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Examining subjective sleep quality in adults with hoarding disorder

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ABSTRACT

Hoarding disorder (HD), characterized by difficulty parting with possessions and functionally impairing clutter, affects 2–6% of the population. Originally considered part of Obsessive-Compulsive Disorder (OCD), HD became a distinct diagnostic entity in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) in 2013. While sleep impacts OCD, little is known about sleep in HD. As HD patients often report poor sleep in clinical settings, understanding global subjective sleep quality and disturbances may lead to novel therapeutic targets. To address this gap, the authors used a sample of convenience: an existing data set designed to screen research study eligibility and explore the psychopathology and phenomenology of OCD and HD. The data set included information collected from individuals with HD (n = 38), OCD (n = 26), and healthy participants (n = 22) about insomnia, sleep quality, and mood using interviews and structured instruments including the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), and Depression Anxiety Stress Scales (DASS). In this data set, HD and OCD groups reported significantly greater insomnia symptoms and poorer sleep quality compared with healthy controls while controlling for depression, age, and gender. A sizable minority of HD and OCD individuals met criteria for comorbid sleep disorders. OCD and HD groups differed in delayed sleep phase prevalence. To our knowledge, this is the first study examining subjective sleep quality and insomnia in HD as compared to healthy individuals and those with OCD, while controlling for relevant clinical characteristics. Given that there are evidence-based treatments for insomnia and other sleep disorders, our study raises the possibility that treatment interventions targeting sleep may improve HD outcomes.

1. Introduction

Insufficient or poor quality sleep is associated with impairments in functioning and mental health, including higher rates of chronic pain and illness (Luyster et al., 2012; Taylor et al., 2007), increased risk for depression (Baglioni et al., 2011; Li et al., 2016), and suicide (Bernert et al., 2014, 2015). Sleep also impacts cognition, decision-making, and emotional processing (Bernert et al., 2014; Deliens et al., 2014; Haack and Mullington, 2005; Palmer and Alfano, 2017; Scullin and Bliwise, 2015; Stubbs et al., 2016). Despite its negative effects, sleep disturbances remain underdiagnosed and undertreated in the general population and in individuals with mental illness (Benca, 2005; Kallestad et al., 2011; Krystal et al., 2008).

Hoarding disorder (HD) is a common disorder, with a prevalence of 2–6% (Timpano et al., 2011). HD is characterized by persistent difficulty discarding possessions—regardless of their actual value—and distress

associated with discarding, such that clutter compromises use of living areas in the home (American Psychiatric Association, 2013). In DSM-IV, hoarding symptoms were exclusively attributed to obsessive-compulsive disorder (OCD). However, in DSM-5, HD is now considered a discrete diagnostic entity within the Obsessive-Compulsive and Related Disorders category due to distinct patterns of risk, vulnerability, and treatment response (American Psychiatric Association, 2013; Mataix-Cols et al., 2010; Timpano et al., 2016).

Little is known about sleep in HD. A small study (n = 24) using the Insomnia Severity Index (ISI) found that hoarding severity of individuals with HD correlated with insomnia severity (Raines et al., 2015). Due to past nosological overlap, evidence of sleep disturbance in OCD is important to note. In one study of treatment-seeking individuals with OCD, 70% reported subjective sleep quality disturbances as measured by the Bergen Insomnia Scale (Nordahl et al., 2018). In a nationally representative sample, sleep disturbance as measured by the Chronic Conditions section of the CIDI 3.0 was associated with obsessions and compulsions severity, even when controlling for depression (Cox and Olatunji, 2016). A systematic review of OCD and sleep found evidence for poorer sleep quality (e.g., reduced sleep duration and lower sleep efficiency) and associations between poor sleep quality and higher OCD severity (Paterson et al., 2013). Sleep disturbance may interfere with effective OCD treatment (Donse et al., 2017; Paterson et al., 2013). However, the precise relationship between sleep and OCD remains unclear given negative findings, contributions of comorbid depression to sleep disturbance, and methodological challenges (Bobdey et al., 2002; Díaz-Román et al., 2015; Marcks et al., 2010). One robust finding is the higher incidence of delayed sleep phase in OCD, which may also be associated with poor treatment response (Donse et al., 2017). To the best of our knowledge, however, no study has previously examined sleep quality and sleep phase in hoarding disorder. Comparing sleep quality between HD, OCD, and healthy controls may shed light on the converging and diverging relevance of sleep disorder to one or both disorders, which in turn may impact our mechanistic understanding of the Obsessive-Compulsive and Related Disorders category, as well as impact our treatments for these disorders.

To examine sleep quality, symptoms of insomnia, and prevalence of delayed sleep phase in HD, we contrasted self-reports of individuals with HD, OCD, and healthy controls using DSM-5 criteria in a sample of convenience (i.e., individuals being screened for clinical study participation). Based on previous findings, we hypothesized that individuals with HD and individuals with OCD would self-report poorer sleep quality and greater symptoms of insomnia as compared to healthy controls. We also explored the prevalence of delayed sleep phase in the three groups (HD, OCD, healthy controls). Two sleep questionnaires assessing global subjective sleep quality and disturbances over a specified period of time were used: the Pittsburgh Sleep Quality Index (PSQI)—the most extensively studied self-report measure of sleep quality (Devine et al., 2005)—and the Insomnia Severity Index, a brief, reliable measure of perceived insomnia commonly used in research and clinical practice (Bastien et al., 2001).

2. Methods

2.1. Data set

The authors used an existing data set designed to explore OCD and HD psychopathology and phenomenology and to screen eligibility of individuals interested in OCD- and HD-specific research studies between June 2016 and April 2018. All data collection procedures were approved by the Stanford Institutional Review Board. The data set included information collected from individuals with HD (n = 38), OCD (n = 26), and healthy participants (n = 22) about insomnia, sleep quality, and mood using clinical interviews, structured diagnostic scales and self-report measures including the Insomnia Severity Index, Pittsburgh Sleep Quality Index, and Depression Anxiety Stress Scales. Participants

met DSM-5 criteria for hoarding disorder or OCD, as assessed using a structured interview (Structured Clinical Interview for DSM-5; SCID; First et al., 2015). Exclusion criteria for the OCD and HD groups included comorbid HD or OCD, respectively, and diagnosis with a psychotic disorder. Of the 26 OCD participants, two (8%) reported current hoarding obsessions and compulsions as target symptoms on the Y-BOCS checklist. An additional three of 26 OCD participants reported either hoarding obsessions or compulsions as Y-BOCS target symptoms. No OCD participants met DSM-5 criteria for hoarding disorder. Healthy participants were excluded if diagnosed with any neuropsychiatric disorder.

3. Measures

Insomnia Severity Index (ISI). The Insomnia Severity Index is a brief and reliable measure of perceived insomnia symptoms over the preceding two weeks (Bastien et al., 2001). The ISI is comprised of seven items and assesses severity of sleep onset and maintenance problems, satisfaction with current sleep patterns, interference with functioning, noticeability of related impairment, and concern or distress related to sleep (Bastien et al., 2001). Scores range from 0 to 28, with higher scores indicating more severe insomnia symptoms (Bastien et al., 2001).

Pittsburgh Sleep Quality Index (PSQI). The Pittsburgh Sleep Quality Index is a self-report measure of sleep quality and sleep disturbances over a one-month period (Buysse et al., 1989). The PSQI is comprised of 19 items and generates a global score with seven subscale scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The global scores range from 0 to 21, with higher scores indicating poorer sleep quality (Buysse et al., 1989). The PSQI is the most extensively studied self-report measure of sleep problems (Devine et al., 2005). It has acceptable psychometric properties, including good internal reliability and test-retest reliability (Buysse et al., 1989). Relevant PSQI items (i.e., Items 1, 2, and 3) were used to determine an individual's typical sleep phase during the past month and identify delayed sleep phase, analogous to Delayed Sleep Phase Disorder (DSPD). Delayed sleep phase was operationally defined as a pattern of falling asleep after 1 a.m. and awakening after 10 a.m. during the past month (Turner et al., 2007).

Depression Anxiety Stress Scales (DASS). The Depression Anxiety Stress Scales is a 21-item, self-report measure assessing depression, anxiety, and stress over the past week. Responses are provided on a 4-point scale (0–3). The DASS shows very good psychometric properties in clinical and non-clinical cohorts (Crawford and Henry, 2003). The depression subscale has a range of 0–42, with higher scores indicating higher symptoms of depression.

4. Data analysis

Descriptive statistics were computed for all measures. Sociodemographic differences between groups were tested with chi-square or Fisher's exact test where appropriate for nominal measures, and with one-way analysis of variance (ANOVA) for scale variables (i.e., DASS depression scores). To test the hypotheses regarding group differences in ISI and PSQI scores, two one-way Analysis of Covariance (ANCOVA) were conducted with ISI and PSQI scores as dependent variables, group (HD, OCD, healthy control) as an independent variable, and depressive symptoms (i.e., DASS depression subscale scores) and age as continuous covariates. We controlled for depressive symptoms, age, and gender for the following reasons. We controlled for depression due to the associations between depression and sleep impairment (Baglioni et al., 2011; Li et al., 2016), differing rates of comorbid depression between OCD and HD (Frost et al., 2011), and previous meta-analyses suggesting that depression affects sleep in OCD (Díaz-Román et al., 2015). We controlled for age given the robust findings on age-related sleep changes (Scullin and Bliwise, 2015), due to increases in severity of hoarding

symptoms with each decade of life and individually in mid-life (Ayers et al., 2010; Dozier et al., 2016; Frost et al., 2000), and since research participants with hoarding disorder are typically older than other clinical samples (Wheaton et al., 2016). Similarly, although there are no clear gender differences in hoarding disorder (Postlethwaite et al., 2019), gender as well as sex-specific steroid hormones may alter different sleep properties (Adan and Natale, 2002; Manber and Armitage, 1999). Additionally, clinical hoarding research samples have a higher average percentage of female participants (77%) compared to community samples (55%) (Woody et al., 2020). We explored delayed sleep phase prevalence in each group (HD, OCD, healthy control) using the PSQI (Turner et al., 2007). Due to observed gender differences in our sample, we conducted two post-hoc ANCOVAs with depression severity, age, and gender as covariates, which did not alter our findings. Self-identified gender was coded into female, male, and non-binary to be inclusive of both binary and non-binary participants. To calculate the sample size without a prior study of hoarding with either ISI or PSQI, we first reviewed the literature and found a study comparing groups including OCD and HC participants and contrasted only these groups, revealing a large effect size in PSQI (Bobdey et al., 2002). With this assumption, using G*Power 3.1 (Faul et al., 2007), we calculated that the current sample allowed for examination of our main ANCOVAs at a power > 95% to test large size effects with a Type 1 error $\alpha < 0.05$.

5. Results

5.1. Participant characteristics

Participants from OCD, HD, and healthy control groups differed significantly by age ($p < .001$), depression severity (F = 17.09, $p < .0001$), and gender ($p = .001$), but did not differ significantly by race ($p = .08$) or ethnicity ($p = .21$) (Table 1). Concomitant medications and psychiatric comorbidities are presented in Supplementary Tables 1 and 2, respectively.

Self-Reported Symptoms of Insomnia and Sleep Quality.

Insomnia Severity Index (ISI). Mean ISI scores significantly differed between the groups, F = 5.5, $p = .006$ (Table 2; Fig. 1). Planned pairwise comparisons indicated that HD and OCD groups each had higher ISI total scores than the HC group (F = 8.96, $p = .004$; F = 7.56, $p = .007$, respectively), whereas HD and OCD groups did not differ (F = 0.143, $p = .706$). Item-level data is presented in Supplementary Table 3.

Pittsburgh Sleep Quality Index (PSQI). Mean PSQI scores statistically differed between HD, OCD, and healthy controls, F = 3.34, $p = .04$ (Table 2; Fig. 2). Planned pairwise comparisons indicated that HD and OCD groups both had higher scores than healthy controls (F = 4.52,

$p = .037$; F = 5.38, $p = .023$, respectively), whereas OCD and HD groups did not differ (F = 0.02, $p = .9$). Item-level data is presented in Supplementary Table 4.

Delayed Sleep Phase Prevalence. Three members of the OCD group (12%) met criteria for delayed sleep phase as operationally defined. No individuals with HD and no healthy controls met criteria for delayed sleep phase.

6. Discussion

This is the first study to 1) investigate self-reported sleep quality in individuals with HD, 2) compare insomnia symptoms and sleep quality among HD, OCD, and healthy controls, and 3) explore frequency of delayed sleep phase in a clinical sample of individuals with HD. The study used two sleep questionnaires assessing global subjective sleep quality and disturbances over a specified period of time: the Pittsburgh Sleep Quality Index (PSQI)—the most-extensively studied self-report measure of sleep quality (Devine et al., 2005)—and the Insomnia Severity Index (ISI), a brief, reliable measure of perceived insomnia which is the gold standard for insomnia assessment and a primary outcome measure in clinical trials (Bastien et al., 2001; Buysse et al., 2006). We found that OCD and HD groups reported comparably elevated insomnia symptoms and poorer sleep quality compared to healthy controls, when adjusting for age, gender, and depression. Second, a sizable minority of both OCD and the HD groups met criteria for a sleep disorder. Third, three out of 25 individuals with OCD (12%), and none in the HD or HC groups, reported a pattern of late bedtime and late rise time consistent with delayed sleep phase.

Our finding of worsened sleep quality and elevated insomnia symptoms in OCD and HD compared to healthy controls while adjusting for age, gender, and depression severity suggests that sleep is an area of clinical concern for individuals with both OCD and HD. Regarding sleep disturbances in HD, our findings are consistent with preliminary findings indicating that HD symptoms may interfere with sleep quality (Raines et al., 2015). Furthermore, OCD and HD participants' higher levels of sleep impairment even when controlling for depression severity is consistent with previous findings of sleep impairment independent of depression severity (Nota et al., 2015; Paterson et al., 2013). Our finding that sleep impairment is associated with HD and OCD despite controlling age and depression is striking, as sleep-related complaints increase with age (Neikrug and Ancoli-Israel, 2010), and there are robust and well-established connections between depression and impaired sleep.

In this study, three out of 26 individuals with OCD reported a pattern of late bedtime and late rise times consistent with delayed sleep phase. This finding is consistent with evidence that individuals with OCD experience higher rates of circadian dysregulation resulting in delayed sleep phase (Coles et al., 2012; Mukhopadhyay et al., 2008; Paterson et al., 2013). Three out of 25 individuals with OCD reported delayed sleep phase (12%). This percentage is higher than estimated rates of 0.13–10% in the general population (Magee et al., 2016), but lower than previously reported estimates of 17–42% delayed sleep prevalence in OCD patients (Mukhopadhyay et al., 2008; Turner et al., 2007). These previous studies utilized inpatients and objective sleep logging over several days, while we utilized a self-report measure—suggesting our findings may underreport specific sleep patterns. In our study, none of the individuals with HD reported bedtimes and rising times consistent with delayed sleep phase. The absence of delayed sleep phase in our HD sample suggests differences in the nature of sleep impairments between OCD and HD. As the etiology of delayed sleep phase in OCD remains unclear (Paterson et al., 2013), the difference we found between OCD and HD patients could indicate group differences and warrants replication.

Our findings of poorer sleep quality and elevated insomnia symptoms in individuals with OCD and HD compared with healthy controls have important clinical implications. First, for individuals with HD and OCD experiencing disordered sleep, sleep disturbances may increase

Table 1
Participants.

	HD	OCD	HC
	n = 38	n = 26	n = 22
	n	n	n
Self-Reported Gender (M/F/NB)*	7/31/0	16/9/1	11/11/0
Race (C/AF/NH-PI/ AI-AN/A/M/U/O)	31/1/1/0/ 3/0/2/0	19/0/0/0/2/ 2/3/0	11/0/1/0/4/ 1/2/3
Ethnicity (H/NH/U)	2/35/1	5/21/0	4/17/1
Age, years (SD| Range) *	58.58 (9.06| 35–75)	36.15 (10.91| 21–58)	36.09 (14.04| 21–72)

Sociodemographic summary. * indicates statistically significant differences between groups $p < .05$; OCD – obsessive-compulsive disorder; HD – hoarding disorder; HC – healthy controls; SD – standard deviation. M – male; F – female; NB – non-binary; C – Caucasian; AF – African American/Black; NH/PI – Native Hawaiian/Pacific Islander; AS-AN – American Indian/Alaska Native; A – Asian; M – Mixed; U – Unknown; O – Other; H – Hispanic; NH – non-Hispanic.

Table 2
Descriptive statistics.

	HD group (n = 38)			OCD group (n = 26)[c]				Healthy Controls (n = 22)		
	M	SD	Range	M	SD	Range		M	SD	Range
ISI total score	7.08	5.34	0–21	7.92	5.73	0–20		0.82	2.26	0–21
PSQI global score	6.26	3.00	0–14	6.72	3.87	0–14		2.32	2.32	0–10
DASS depression score	8.95	8.0		14.69	12.41			0.09	0.43	
	n	%		n	%			N	%	
Hypersomnolence Disorder[a]	3	8		2	8			0		
Insomnia Disorder[a]	3	8		3	12			0		
Delayed Sleep Phase[b]	0			3	12			0		

Descriptive Statistics summary. ISI – Insomnia Severity Index; PSQI – Pittsburgh Sleep Quality Global Score.

[a] Determined with SCID.

[b] Identified with PSQI (Turner et al., 2007).

[c] 26 OCD participants completed the ISI, and 25 OCD participants completed the PSQI.
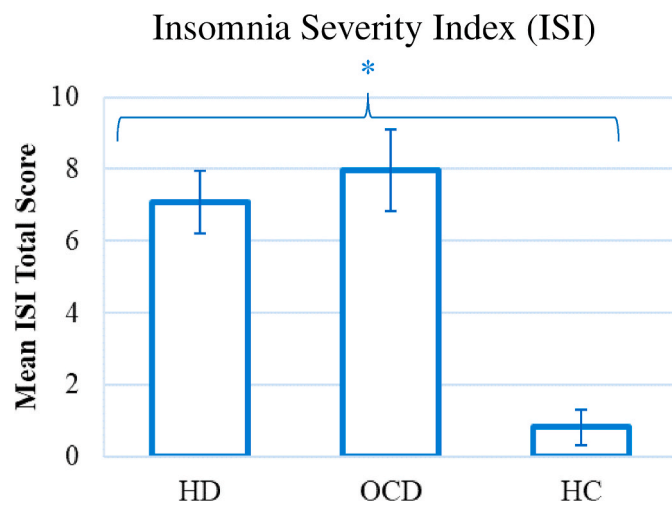
Fig. 1. Mean ISI total scores in OCD, HD, and Healthy Controls. *significance at .01 level. Error bars represent one standard error from the mean.
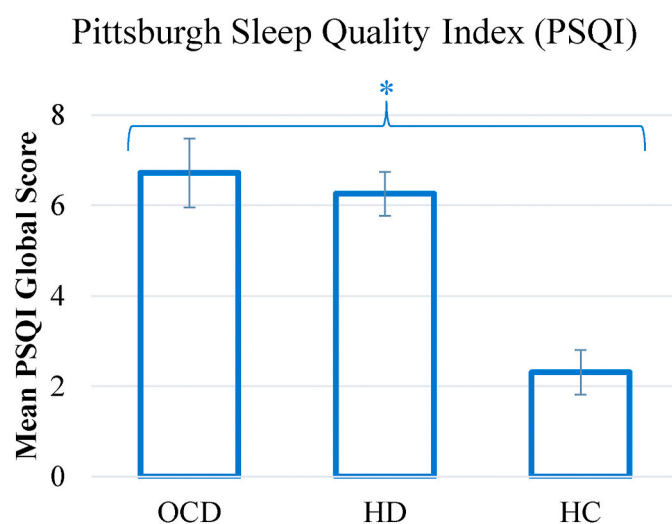
Fig. 2. Mean PSQI global scores in OCD, HD, and Healthy Controls. *significance at .05 level. Error bars represent one standard error from the mean.

functional impairment and hinder effective treatment through negative effects on cognition and emotion regulation (Deliens et al., 2014; Durmer and Dinges, 2005; Krystal et al., 2008; Linkovski et al., 2019; Ramsawh et al., 2009). We suggest that screening for sleep disturbances may influence treatment of choice and impact treatment response among patients. Second, both HD and OCD have high comorbidity with depression (Brakoulias et al., 2017; Frost et al., 2011). Evidence from other populations indicates that sleep disturbances may increase the risk for the onset and reoccurrence of depressive episodes (Baglioni et al., 2011). Moreover, sleep disturbances may increase risk for suicide, independent of depressed mood. Indeed, this finding has been replicated using multiple measurements of sleep disturbance as well as objective sleep parameters (Bernert et al., 2014; 2015; Bernert et al., 2017a, 2017b; Turvey et al., 2002).

Our findings suggest that HD and OCD patients experience sleep disturbance. Addressing HD and OCD patients' sleep difficulties in our treatments may improve patients' lives. There are effective interventions to reduce symptoms of patients suffering from sleep disorders. Cognitive Behavioral Therapy for Insomnia (CBT-i) is a highly effective treatment that can lead to meaningful reductions in insomnia symptoms sustained over 6 months (Trauer et al., 2015). Current treatments for delayed sleep phase include chronotherapy (sleep scheduling), photic (exposure to bright morning light), chronobiotic (e. g., administration of melatonin), or other approaches (e.g., exercise, sleep hygiene) (Magee et al., 2016). Applying these treatments for OCD and HD patients may improve their sleep and possibly reduce their clinical symptoms.

Initial treatment efforts have addressed sleep disturbance in OCD and HD. In a case study of a patient with treatment-resistant OCD, CBT for OCD with adjunct chronotherapy (i.e., behavioral techniques to adjust sleep phase) led to a reduction in OCD symptoms and successful shifting of a patient's sleep schedule (Coles and Sharkey, 2011). Furthermore, OCD inpatient programs with a set lights-out time have a higher rate of treatment response compared to programs without a set lights-out time (Coles and Stewart, 2019). Effective OCD treatment may also reduce sleep disturbance in some individuals affected by OCD and related disorders. In a small study (n = 36), concentrated exposure treatment for OCD (i.e., intensive four-day treatment in a group setting) not only reduced OCD symptoms, but also reduced comorbid sleep disturbance, with improvements in sleep maintained at 6-month follow-up (Nordahl et al., 2018). These improvements in sleep were not linked to reductions in depression (Nordahl et al., 2018). In HD, different groups are testing novel treatments (Arch et al., 2012; Ayers et al., 2014; Chou et al., 2019; Diefenbach et al., 2015; Levy et al., 2019; Linkovski et al., 2018; Mathews et al., 2018; Moulding et al., 2017) that might be further enhanced by addressing patients' disturbed sleep. Exploring specific sleep components (e.g., onset, maintenance, latency vs. duration) may impact treatment implications. Further, the presence

of specific sleep difficulties may serve as prognostic indicators of treatment impact or treatment resistance (Donse et al., 2017; Manber et al., 2011).

Our study has several limitations, including our cross-sectional design, a relatively small sample size, use of self-report assessments, excluding individuals with comorbid OCD and HD, screening for sleep disorders using the SCID, and examining only primary sleep measures to conserve statistical power. In addition, while we did control for age in our analyses, the average ages of the groups were significantly different. Of note, our HD sample showed lower comorbidity with depression than typical samples, and at the same time, it also supports our finding that the high incidence of sleep disturbance observed in our sample is not attributable to mood disorder. Our results warrant replication and extension using objective sleep measures (e.g., polysomnography, actigraphy), which may allow assessment of additional sleep disorders (e.g., narcolepsy) potentially associated with OCD and HD. Using larger patient cohorts may elucidate the contribution of sleep to OCD and HD patients' symptom presentation and severity, while incorporating sleep measures within clinical trials may facilitate exploration of sleep as a predictor treatment response. Our study demonstrates the presence of similar and distinct patterns of sleep disruption in HD and OCD. The potential role of an adjunct sleep intervention in improving response to existing treatments is recommended for further investigation.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2020.10.044.

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