



Full length article

# Subjective sleep quality and sleep duration of patients in a psychiatric hospital

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## ABSTRACT

Sleep complaints and sleep disturbances are highly prevalent in patients with psychiatric disorders. During hospitalization the patients' condition may be even worse but little is known about the subjective sleep quality in psychiatric hospitals. Thus, we have investigated subjective sleep quality and mean sleep duration in patients with different psychiatric disorders at the end of hospitalization. For a period of one year, inpatients of a psychiatric hospital with diagnosis of substance use disorder (SUD), schizophrenia (SCZ), or anxiety/depressive disorders (AND) were routinely asked to fill in an easily comprehensible sleep quality questionnaire at the end of their hospitalization. Age, gender, subjective sleep quality, and sleep duration were analyzed; sleep duration was classified according to age-specific recommendations. Data of  $n=309$  patients (age  $52.1 \pm 17.9$ y, 56.1% women) were analyzed ( $n=63$  SUD,  $n=50$  SCZ,  $n=196$  AND). Mean sleep duration was  $7.0 \pm 2.0$  h; 20.7% of patients had sleep durations below and 4.5% above age-specific recommendations. Non-restorative sleep during hospitalization was reported "almost always" in 38.2% ( $n=118$ ), and "occasionally" in 30.1% ( $n=93$ ). Subjective sleep quality was significantly associated with sleep duration ( $r_s = -0.31$ ,  $P < 0.0005$ ), but not with age, gender or diagnostic subgroup. The study showed that a great proportion of patients reported poor subjective sleep quality during hospitalization, regardless of age, gender and psychiatric diagnosis. As sleep quality was significantly associated with short sleep duration, a first step could be to take care to achieve recommended age-specific sleep durations in psychiatric hospitals.

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## 1. Introduction

Sleep complaints and sleep disturbances are highly prevalent in neuropsychiatric disorders across the lifespan [1,2]. Up to 80% of patients with schizophrenia spectrum disorder (SCZ) report sleep disturbances [3], including increased sleep onset latency, shorter sleep duration (total sleep time) and decreased sleep efficiency [1,2]. Self-reported sleep disturbances are already prevalent in early psychosis and seem to be associated with symptom severity [4].

Sleep disturbances and non-restorative sleep are frequently occurring in patients with anxiety and depressive disorders (AND) [1,2,5–7]. Compared to healthy subjects, both insomnia (40–90%)

and hypersomnia (5–10%) are more common in depression and related affective disorders. Persistent sleep disturbances are a major risk of developing depressive disorders, are part of the diagnostic criteria for major depressive disorders, and quite frequently continue during remission of depressive and anxiety disorders [5,7,8].

Alcohol and drugs of abuse have disruptive effects on sleep; accordingly, 50–90% of patients with substance use disorders (SUD), i.e. alcohol or drug dependence, have sleep disturbances, particularly longer sleep onset latency and shorter sleep duration as well as distorted sleep architecture [9,10]. As consequences, reduced alertness, impaired next-day function, and increased daytime sleepiness are highly prevalent in patients with SUD [2,10,11]. Insomnia and poor subjective sleep quality are present during active substance use, intensified during discontinuation and withdrawal, and often persist even in abstinent patients [1]. Moreover, longitudinal studies suggest that enduring short sleep durations and insomnia are general risk factors for the development and non-remission of neuropsychiatric disorders, particularly of anxiety/depressive disorders (AND) and SUD [1,6,7,12].

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Additionally, the unique and independent importance of sleep disorders in patients with medical or psychiatric disorders has been corroborated with the transition from the fourth to the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV to DSM-5). Consistent with this view a bidirectional relationship between sleep disturbances and psychiatric disorders has to be assumed [13].

Based on a systematic review of available literature relating sleep duration to health, the National Sleep Foundation (NSF) has recommended sleep times at different life stages [14] which are largely in agreement with other recommending statements [15,16]. Recommendations comprise optimum daily sleep durations for different age stages, acceptable and potentially even appropriate lower and higher sleep durations, and sleep durations outside this range (not recommendable, i.e. too low or too high). Meta-analyses have suggested that particularly short sleep durations (i.e. < 5 h) are clearly associated with a heightened risk of metabolic and cardiovascular diseases [17,18].

Taken together, all presently available findings suggest that insomnia and non-restorative sleep are highly frequent in patients with psychiatric disorders. It is assumed that due to the severity of illness and additional stress factors the poor sleep quality of patients with neuropsychiatric disorders is even worse during hospitalization [19,20]. However, little is known about the sleep duration and subjective sleep quality of patients in psychiatric hospitals [21]. Thus, we have analyzed sleep duration and subjective sleep quality in patients with SUD, SCZ or AND at the end of their hospitalization.

## 2. Methods

### 2.1. Patients and design

Questionnaire data from adult inpatients (18–65 years) were consecutively sampled for 12 months at a university-affiliated regional psychiatric clinic and retrospectively analyzed. The study is part of a larger, self-financed health services research project on chronobiology, sleep, and mood in psychiatric disorders (CSMP). All included patients were able to consent and the study was approved by the local ethics committee. All patients of 6 wards specialized for the treatment of patients with either substance use disorder (SUD) (2 wards, about 80% alcohol dependence and 20% other SUDs), schizophrenia and related disorders (SCZ) (one ward), or anxiety and depressive disorders (AND) (3 wards) were asked to fill in a short self-rating sleep questionnaire [21,22] on sleep duration and subjective sleep quality voluntarily and fully anonymously before discharge.

### 2.2. Assessment

The questionnaire comprises items regarding sex, age, and psychiatric disorder or complaints and problems as well as sleep-related questions. Sleep duration at night (i.e. weighted mean of workdays and weekends, mean hours) and sleep quality (“non-restorative sleep”; 3-point scale: 0=never, 1=occasionally/sometimes, 2=almost always) were assessed as an average of the period of hospitalization. As potentially influencing factors, caffeine consumption (0=no, 1= $\leq$  three cups of coffee/tea; 2=four or more cups of coffee/tea per day) and smoking status (0=never, 1= $\leq$  three cig/d; 2=three or more cig/d) were included in the present analyses; other aspects of the project will be reported in detail elsewhere.

Patients were treated according to current treatment guidelines and with sleep-promoting non-pharmacological and pharmacological measures as needed, no patient received sleep deprivation

**Table 1**  
Recommended sleep duration in adults [14].

Recommendation	Age group	
	Young adults (18–25 years)	Adults (26–65 years)
(A) Low, not recommended	< 6 h	< 6 h
(B) Low, may be appropriate	6–7 h	6–7 h
(C) Recommended	7–9 h	7–9 h
(D) High, may be appropriate	10–11 h	9–10 h
(E) High, not recommended	> 11 h	> 10 h

Associations between variables were calculated using non-parametric rank correlations (Spearman's  $r_s$ ). The level of statistical significance was set at two-tailed  $\alpha=0.05$ .

treatment.

### 2.3. Statistics

Subjective sleep quality and sleep duration were categorically and dimensionally analyzed, and descriptive statistics were calculated (frequencies, mean, standard deviation, 95% confidence intervals). Variables were compared between different patient groups (SUD, SCZ and AND) by means of analyses of variance (ANOVA) (dimensional data) or Chi<sup>2</sup> tests (categorical data). To control for age effects, sleep duration was converted into age-specific categories according to the NSF recommendations [14] (Table 1).

## 3. Results

Data of 309 patients could be analyzed with a substantially larger number of patients with anxiety or depressive disorder (AND). In Table 2, patients' characteristics and sleep-related variables are reported for three diagnostic groups.

Age differed significantly between diagnostic groups (AND > SUD > SCZ). Significantly less females were in the group of patients with SUD compared to SCZ or AND.

More than 2/3 of all patients reported poor subjective sleep quality (occasionally or always) during hospitalization without significant differences between the diagnostic groups (see also Fig. 1). Numerically, the highest proportion of patients with persistently poor subjective sleep quality during hospitalization was found in the SUD group. Additionally, significantly higher proportions of patients with SUD were smokers or reported higher caffeine consumption (more than 3 cups of coffee or tea a day).

Mean sleep duration was significantly different between groups: SUD patients reported significantly lower sleep durations (95%CI [5.6–6.4 h]) than patients with SCZ (95% [7.3–8.2 h]) or AND (95% [6.7–7.2 h]) (Fig. 2).

The analysis of age-specific recommended sleep durations revealed similar results: the significantly highest proportion of patients with non-recommended low sleep duration (43%) was found among patients with SUD (AND 24%; SCZ 10%; c.f. Table 2).

No significant gender differences were found with respect to clinical or sleep-related variables with the exception of a lower proportion of smoking women (59.6%) than men (76.3%, Chi<sup>2</sup> test,  $P=0.006$ ). Table 3 shows correlations of age and other sleep-related variables. Age showed a low, but significant negative correlation with sleep duration ( $r=-0.13$ ,  $P=0.027$ ) and a significant negative association with smoking ( $r=-0.40$ ;  $P<0.0005$ ) (Table 3).

Subjective sleep quality (0–2) was significantly correlated with the mean sleep duration controlling for age (partial correlation;

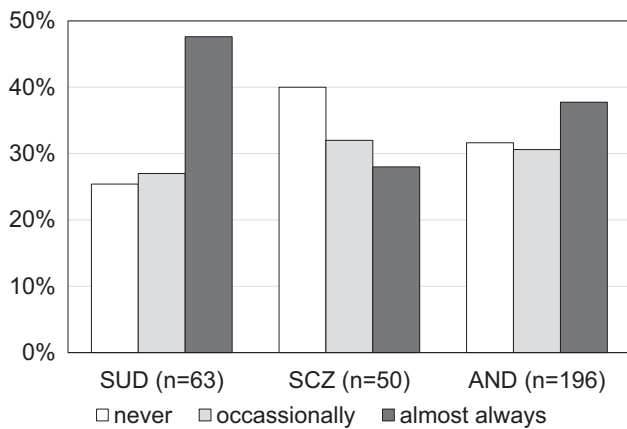
**Table 2**  
Patients' characteristics.

	SUD	SCZ	AND	Total	Group differences
	N=63	N=50	N=196	N=309	
Age [years]	41.6 ± 10.8	34.7 ± 11.3	58.1 ± 16.2	52.1 ± 17.9	<sup>a</sup> P < 0.001
% female	26.3	52.0	64.6	56.1	<sup>b</sup> P < 0.001
Subjective Sleep Quality					
Non-restorative sleep [0–2]	1.2 ± 0.8	0.9 ± 0.8	1.1 ± 0.8	1.1 ± 0.8	<sup>a</sup> P = 0.10
% Non-restorative sleep (occasionally or always)	74.6	60.0	68.4	68.3	<sup>b</sup> P = 0.25
% never	25.4	40.0	31.6	31.7	<sup>b</sup> P = 0.29
% sometimes	27.0	32.0	30.6	30.1	
% always	47.6	28.0	37.8	38.2	
Sleep duration and age-specific recommendations					
Mean sleep duration [h]	6.0 ± 1.6	7.7 ± 1.6	7.1 ± 2.0	6.9 ± 2.0	<sup>a</sup> P < 0.001
% not recommended sleep duration	42.9	10.0	23.5	25.2	<sup>b</sup> P < 0.001
% not recommended low	42.9	8.0	16.8	20.7	-
% may be appropriate low	28.6	20.0	22.4	23.3	
% recommended	23.8	56.0	45.9	43.0	
% may be appropriate high	4.8	14.0	8.2	8.4	
% not recommended high	0.0	2.0	6.6	4.5	
% smoking > 3 cig/d	84.1	64.6	62.1	67.2	<sup>b</sup> P = 0.005
% coffee/tea > 3 cups/d	73.0	50.0	49.2	54.5	<sup>b</sup> P = 0.004

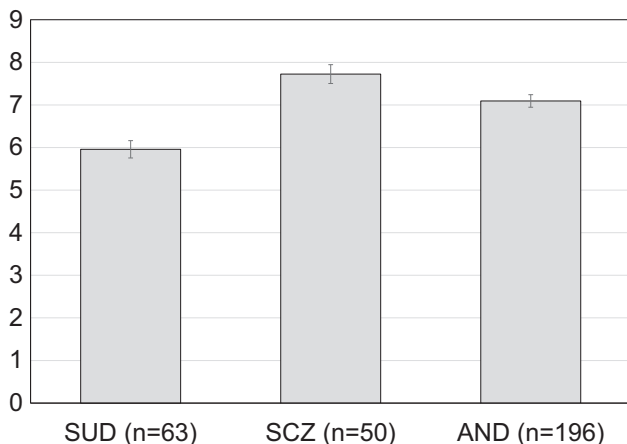
SUD, substance use disorder; SCZ, schizophrenia and related disorders; AND, anxiety and depressive disorders.

<sup>a</sup> analysis of variance (ANOVA).

<sup>b</sup> Chi<sup>2</sup> tests.



**Fig. 1.** Subjective sleep quality in patients with psychiatric disorders during hospitalization. SUD, substance use disorder; SCZ, schizophrenia and related disorders; AND, anxiety and depressive disorders.



**Fig. 2.** Self-reported mean sleep duration during hospitalization in different diagnostic groups. Means ± standard error of means (SEM); SUD, substance use disorder; SCZ, schizophrenia and related disorders; AND, anxiety and depressive disorders.

**Table 3**  
Rank correlations ( $r_s$ ) of age and sleep-related variables.

	SQI	MSD	MSDc	Smoking	Caffeine
Age [years]	-0.04	-0.13 <sup>*</sup>	-0.01	-0.40 <sup>***</sup>	-0.07
Sleep quality index SQI [0–2]	-	-0.27 <sup>***</sup>	-0.34 <sup>***</sup>	-0.03	-0.04
Mean sleep duration MSD [h]	-	-	+0.92 <sup>***</sup>	-0.03	+0.06
MSD categories [1–5]	-	-	-	-0.11	+0.02
Smoking status [0–2]	-	-	-	-	+0.35 <sup>***</sup>

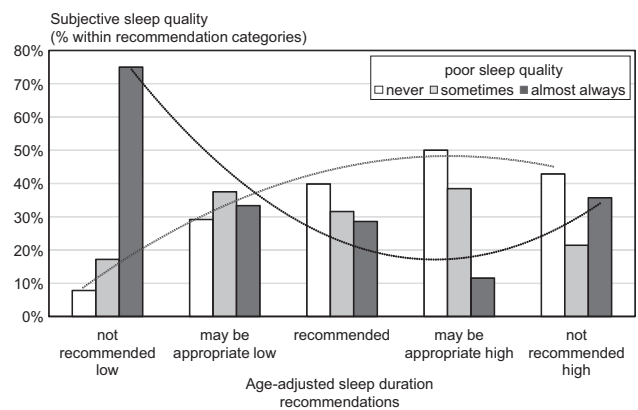
SQI, sleep quality index (non-restorative sleep); MSD, mean sleep duration; MSDc, categories of sleep duration recommendations;

<sup>\*</sup> P < 0.05.

<sup>\*\*\*</sup> P < 0.001.

$r = -0.28$ ;  $P < 0.0005$ ). A similar correlation emerged between sleep quality ratings and categories of age-specific recommendations ( $r_s = -0.34$ ;  $P < 0.0005$ ).

The relationship between recommended sleep duration and sleep quality is illustrated in Fig. 3. More than 75% of patients within the category of not recommended low sleep duration (i.e. < 6 h) reported poor sleep quality. The highest proportion of



**Fig. 3.** Sleep duration and subjective sleep quality. Dotted lines represent quadratic (polynomial) trend lines; --- "almost always" poor sleep quality; --- "never" poor sleep quality.

patients with good subjective sleep quality (50%) was found within the category of patients with recommended normal to high sleep duration. The quadratic polynomial components superimposed in Fig. 3 illustrate a u-shaped relationship between recommended sleep duration and good sleep quality and an inverted u-shaped relationship between sleep duration and poor sleep quality.

#### 4. Discussion

The study investigated subjective sleep quality and self-reported sleep duration in patients aged 18–65 years with a major neuropsychiatric disorder (schizophrenia spectrum disorders, substance use disorders, anxiety/depressive disorders) before discharge from hospitalization. A high prevalence of sleep disturbances in patients with different neuropsychiatric disorders during all illness stages has been repeatedly shown [1–12,23]. However, subjective sleep quality and sleep duration has rarely been investigated during hospitalization in these patients.

Our results indicate that about 2/3 of inpatients with SCZ, SUD or AND experience poor subjective sleep quality during hospitalization. This number corresponds to prevalence rates of insomnia and sleep disorders found in clinical studies in patients with neuropsychiatric disorders [1,2,9,10]. The large proportion of patients reporting non-restorative sleep during hospitalization in the present study (68.3%) did not significantly differ between diagnostic groups and was even higher than that found in general hospitals (medical/surgical hospitals: 45.6%) [19,20]. However, the studies are hardly comparable due to different assessment methods, settings, and samples.

In the present study, gender and age were not significantly associated with subjective sleep quality. In the general population, a female predisposition of insomnia has been confirmed [24]. Moreover, age-related changes of objective sleep parameters, particularly higher sleep latencies and proportions of sleep stages 1/2 as well as lower nighttime sleep amounts have been found with increasing age [25,26]. However, there are other findings at least in patients with depression relating increasing age to normalized sleep duration, reduced sleep onset latencies [27], as well as less-severe sleep-wake symptoms [28]. Smaller age-related changes are found, if at all, with self-reported sleep variables and subjective sleep quality compared to polysomnography measures [26,28].

This discrepancy could at least partly reflect decreased symptom awareness in elderly patients [28]. Furthermore, the present analysis was limited to patients within an age range between 18 and 65 years to avoid confounding with sleep disturbances related to higher age. The present study revealed only limited evidence that caffeine consumption or smoking had an impact on sleep in patients with neuropsychiatric disorders during hospitalization. These findings are in line with reviews and meta-analyses showing potential sleep-disturbing properties of caffeine and nicotine [29] but also, that low to moderate caffeine consumption, mostly during morning hours, and regular smoking has little effect on subjective or polysomnographic sleep measures [10,30]. Moreover the daily intake of 2–3 cups of coffee or tea appears to be associated with neutral or even beneficial effects for most health outcomes (cardiovascular and renal diseases, diabetes mellitus) [31,32].

In the present study sleep duration emerged as the main factor contributing to subjective sleep quality. Across different diagnoses (SUD, SCZ, AND) the poorest subjective sleep quality was reported by patients with non-recommended low (and high) mean sleep durations. The analyses of age-specific recommendations were corroborated by a significant age-adjusted correlation between sleep duration and sleep quality.

It has, however, to be taken into account that in the present study the measure of sleep duration was exclusively subjective. It is known that sleep time misperceptions are common among subjects with sleep difficulties, particularly insomnia, with a however broad continuum between substantial under- and over-estimates compared to polysomnographically estimated sleep durations [33–35]. Thus, perceived duration and quality of sleep seem to constitute important indicators of sleep disturbances beside and in addition to objective sleep measures [35]. A further potential limitation of the present study is its cross-sectional design with only one assessment of sleep quality at the end of hospitalization excluding e.g. pre-post comparisons.

Converging evidence suggests that short – but also excessively long – nighttime sleep durations bear the risk of mental and physical health problems in adults at least until reaching the age of 65 [15,16,36]. Accordingly, associations between sleep duration and daytime functioning are assumed to be associated in a curvilinear fashion with very low and excessively high sleep durations bearing the highest risk of impairment [13].

#### 5. Conclusions

Although in the present study sleep duration and subjective sleep quality showed a shared variance of only about 10%, sleep duration was by large the most substantial factor influencing sleep quality. Clinicians should be aware that both insomnia and hypersomnia are associated with poor sleep quality [37] and that persistently short sleep duration and insomnia are great risks for higher morbidity and mortality [36,38,39]. Moreover, our results suggest that more efforts should be undertaken to ensure individually recommended, age-specific sleep durations during hospitalization in patients with psychiatric disorders.

#### Conflict of interests

None.

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