

**SHORT REPORT**

# Sleep quality in persons with mental disorders: Changes during inpatient treatment across 10 diagnostic groups

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## Summary

Sleep disturbances have been documented across a range of mental disorders, particularly depression. However, studies that have examined sleep quality in large samples of different diagnostic groups and that report how sleep quality changes during inpatient treatment have been scarce. This retrospective, observational study examined changes in sleep quality during inpatient treatment at a psychosomatic hospital in Germany from admission to discharge as a function of 10 diagnostic groups. Data of 11,226 inpatients were analysed who completed the Pittsburgh Sleep Quality Index as part of the routine diagnostic assessment at admission and discharge. All diagnostic groups showed impaired sleep quality (Pittsburgh Sleep Quality Index score > 5). Patients with trauma-related disorders had the lowest sleep quality and patients with obsessive-compulsive disorder had the highest sleep quality. While sleep quality significantly improved in each diagnostic group, changes differed in size, with patients with trauma-related disorders showing the smallest improvement and patients with eating disorders showing the largest improvement. The current study documents impaired sleep quality in inpatients with mental disorders and shows that sleep problems are a transdiagnostic feature in this population. Results also resonate with earlier suggestions that sleep disturbances represent a key feature of trauma-related disorders in particular and the need for trauma-specific sleep interventions. Although sleep quality significantly improved during disorder-specific inpatient treatment in all diagnostic groups, average scores were still clinically elevated at discharge. Thus, a future avenue would be to examine whether adding sleep-specific treatment elements fosters both short- and long-term success in the treatment of mental disorders.

## KEYWORDS

depression, inpatient treatment, mental disorders, sleep quality, trauma-related disorders

## 1 | INTRODUCTION

Sleep disturbances have been documented across a range of mental disorders, particularly depression (Baglioni et al., 2016; Lijun et al., 2012).

However, studies that have examined sleep quality in large samples of different diagnostic groups and that report how sleep quality changes during psychotherapeutic treatment have been scarce (Schennach, Feige, Riemann, Heuser, & Voderholzer, 2019). Therefore, this report examines

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TABLE 1 Sample characteristics

	Depressive episode (F32)	Recurrent depressive disorder (F33)	Phobic anxiety disorders (F40)	Other anxiety disorders (F41)	Obsessive-compulsive disorder (F42)	Reaction to severe stress, and adjustment disorders (F43)	Somatiform disorders (F45)	Eating disorders (F50)	Specific personality disorders (F60)	Other mental disorders
Group size	n = 2128	n = 2961	n = 505	n = 183	n = 970	n = 630	n = 423	n = 3126	n = 124	n = 176
Sex (female)	n = 1272 (59.8%)	n = 1803 (60.9%)	n = 286 (56.6%)	n = 107 (58.5%)	n = 587 (60.5%)	n = 530 (84.1%)	n = 281 (66.4%)	n = 3005 (96.1%)	n = 88 (71.0%)	n = 100 (56.8%)
Age (years)	M = 41.7 (SD = 16.8)	M = 46.7 (SD = 14.7)	M = 30.1 (SD = 15.0)	M = 42.1 (SD = 15.7)	M = 33.1 (SD = 13.9)	M = 41.3 (SD = 14.1)	M = 44.8 (SD = 16.2)	M = 23.5 (SD = 10.6)	M = 30.8 (SD = 13.3)	M = 44.3 (SD = 16.9)
Treatment duration (days)	M = 54.5 (SD = 25.2)	M = 52.9 (SD = 19.4)	M = 59.8 (SD = 23.7)	M = 53.3 (SD = 19.3)	M = 72.5 (SD = 24.5)	M = 69.1 (SD = 26.1)	M = 49.7 (SD = 18.7)	M = 91.6 (SD = 44.6)	M = 57.4 (SD = 19.7)	M = 48.1 (SD = 20.9)
PSQI at admission	M = 10.1 (SD = 4.1)	M = 10.6 (SD = 4.3)	M = 8.4 (SD = 4.0)	M = 9.1 (SD = 4.3)	M = 8.0 (SD = 4.0)	M = 11.6 (SD = 4.3)	M = 10.2 (SD = 4.5)	M = 9.0 (SD = 4.3)	M = 9.9 (SD = 4.0)	M = 9.2 (SD = 4.7)
PSQI at discharge	M = 8.1 (SD = 4.2)	M = 8.7 (SD = 4.3)	M = 7.1 (SD = 3.9)	M = 7.7 (SD = 4.1)	M = 6.8 (SD = 3.9)	M = 10.6 (SD = 4.7)	M = 8.9 (SD = 4.6)	M = 6.9 (SD = 3.9)	M = 8.6 (SD = 4.2)	M = 7.8 (SD = 4.4)
Specific diagnoses	Mild depressive episode (F32.0, n = 10, 0.5%) Moderate depressive episode (F32.1, n = 1367, 64.2%) Severe depressive episode without psychotic symptoms (F32.2, n = 740, 34.8%) Severe depressive episode with psychotic symptoms (F32.3, n = 8, 0.4%) Other depressive episodes (F32.8, n = 1, < 0.1%) Unspecified depressive episode (F32.9, n = 2, 0.1%)	Recurrent depressive disorder, current episode mild (F33.0, n = 5, 0.2%) Recurrent depressive disorder, current episode moderate (F33.1, n = 1549, 52.3%) Recurrent depressive disorder, current episode severe without psychotic symptoms (F33.2, n = 1391, 47.0%) Recurrent depressive disorder, current episode severe with psychotic symptoms (F33.3, n = 12, 0.4%) Recurrent depressive disorder, currently in remission (F33.4, n = 1, < 0.1%) Other recurrent depressive disorders (F33.8, n = 1, < 0.1%) Unspecified recurrent depressive disorder (F33.9, n = 2, 0.1%)	Agoraphobia (F40.0, n = 192, 38.0%) Social phobias (F40.1, n = 274, 54.3%) Specific phobias (F40.2, n = 34, 6.7%) Other phobic anxiety disorders (F40.8, n = 4, 0.8%) Unspecified phobic anxiety disorders (F40.9, n = 1, 0.2%)	Panic disorder (F41.0, n = 110, 60.1%) Generalized anxiety disorder (F41.1, n = 52, 28.4%) Mixed anxiety and depressive disorder (F41.2, n = 6, 3.3%) Other mixed anxiety disorders (F41.3, n = 4, 2.2%) Other specified anxiety disorders (F41.8, n = 4, 2.2%) Unspecified anxiety disorder (F41.9, n = 7, 3.8%)	Predominantly obsessional thoughts or ruminations (F42.0, n = 56, 5.8%) Predominantly compulsive acts (F42.1, n = 180, 18.6%) Mixed obsessional thoughts and acts (F42.2, n = 730, 75.3%) Unspecified obsessive-compulsive disorder (F42.9, n = 4, 0.4%)	Acute stress reaction (F43.0, n = 1, 0.2%) Post-traumatic stress disorder (F43.1, n = 589, 93.5%) Adjustment disorders (F43.2, n = 32, 5.1%) Other reactions to severe stress (F43.8, n = 7, 1.1%) Unspecified reaction to severe stress (F43.9, n = 1, 0.2%)	Somatization disorder (F45.0, n = 63, 14.9%) Undifferentiated somatoform disorder (F45.1, n = 46, 10.9%) Hypochondriacal disorder (F45.2, n = 54, 12.8%) Somatoform autonomic dysfunction (F45.3, n = 60, 14.2%) Persistent somatoform pain disorder (F45.4, n = 185, 43.7%) Other somatoform disorders (F45.8, n = 12, 2.8%) Unspecified somatoform disorder (F45.9, n = 3, 0.7%)	Anorexia nervosa (F50.0, n = 1880, 60.1%) Atypical anorexia nervosa (F50.1, n = 234, 7.5%) Bulimia nervosa (F50.2, n = 668, 21.4%) Atypical bulimia nervosa (F50.3, n = 105, 3.4%) Overeating associated with other psychological disturbances (F50.4, n = 10, 0.3%) Vomiting associated with other psychological disturbances (F50.5, n = 3, 0.1%) Other eating disorders (F50.8, n = 104, 3.3%) Unspecified eating disorder (F50.9, n = 122, 3.9%)	Paranoid personality disorder (F60.0, n = 1, 0.8%) Emotionally unstable personality disorder (F60.3, n = 102, 82.3%) Histrionic personality disorder, current episode severe (F60.4, n = 1, 0.8%) Anankastic personality disorder (F60.5, n = 3, 2.4%) Anxious personality disorder (F60.6, n = 7, 5.6%) Dependent personality disorder (F60.7, n = 1, 0.8%) Other specific personality disorder (F60.8, n = 8, 6.5%) Unspecified personality disorder (F60.9, n = 30, 17.0%)	Bipolar affective disorder, current episode mild or moderate depression (F31.3, n = 18, 10.2%) Bipolar affective disorder, current episode severe depression without psychotic symptoms (F31.4, n = 22, 12.5%) Psychological and behavioural factors associated with disorders or diseases classified elsewhere (F54, n = 16, 9.1%) Mixed and other personality disorders (F61, n = 30, 17.0%) Other diagnoses, each with n = 1–10 (n = 90, 51.1%)

Note: PSQI, Pittsburgh Sleep Quality Index.

changes in sleep quality during inpatient treatment from admission to discharge as a function of 10 diagnostic groups in more than 11,000 patients with mental disorders.

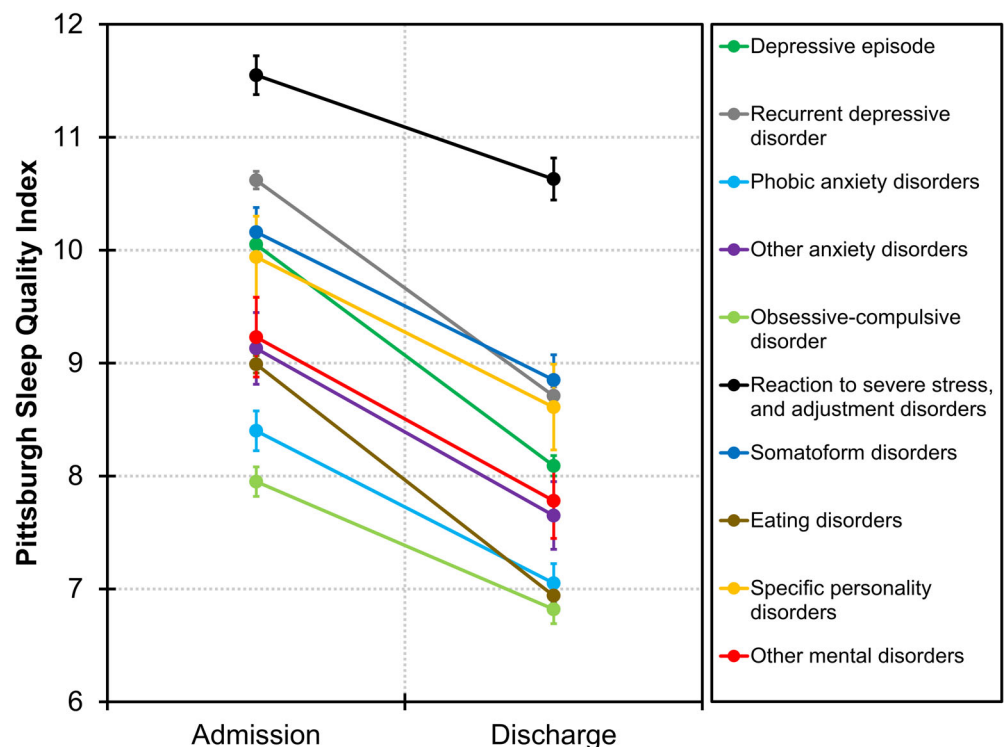
## 2 | MATERIALS AND METHODS

Data of 11,226 inpatients were analysed who completed the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) as part of the routine diagnostic assessment at admission and discharge at the Schoen Clinic Roseneck (Prien am Chiemsee, Germany) between July 2014 and September 2020. At the Schoen Clinic Roseneck, data from the routine diagnostic assessment (e.g., age, sex, treatment duration, diagnoses, questionnaire scores) are automatically transferred to a database from which they can be exported without any identifying information (e.g., name, date of birth, place of residence) by authorized employees. Thus, accessing individual patient charts is not necessary. According to the guidelines by the institutional review board of the LMU Munich, retrospective studies conducted on already available, anonymized data are exempt from requiring ethics approval. The Schoen Clinic Roseneck is a psychosomatic hospital, that is, in contrast to psychiatric hospitals in Germany, it does not have involuntary admissions and does not treat patients with acute suicidality, substance use disorders or psychotic disorders (for a general description of the term psychosomatic hospital in Germany, see Zipfel, Herzog, Kruse, & Henningsen, 2016). The hospital provides a multimodal inpatient treatment for persons with mental disorders (other than those mentioned above) that includes cognitive-behavioural individual and group therapy sessions and other treatment elements in line with national treatment guidelines. Only a minority of patients receive psychopharmacological medication: approximately three-quarters of the

sample (73.2% at admission and 74.2% at discharge) indicated that they did not use any sleep medication in the past 4 weeks based on item #7 of the PSQI. The PSQI has 10 items with different response formats, which are converted to seven component scores, internal reliability of which was  $\omega = 0.758$  at admission and  $\omega = 0.783$  at discharge. Higher total scores represent lower sleep quality. Changes in PSQI total scores from admission to discharge as a function of diagnostic groups (based on ICD-10 categories; Table 1) were examined with analyses of variance and paired *t*-tests. The data that support the findings of this study are openly available at <https://osf.io/82wmp>.

## 3 | RESULTS

Groups differed in sex ( $\chi^2 = 1447, p < 0.001, \phi = 0.359$ ), age ( $F_{9,11216} = 549, p < 0.001, \eta^2_p = 0.306$ ) and treatment duration ( $F_{9,11216} = 549, p < 0.001, \eta^2_p = 0.306$ ; Table 1). Main effects of time ( $F_{1,11216} = 528, p < 0.001, \eta^2_p = 0.045$ ) and group ( $F_{9,11216} = 85.8, p < 0.001, \eta^2_p = 0.064$ ) indicated that sleep quality improved from admission to discharge, and that groups differed in sleep quality: descriptively, patients with reactions to severe stress, and adjustment disorders had the lowest sleep quality, and patients with obsessive-compulsive disorder had the highest sleep quality (Figure 1; Table 1). While sleep quality significantly improved in each diagnostic group (all  $p < 0.001$ ), a significant time  $\times$  group interaction ( $F_{9,11216} = 10.7, p < 0.001, \eta^2_p = 0.008$ ) indicated that changes differed in size: descriptively, patients with reactions to severe stress, and adjustment disorders had the smallest changes ( $M = -0.9, SD = 4.3, d = 0.212$ ), and patients with eating disorders had the largest changes ( $M = -2.1, SD = 4.0, d = 0.518$ ; Figure 1; Table 1). Controlling for sex, age and treatment duration did not change this effect ( $F_{9,11213} = 10.7, p < 0.001, \eta^2_p = 0.008$ ).



**FIGURE 1** Mean sum scores of the Pittsburgh Sleep Quality Index at admission and discharge as a function of diagnostic groups. Error bars indicate the standard error of the mean. Note that higher scores represent lower sleep quality

## 4 | DISCUSSION

In line with previous findings, the current study documents impaired sleep quality in inpatients with mental disorders (Baglioni et al., 2016; Lijun et al., 2012; Schennach et al., 2019). Specifically, average PSQI scores were above the cut-off score of 5—indicating poor sleep quality (Buysse et al., 1989)—in all diagnostic groups, suggesting that sleep problems are a transdiagnostic feature in this population. Of note, however, is that results are limited to inpatients that are typically treated in psychosomatic hospitals in Germany and, thus, are not representative for the entire population of inpatients with mental disorders (including, e.g., psychiatric inpatients with substance use or psychotic disorders).

In contrast to previous reports, which found the lowest self-reported sleep quality and the most severe alterations in polysomnographic variables in patients with depression (Baglioni et al., 2016; Lijun et al., 2012), patients with trauma-related disorders showed the lowest sleep quality in our sample. However, this result is in line with previous findings from our hospital (Schennach et al., 2019), and with earlier suggestions that sleep disturbances represent a key feature of post-traumatic stress disorder (Germain, 2013). Furthermore, patients with trauma-related disorders showed the smallest improvements in sleep quality from admission to discharge. Thus, the current findings resonate with recent suggestions that highlight the need for trauma-specific sleep interventions in the treatment of trauma-related disorders (Miller, Brownlow, & Gehrman, 2020).

Finally, although disorder-specific inpatient treatment significantly improved sleep quality in all diagnostic groups in the current study, average scores were still clinically elevated at discharge. Thus, a future avenue would be to examine whether low sleep quality at discharge is predictive of poorer long-term treatment outcome, and whether adding sleep-specific treatment elements fosters both short- and long-term success in the treatment of mental disorders. Such transdiagnostic, sleep-specific treatment programs for inpatients with mental disorders are currently under development (Sheaves et al., 2018), and preliminary feasibility trials suggest that they have the potential to improve sleep quality and possibly other health outcomes as well (Schneider et al., 2020).

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### CONFLICT OF INTEREST

The authors declare that none of them has a conflict of interest.

### AUTHOR CONTRIBUTIONS

UV conceived the study. AM conducted the statistical analyses and wrote the first draft. DR and UV contributed to interpretation of the data and revised the manuscript for content.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available at <https://osf.io/82wmp>.

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### REFERENCES

- Baglioni, C., Nanovska, S., Regen, W., Spiegelhalter, K., Feige, B., Nissen, C., Reynolds, C. F., III, & Riemann, D. (2016). Sleep and mental disorders: A meta-analysis of polysomnographic research. *Psychological Bulletin*, 142, 969–990. <https://doi.org/10.1037/bul0000053>
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28, 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Germain, A. (2013). Sleep disturbances as the hallmark of PTSD: where are we now? *American Journal of Psychiatry*, 170, 372–382. <https://doi.org/10.1176/appi.ajp.2012.12040432>
- Lijun, C., Ke-Qing, L., Xiuli, S., Ze, C., Qinpu, J., Yanchao, H., Lianghui, G., Yang, Z., Jianfeng, L., Yongqiao, L., Laohu, Y., & Hua, L. (2012). A survey of sleep quality in patients with 13 types of mental disorders. *The Primary Care Companion for CNS Disorders*, 14(6). <https://doi.org/10.4088/PCC.11m01173>
- Miller, K. E., Brownlow, J. A., & Gehrman, P. R. (2020). Sleep in PTSD: Treatment approaches and outcomes. *Current Opinion in Psychology*, 34, 12–17. <https://doi.org/10.1016/j.copsyc.2019.08.017>
- Schennach, R., Feige, B., Riemann, D., Heuser, J., & Voderholzer, U. (2019). Pre- to post-inpatient treatment of subjective sleep quality in 5,481 patients with mental disorders: A longitudinal analysis. *Journal of Sleep Research*, 28(4), e12842. <https://doi.org/10.1111/jsr.12842>
- Schneider, C. L., Hertenstein, E., Fehér, K., Maier, J. G., Cantisani, A., Moggi, F., Berger, T., & Nissen, C. (2020). Become your own SLEEP-expert: Design, implementation, and preliminary evaluation of a pragmatic behavioral treatment program for insomnia in inpatient psychiatric care. *SLEEP Advances*, 1(1), zpaa005. <https://doi.org/10.1093/sleepadvances/zpaa005>
- Sheaves, B., Isham, L., Bradley, J., Espie, C., Barrera, A., Waite, F., Harvey, A. G., Attard, C., & Freeman, D. (2018). Adapted CBT to stabilize sleep on psychiatric wards: A transdiagnostic treatment approach. *Behavioural and Cognitive Psychotherapy*, 46(6), 661–675. <https://doi.org/10.1017/S1352465817000789>
- Zipfel, S., Herzog, W., Kruse, J., & Henningsen, P. (2016). Psychosomatic medicine in Germany: More timely than ever. *Psychotherapy and Psychosomatics*, 85(5), 262–269. <https://doi.org/10.1159/000447701>

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