to insomnia in these individual cases.

To summarize, approximately a third of the participants with one or more sleep disorders and/or a poor sleep quality used a hypnotic drug especially prescribed for their sleep problems. Apparently, prescribing hypnotic drugs to these patients did not alleviate their sleep quality and quantity to normal levels, at the time of our investigation. Importantly, a large proportion of these participants used (additionally) other medications with sleep-interfering properties.

DISCUSSION

The goal of this study was to determine the prevalence of sleep problems in a clinical forensic psychiatric population. We found that close to 30% of the forensic psychiatric patients had a sleep disorder, insomnia being the most frequent. As the instrument used to assess insomnia focuses on relatively severe, chronic insomnia, the finding that almost 20% of the forensic psychiatric patients suffer from insomnia is considerable. For comparison, a prevalence rate of only 4% was found in a large cohort study in the general population in Germany, based on the more lenient DSM-IV criteria (Hajak et al., 2001). In the present study the prevalence of PLMs/RLS (6.3%) is not substantially different from the rates observed in general population studies, in which PLMs are found in 4-11% (Hornyak et al., 2006) and RLS in 4-29% (Innes et al., 2011). The prevalence of sleep related breathing disorders is slightly higher in our study group: 5.4% in our group vs. 3% in a large community sample (Li et al., 2010).

Based on the PSQI, a large proportion of forensic psychiatric patients, approximately 50%, can be characterized as poor sleepers. Interestingly, having antisocial traits/PD was significantly associated with a poor sleep quality. While non-antisocial participants not using sedative medication had a better sleep quality than non-antisocial participants prescribed sedative medication, antisocial individuals were poor sleepers in general, independent of medication effects. Our finding that antisocial personality characteristics are associated with sleep problems is supported by earlier data. Poor sleep is reported in 80% of individuals with antisocial PD (Semiz et al., 2008). In addition, polysomnographic differences have been reported for forensic patients with antisocial PD (Lindberg et al., 2003), suggesting that also objectively sleep in these subjects is different. Reasons for this are not yet clear. Future studies are needed to elucidate the possible interactions between poor sleep and antisocial symptomatology.

It is important to identify the predisposing, precipitating and perpetuating factors underlying sleep problems, since these determine the treatment targets and may offer possibilities for early detection and prevention (Spielman et al., 1987). To what category (predisposing, precipitating or perpetuating) a certain factor belongs to, depends largely on the sleep history of the individual patient. Predisposing factors extend across the entire biopsychosocial spectrum, for example hyperarousal and a tendency to ruminate. Some participants in this study attributed their sleep problems to traumatic childhood, which may represent a predisposing factor to sleep problems later in life. Precipitating factors are acute events that interact with the patient's predisposition to develop sleep

difficulties. Part of our participants linked their poor sleep to stress/ruminating, ADHD and negative effects of psychopharmacological drugs, which may constitute precipitating factors. Perpetuating factors refer to the variety of maladaptive strategies to cope with the sleep problem. Our study revealed that a large proportion of the participants with poor sleep quality displayed such maladaptive behavior, namely unhealthy sleep hygiene habits, for example daytime napping. A recent Irish study showed that education on healthy sleep hygiene practices in psychiatric outpatients significantly improved sleep quality (Lyne et al., 2011). Thus, a first step in promoting sleep quality in forensic psychiatric patients may be directed at improving sleep hygiene practices within the clinic. The high rate of another well-known perpetuating factor of sleep difficulties – negative sleep conditioning – indicates that this should be included in the differential diagnosis of sleep problems in forensic psychiatric patients as well.

These latter findings raise concern about the influence of the hospital environment on sleep quality. In our experience, many patients complain about noise made by fellow-patients and staff during the night. In both facilities patients have their own private bedroom. But instead of just using this room for sleep, it is also the place where they spend quite some time doing other things, such as watching television and playing computer games. Furthermore, when a patient is too agitated to be on the ward, a first step is to lock their bedroom door in order to isolate the patient. This may increase the chance that ruminating and worrying become associated with the sleep environment. There is a daily fixed routine on most wards with joint meals and coffee breaks. Ideally, most patients would have activities, such as therapy, work or exercise, in between. In practice, especially during the first months of admission, their schedules are scarcely filled, leaving them with quite a lot of free time on their hands, but without many options to spend this in a sensible way. This may diminish the opportunity to build up enough sleep debt and therefore may precipitate and/or perpetuate sleep problems.

Treating poor sleep can reduce psychopathological symptomatology (Londborg et al., 2000; Fava et al., 2006; Manber et al., 2008) and may diminish aggressive disregularities and lack of impulse control (Kamphuis et al., 2012). The latter are extremely relevant for forensic psychiatry and stress the significance of the high rate of poor sleep and insomnia found in this study for daily clinical practice. With regard to pharmacological sleep treatment, we found that 31.3% of participants with one or more sleep disorders and 40.7% of the poor sleepers received a hypnotic drug. However, as many forensic psychiatric patients are prescribed multiple drugs (5 on average in our study group), the effect of a pharmacological treatment of sleep disorders becomes hard to predict. For

example, how will a hypnotic affect the sleep of a patient already using an antipsychotic drug with sedating properties, a mood stabiliser and an antidepressant with sleep promoting side effects? One should also consider the possibility that one of these drugs is actually contributing to the sleep problem itself. Careful assessment of the currently used medications and well thought-out changes herein, such as replacement of a one drug by another with less sleep disrupting or overly sedative effects, is of utmost importance in treating sleep disturbances. Furthermore, it becomes increasingly clear that in the long-term psychological and behavioral interventions are more effective in treating sleep complaints than prescribing hypnotics (Smith et al., 2005; Riemann and Perlis, 2009). Especially various forms of insomnia and negative sleep conditioning, both highly prevalent in our sample, are well-known to respond positively to a cognitive behavioral approach (Smith et al., 2005). Treatment modalities such as stimulus control therapy, relaxation training, sleep restriction therapy and cognitive therapy comprise such an approach (Perlis et al., 2005). Although cognitive behavioral therapy for insomnia was originally not intended for psychiatric patients, there is increasing evidence that, with some adjustments, this evidence-based method for insomnia can also be successfully applied to patients with psychiatric comorbidity (Smith et al., 2005). It would be interesting to study the effects of various sleep treatments on sleep as well as on psychopathological symptoms and problematic behavior in psychiatric patients in general and forensic populations, specifically.

This study has both limitations and strengths. Strengths are the usage of multiple self-report instruments to measure sleep and the inclusion of participants from two hospitals, increasing the generalizability of our results. A limitation is the relatively low response rate, which may have caused a bias in observed sleep problems. Second, all sleep parameters are measured subjectively with questionnaires, which does not always correspond with findings from objective sleep recordings. However, psychiatric practice is guided mainly by reported and subjective aspects of sleep experience, which makes our results directly relevant for psychiatrists working on a daily basis with these patients. Still, it would be interesting to extend our results with objective measurements, such as actigraphy or polysomnography. Finally, we only investigated hospitalized patients. Although not confronted with the mental stress of an involuntary admission, outpatients lack the predictable daily structure provided by a forensic hospital and may have a higher risk of active substance abuse, which may increase the risk of problems regarding sleep.

In conclusion, the present study shows that sleep disorders and poor sleep quality are experienced by a large part of clinical forensic psychiatric patients. This is highly relevant,

as poor sleep may exacerbate psychiatric symptomatology and aggressive reactivity, which in turn may increase the risk of recidivism. Especially patients with antisocial traits or PD seem to be at risk for poor sleep quality. Precipitating and perpetuating factors of sleep problems in forensic psychiatric patients are diverse, but clinicians should be especially aware of unhealthy sleep hygiene habits, negative sleep conditioning and side effects of psychotropic drugs on sleep. As treatment of sleep disturbances may positively affect sleep quality as well as psychiatric disorders and emotional and aggression control, it may be an important direction for intervention programs and future research.

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