Article

The Association Between Sleep and Late Life Hoarding

Mary E. Dozier[1,2] (iD), Katrina J. Speed[3], Eliza J. Davidson[2,4],
Courtney J. Bolstad[1], Michael R. Nadorff[1], and
Catherine R. Ayers[2,5,6]

Abstract

Sleep problems are associated with many different forms of psychopathology in late life; however, there is currently a gap in the literature on the association between sleep quality and hoarding in older adults. This secondary data analysis of 40 older adults with hoarding disorder examined the association between sleep and hoarding, change in sleep disturbance following treatment, and the impact of sleep on treatment response. Sleep disturbance was correlated with hoarding severity, and this association remained significant when controlling for inability to sleep in a bed due to clutter in a multiple regression analysis. Following treatment, there was no change in sleep disturbance using a paired *t*-test, and baseline sleep disturbance was not correlated with change in hoarding severity. Future studies on the potential impact of sleep disturbance on hoarding treatment in older adults should examine if targeting sleep issues adjunctively could lead to improved sleep and improved treatment adherence/efficacy.

Keywords

[1]Department of Psychology, Mississippi State University, MS, USA
[2]Research Service, VA San Diego Healthcare System, San Diego, CA, USA
[3]VA Center of Excellence for Suicide Prevention, Canandaigua VA Medical Center, NY, USA
[4]Department of Psychiatry, San Diego State University/University of California San Diego Joint Doctoral Program in Clinical Psychology, San Diego, CA, USA
[5]Mental Health Care Line, VA San Diego Healthcare System, San Diego, CA, USA
[6]Department of Psychiatry, University of California, San Diego School of Medicine, CA, USA

Corresponding Author:
Mary E. Dozier, Department of Psychology, Mississippi State University, P.O. Box 6161, MS 39762, USA.
Email: maryedozier@psychology.msstate.edu

Hoarding disorder is a progressive and debilitating condition, particularly for older adults (Ayers & Dozier, 2015; Dozier et al., 2016). The prevalence of hoarding disorder among the general population is approximately 2% (Postlethwaite et al., 2019), and is likely much higher in older adults (Cath et al., 2017; Samuels et al., 2008). Within adults over the age of 70, the prevalence of hoarding disorder has been estimated to be over 6% (Cath et al., 2017). Furthermore, older adults with hoarding disorder tend to report that their symptoms begin early in life and increase over the lifespan (Dozier et al., 2016). Hoarding symptoms involve difficulties parting with possessions and strong urges to save items, regardless of their inherent value, resulting in excessive and debilitating levels of clutter (American Psychiatric Association, 2013). Functional impairment due to clutter precludes the use of living spaces for essential activities such as preparing meals, using appliances, eating at a table, and sleeping in one's bed (Ayers et al., 2012).

Older adults with hoarding disorder are at greater risk of malnourishment, falling in the home, housefires, and eviction and are more likely to live in a home with an insect or animal infestation (Ayers & Dozier, 2015; Diefenbach et al., 2013). The presentation of hoarding disorder among older adults is complicated by psychiatric and medical comorbidities, with most older adults with hoarding disorder reporting a minimum of one medical comorbidity (Ayers & Dozier, 2015). One in three older adults with hoarding disorder meet the criteria for major depressive disorder and one in four meet the criteria for generalized anxiety disorder (Ayers & Dozier, 2015). Furthermore, within older adults with hoarding disorder, symptoms of anxiety and depression are associated with increased hoarding symptom severity (Ayers et al., 2017). In general, hoarding has also been associated with increased levels of behavioral and experiential avoidance (Ayers et al., 2014) and intolerance of uncertainty (Castriotta et al., 2019).

Sleep problems are associated with many different forms of psychopathology in late life (Nadorff et al., 2018), including depression (Perlis, Jungquist, et al., 2006; Perlis, Smith, et al., 2006), anxiety (Magee & Carmin, 2010; Potvin et al., 2014), and suicidality (Bernert et al., 2014; Golding et al., 2015; Nadorff et al., 2013). Furthermore, using cognitive behavioral therapy (CBT) to treat late-life anxiety has been found to improve insomnia (Freshour et al., 2016) and reduce bad dreams (Nadorff et al., 2014). Sleep disturbance is likely to have a similar association with geriatric hoarding disorder as with other late life psychiatric disorders. However, there is currently a gap in the literature on the association between sleep quality and hoarding in older adults. Subjective sleep disturbance has been documented in patients with obsessive-compulsive disorder (OCD), trichotillomania, and excoriation disorder (Cox et al., 2020). Hoarding disorder is currently categorized under the "Obsessive-Compulsive and Related Disorders" diagnostic class within the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013); thus, patients with hoarding disorder may also be likely to experience sleep difficulties. However, to date, there has only been one study that investigated the association between sleep and hoarding symptoms at any stage of the lifespan. Raines et al. (2015) found that hoarding symptoms, particularly acquiring and difficulty discarding,

were associated with increased insomnia in 24 adults with hoarding disorder. Although this study provides initial evidence for the link between hoarding and sleep disturbance, the sample was primarily middle-aged (mean age 42; range 18–63).

Furthermore, no study has yet investigated the potential effect of clutter in the bed to physically impede sleep or potential changes in sleep following treatment. Because clutter is a core symptom of hoarding disorder, it is likely that some individuals with hoarding disorder may be unable to physically sleep in their bed (e.g., they instead sleep on a couch, in their car, or in the backyard) or may only be able to do so with great difficulty (e.g., they must sleep in an uncomfortable position due to the clutter in the bed). Dissecting whether any association between hoarding and sleep is due to physical difficulty sleeping in the bed is thus vital to understanding how hoarding may affect sleep (or vice versa).

Thus, the main goals of the current study were to: (1) investigate the association between self-reported sleep disturbance and hoarding symptom severity in older adults with hoarding disorder when controlling for physical inability to sleep in a bed due to clutter, (2) determine if self-reported sleep quality improves following a 6-month behavioral intervention for late life hoarding, and (3) examine the potential impact of baseline sleep problems on treatment response.

Method

Participants

This study represents a secondary data analysis of older adults (aged 55+; $n = 40$) who participated in pilot studies examining the efficacy of group behavioral treatments for hoarding disorder (Ayers et al., 2018). The mean age of participants at baseline was 63 ($SD = 5.8$, range 55–77). The majority of participants identified as female (70%), identified as Caucasian (78%), reported being currently unmarried (78%), and reported that they were not currently working (40% retired, 13% unemployed, 15% on disability).

Participants were recruited from the community through flyers, clinician referrals, and media appearances. All participants were required to have a primary diagnosis of hoarding disorder, as determined by a clinical interview using DSM-5 criteria in conjunction with self-report measures of hoarding symptom severity (Ayers et al., 2018). The clinical interview was conducted by a master's-level clinician and final diagnosis was determined in weekly meetings with a licensed clinical psychologist with expertise in hoarding disorder. Further exclusionary criteria included being currently engaged in psychotherapy, active suicidal ideation, impaired cognitive functioning on a brief screener, or a history of psychosis. The original sample included 60 adults aged 18+ (Ayers et al., 2018); however, for the current investigation, only participants 55 years of age and older with complete data for hoarding severity and sleep disturbance at baseline were included in the analyses ($n = 40$). Participants were assessed at baseline and following completion of group treatment (~6 months after the baseline

assessment). Due to attrition, there were only 34 participants with post-treatment data available for the current investigation.

The parent project involved two pilot studies of group treatment for hoarding disorder; further details of both studies can be found in Ayers et al. (2018). Study protocols were approved by the local Institutional Review Board (protocol number H130003; "Cognitive Rehabilitation and Exposure Based Groups for Compulsive Hoarding") and all participants provided written informed consent. Participants either received seven sessions of group compensatory cognitive training and 19 sessions of group exposure therapy ($n = 15$; cognitive rehabilitation and exposure/sorting therapy; CREST) or 26 sessions of group exposure therapy ($n = 25$; ET). Both behavioral interventions were found to significantly reduce hoarding symptoms (Ayers et al., 2018). The compensatory cognitive training in the CREST study involved teaching the participants skills related to prospective memory (e.g., calendar use) and executive functioning (e.g., brainstorming). The bulk of both treatments involved in-session exposures to sorting and discarding possessions brought from home. Participants were assigned weekly homework to sort and discard items daily. The CREST and ET samples were combined for the current study to investigate the potential change in sleep quality following an evidence-based treatment for hoarding and the impact of baseline sleep quality on response to behavioral interventions.

Measures

Hoarding symptom severity was assessed using the Saving Inventory-Revised (SI-R; Frost et al., 2004). The SI-R is a 23-item self-report measure that uses a Likert-type scale (0 to 4) to assess hoarding symptom severity. Items are summed to create a total score and three subscale scores: acquisition, difficulty discarding, and clutter. The SI-R has been found to be valid for use in older hoarding samples (Ayers et al., 2017; Kellman-McFarlane et al., 2019).

Overall household clutter level was assessed using the Clutter Image Rating (CIR; Frost et al., 2008). The CIR is a three-item pictorial measure of household clutter level in which the participant selects the picture that best represents the clutter level (on a scale of 1 to 9) of the corresponding room in their home. The ratings of the three rooms (living room, bedroom, and kitchen) are averaged to create the mean clutter score. Older adults with hoarding disorder are able to accurately rate their household clutter level when assessed away from the home (and using clinician ratings of the rooms during home visits as a comparison; Dozier & Ayers, 2015).

Sleep disturbance was assessed using the six sleep disturbance items on the PROMIS–43 Profile v2.1 (Buysse et al., 2010). Items are rated for the past 7 days and query for general "sleep quality," if sleep was "refreshing," if there was "a problem" with sleep, "difficulty falling asleep," if "sleep was restless," and if the participant "tried hard to get asleep." The items are rated on a Likert-type scale from 1 to 5 and are then summed to create a total raw score, which is then converted into a *T*-score with a mean score of 50 and a standard deviation of 10. Higher scores indicate

increased levels of sleep disturbance such that a *T*-score of 60 indicates sleep distur-
bance 1 standard deviation worse than average. The original validation sample for the
sleep disturbance items (*n* = 1993) included a substantial subset of older adults (21%
were 65 and older; Cella et al., 2010). The sleep disturbance items have also been
found to have validity for use in older adults with multiple chronic conditions (Rose
et al., 2018).

To control for sleep disturbance caused by participants' inability to use their bed for
sleeping due to excessive clutter in the bed, participants were also asked to rate the
degree to which clutter has affected their physical ability to sleep in a bed using the
item 13 of the Activities of Daily Living in Hoarding Scale (ADL-H; Frost et al.,
2013). The item is rated on a Likert-type scale from 1 (*can do it easily*) to 5 (*unable to
do*). The sleep item on the ADL-H has been found to discriminate between older adults
with and without hoarding disorder (Ayers et al., 2012).

Data Analysis

All analyses were performed using Stata version 13.0 (StataCorp, 2013). Zero-order
correlations were conducted between baseline hoarding severity on the SI-R and CIR,
sleep disturbance on the PROMIS–43 Profile v2.1, and participants' ratings of their
inability to use their beds on the ADL-H item 13. Multiple regression analyses were
used to determine the unique variance in predicting baseline hoarding severity (on the
SI-R and on the CIR) explained by sleep disturbance when controlling for inability to
physically sleep in a bed due to clutter. Change in sleep disturbance from baseline to
post-treatment was determined using a paired *t*-test. Finally, zero-order correlational
analyses were used to determine whether baseline sleep disturbance was predictive of
change in hoarding symptoms over the course of treatment.

Results

Descriptive statistics for all psychiatric variables for study participants at baseline and
post-treatment are presented in Table 1. At baseline, the majority of participants
reported a level of sleep disturbance on the PROMIS-43 Profile v2.1 within 1 standard
deviation of the mean (*n* = 30; 75%). Three participants reported no sleep disturbance
(*T* = 31.7), and seven participants reported sleep disturbance 1 standard deviation
worse than population average (*T* ≥ 60). Similarly, 51% (*n* = 20) of participants
reported that they could "easily" sleep in their bed (i.e., that clutter did not impact their
ability to do so). Only 5% (*n* = 2) of participants reported being entirely unable to sleep
in their bed due to clutter; with 18% (*n* = 7) reporting that they were able to do so with
a little difficulty, 13% (*n* = 5) with moderate difficulty, and 13% (*n* = 5) with great
difficulty.

Baseline sleep disturbance and ability to sleep in a bed on the ADL-H were both
significantly associated with hoarding severity on the SI-R Total, all SI-R subscales,
and the CIR (all *p*s < .05; see Table 2). When controlling for inability to physically

Table 1. Descriptive Statistics of Baseline and Post-Treatment Variables in 40 Older Adults Enrolled in Group Behavioral Treatment for Hoarding Disorder.

		Baseline			Post-treatment		
	α	Mean	SD	Range	Mean	SD	Range
Saving inventory-revised							
Total	.91	56.45	12.60	36–89	45.63	16.53	16–91
Difficulty discarding	.70	18.73	3.10	13–27	14.72	4.40	6–28
Acquisition	.80	14.48	4.55	6–26	11.88	5.70	2–27
Clutter	.94	23.25	8.13	4–36	19.03	8.78	3–36
Clutter imaging rating	.83	4.28	1.71	1–9	3.28	1.85	1–8.33
Sleep disturbance[a]	.88	52.84	8.92	31.7–72.4	51.64	8.02	31.7–63.6
Ability to sleep in a bed[b]	-	2.03	1.29	1–5	1.69	1.15	1–5

Note. [a]Assessed using the PROMIS–43 Profile v2.1. Presented as T scores. [b]Assessed using item 13 of the Activities of Daily Living in Hoarding Scale.

sleep in a bed, the association between sleep disturbance and hoarding severity remained significant on the SI-R Total ($\beta = .32$, $p = .017$) and on the SI-R Clutter subscale ($\beta = .31$, $p = .034$), but the association was no longer significant for the Difficulty Discarding or Acquisition subscales or for the CIR (all ps > .05; see Table 3).

Following 6 months of treatment for hoarding disorder, there was no significant change in participants' reports of sleep disturbance ($t(30) = -.48$, $p = .318$) or inability to sleep in a bed due to clutter ($t(31) = 1.22$, $p = .117$). Furthermore, baseline sleep disturbance was not significantly predictive of change in hoarding symptom severity from baseline to post-treatment on the SI-R Total ($r = -.07$, $p = .704$) or on the CIR ($r = -.17$, $p = .340$).

Table 2. Zero-Order Correlations Among Baseline Sleep and Hoarding Variables.

	Sleep disturbance[a]		Ability to sleep in a bed[b]	
	r	p	r	p
Saving inventory-revised				
Total	.51	<.001	.62	<.001
Difficulty discarding	.33	.039	.49	.002
Acquisition	.36	.025	.41	.009
Clutter	.47	.002	.55	<.001
Clutter imaging rating	.35	.026	.59	<.001

Note. [a]Assessed using the PROMIS–43 Profile v2.1. Presented as T scores. [b]Assessed using item 13 of the Activities of Daily Living in Hoarding Scale.

Table 3. Linear Regression Analyses Evaluating Sleep Disturbance as a Predictor of Hoarding Severity When Controlling for Physical Ability to Sleep in Bed Due to Clutter.

	Measures	B	SE B	β	t	p
Saving inventory-revised						
Total	**Sleep disturbance**[a]	**.46**	**.18**	**.32**	**2.51**	**.017**
	Ability to sleep in a bed[b]	4.98	1.28	.50	3.88	<.001
Difficulty discarding	Sleep disturbance	.06	.05	.17	1.09	.284
	Ability to sleep in a bed	1.04	.37	.43	2.79	.008
Acquisition	Sleep disturbance	.12	.08	.23	1.46	.15
	Ability to sleep in a bed	1.16	.57	.33	2.05	.048
Clutter	**Sleep disturbance**	**.28**	**.13**	**.31**	**2.20**	**.034**
	Ability to sleep in a bed	2.77	.90	.43	3.07	.004
Clutter imaging rating	Sleep disturbance	.03	.03	.18	1.25	.220
	Ability to sleep in a bed	.70	.19	.53	3.74	.001

Note. [a]Assessed using the PROMIS–43 Profile v2.1. Presented as T scores. [b]Assessed using item 13 of the Activities of Daily Living in Hoarding Scale.

Discussion

To our knowledge, this study was the first to examine the association between sleep and hoarding in older adults. Similar to other obsessive-compulsive spectrum disorders, we found that a substantial minority of our sample reported some level of impaired sleep quality (Cox et al., 2020). Furthermore, our findings suggest that disturbed sleep quality is associated with greater hoarding symptom severity in older adults, which is consistent with prior research on the association between insomnia and hoarding in middle-aged adults (Raines et al., 2015). However, unlike in the Raines et al. (2015) study, we found a significant correlation between sleep disturbance and level of clutter, suggesting potential age-related differences in the pattern of associations between sleep problems and hoarding symptoms. When controlling for inability to physically sleep in a bed, the overall association between sleep disturbance and hoarding severity remained significant. This suggests that the observed association is not due to the physical limitations of living within a cluttered household but is linked to the underlying psychopathology.

Unlike previous studies of changes in sleep disturbance following psychotherapy (Cox et al., 2020; Freshour et al., 2016; Nadorff et al., 2014), we did not find a change in reported sleep difficulties following treatment for hoarding disorder. However, the current study involved a more behaviorally based version of CBT than previous investigations. The cognitive portion of CBT (e.g., identification of maladaptive thoughts, cognitive restructuring), which was not a part of the behavioral interventions used in the parent study (Ayers et al., 2018), may be the mechanism of action for sleep quality improvement following a typical dose of CBT. This would be consistent with CBT for

insomnia, which includes using cognitive restructuring to facilitate patients decreasing their perseveration on thoughts unhelpful to falling asleep (e.g., "I'll never fall asleep"; Perlis, Jungquist, et al., 2006).

Our results suggest that baseline sleep disturbance did not preclude positive symptom change in treatment for a sample of older adults with hoarding disorder. Sleep disturbance has been linked with decreased concentration and motivation (Bonnet & Arand, 2003), which may hinder a patient's ability to benefit from psychotherapy. The possibility of sleep problems to interfere with treatment underlines the importance to start with a comprehensive functional assessment, including the assessment of sleep disturbance, and to adjust the treatment plan accordingly. The observed association between hoarding and sleep difficulties, even within this limited sample, suggests that increased attention to sleep problems early in treatment may facilitate increased outcomes. During treatment, having the initial focus for exposures to discarding be on areas of the home where the patient is sleeping (or would like to sleep) would facilitate increased duration and quality of sleep, which in turn would increase the patient's ability to focus on the treatment.

Although the current results are promising, our interpretations are limited by several factors, including a relatively small sample size, which limited the power of our analyses to detect small to medium effects, which also precluded the inclusion of additional covariates in the models investigated (e.g., anxiety and depression). The majority of participants did not report an abnormal level of sleep disturbance. Thus, although sleep disturbance may be associated with hoarding, sleep impairment is far from a universal symptom experienced by individuals with hoarding disorder. Furthermore, additional unassessed issues that may occur in the home of a person with hoarding disorder (e.g., bed bugs, poor air quality) could independently impact sleep beyond the psychopathology of hoarding itself. Finally, we were unable to independently verify the level of clutter in participants' beds. Although the lack of independent verification of the clutter level limits the interpretation of the findings, this was the first study to investigate clutter in the bed as a variable of interest when investigating the association between hoarding and sleep problems. Thus, these results provide a foundation for future studies investigating the association between hoarding and sleep.

In sum, this study provided further evidence of the link between hoarding and sleep disturbance while also demonstrating that not only does this association perpetuate into late life, but that the association is independent of the degree to which clutter impedes an individual's ability to sleep in their bed. As we continue to design and evaluate treatment protocols for hoarding disorder in older adults, integration of psychoeducation and therapy to address associated health issues, including sleep disturbance, is critical in order to fully realize potential treatment gains.

Declaration of Conflicting Interests

Funding

ORCID iD

Mary E. Dozier ⬤ https://orcid.org/0000-0002-6360-6945

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Author Biographies

Mary E. Dozier is an Assistant Professor in the Department of Psychology at Mississippi State University.

Katrina J. Speed is a post-doctoral fellow at the Canandaigua VA Medical Center.

Eliza J. Davidson is a doctoral student in the San Diego State University/ University of California San Diego Joint Doctoral Program in Clinical Psychology.

Courtney J. Bolstad is a doctoral student in clinical psychology at Mississippi State University.

Michael R. Nadorff is an Associate Professor in the Department of Psychology at Mississippi State University.

Catherine R. Ayers is the Division Director of the VA San Diego Healthcare System La Jolla Mental Health Outpatient Clinics, Professor in the University of California San Diego Department of Psychiatry, and faculty member in the SDSU/UCSD Joint Doctoral Program in Clinical Psychology.