A Psychometric Study of the Fear of Sleep Inventory-Short Form (FoSI-SF)

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Study Objectives: Fear of sleep may play a significant role in sleep disturbances in individuals with posttraumatic stress disorder (PTSD). This report describes a psychometric study of the Fear of Sleep Inventory (FoSI), which was developed to measure this construct.

Methods: The psychometric properties of the FoSI were examined in a non-clinical sample of 292 college students (Study I) and in a clinical sample of 67 trauma-exposed adults experiencing chronic nightmares (Study II). Data on the 23 items of the FoSI were subjected to exploratory factor analyses (EFA) to identify items uniquely assessing fear of sleep. Next, reliability and validity of a 13-item version of the FoSI was examined in both samples.

Results: A 13-item Short-Form version (FoSI-SF) was identified as having a clear 2-factor structure with high internal consistency in both the non-clinical ($\alpha = 0.76-0.94$) and clinical ($\alpha = 0.88-0.91$) samples. Both studies demonstrated good

convergent validity with measures of PTSD (0.48-0.61) and insomnia (0.39-0.48) and discriminant validity with a measure of sleep hygiene (0.19-0.27). The total score on the FoSI-SF was significantly higher in the clinical sample (mean = 17.90, SD = 12.56) than in the non-clinical sample (mean = 4.80, SD = 7.72); $t_{357} = 8.85$ $p < 0.001$.

Conclusions: Although all items are recommended for clinical purposes, the data support the use of the 13-item FoSI-SF for research purposes. Replication of the factor structure in clinical samples is needed. Results are discussed in terms of limitations of this study and directions for further research.

Keywords: fear of sleep, insomnia, nightmares, trauma, posttraumatic stress disorder, PTSD

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Increasingly, research is examining the role of sleep disturbance in the development and maintenance of posttraumatic stress disorder (PTSD).¹⁻⁵ However, little is known about the mechanisms underlying the relationship between PTSD and sleep disturbances, and greater knowledge of these mechanisms is needed to inform prevention and treatment methods for trauma-exposed individuals. Some have hypothesized that the fear of sleep may account for significant variance in the relationship between trauma and sleep difficulties.⁶⁻⁸ To date, much of the research examining fear of sleep has utilized single dichotomous or Likert scale items to assess this construct.^{7,9-11} The current paper is a psychometric study of the Fear of Sleep Inventory (FoSI),¹² which assesses multiple aspects of fear of sleep. We believe the FoSI has potential to increase understanding of the role of fear of sleep in PTSD and to guide treatment of patients with trauma-related sleep difficulties.

Individuals with PTSD symptoms may fear and avoid sleep for a variety of reasons. An estimated 50% to 70% of PTSD patients report frequent nightmares.^{6,13} Neylan et al. proposed that fear of experiencing nightmares underlies the longer sleep latency of individuals with PTSD.⁶ Krakow et al. also found that individuals with nightmares reported greater fear of sleep than those without nightmares.⁷ Studies have also shown that nightmares that replicate traumatic events are more closely related to

BRIEF SUMMARY

Current Knowledge/Study Rationale: Sleep disturbances are frequently reported in posttraumatic stress disorder (PTSD), and the fear of sleep may be a significant psychological factor contributing to the maintenance of sleep disturbance over time. The current study sought to further validate the Fear of Sleep Inventory (FoSI), which will enable researchers to examine mechanisms underlying trauma-related sleep problems.

Study Impact: The current study demonstrated support for the psychometric properties of a modified, 13-item version of the FoSI (FoSI-SF). The FoSI and the FoSI-SF can help future research unravel the relationships between fear of sleep, PTSD, and sleep disturbances, which can then inform treatments.

fear of sleep and that fear of sleep decreases when nightmares are treated.⁹⁻¹¹ Zayfert and DeViva,⁸ however, found that nightmares were not associated with the persistence of sleep disturbance after remission of PTSD, suggesting that other factors may contribute to trauma-related sleep disruption.

Loss of vigilance associated with sleep may be another factor involved in fear of sleep with PTSD patients.¹⁴ Pietrzak et al. found that fear of loss of vigilance was an independent predictor of poor sleep quality in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) veterans.¹⁵

Table 1—Demographic information for study samples

	Study I Student Sample N = 292	Study II Clinical Sample N = 67
Age, mean (SD)	19.52 (3.6)	42.18 (14.5)
Gender, n (%)		
Women	201 (68.8)	50 (74.6)
Men	91 (31.2)	17 (25.4)
Racial & Ethnic Background, n (%)		
White	137 (46.9)	55 (82.1)
Hispanic	80 (27.4)	
American Indian	1 (0.3)	8 (11.9)
African American	45 (15.4)	2 (3.0)
Asian	19 (6.5)	1 (1.5)
Other	10 (3.4)	1 (1.5)
Number of Potential Traumas ^a , mean (SD)	1.82 (2.0)	6.16 (3.5)
Types of Potential Traumas ^a , n (%)		
Serious illness	31 (10.6)	12 (17.9)
Serious accident	48 (16.4)	39 (58.2)
Attacked with weapon	17 (5.8)	25 (37.3)
Unexpected death	84 (28.8)	19 (28.4)
Sexual abuse	30 (10.3)	30 (44.8)
Physical abuse—adult	28 (9.6)	20 (29.9)
Physical abuse—child	44 (15.1)	30 (44.8)
Witness injury or death	40 (13.7)	34 (50.7)
Other	42 (14.4)	38 (56.7)
PTSD Symptom Total Score ^b , mean (SD)	28.39 (14.37)	23.09 (12.28)
Insomnia Severity Index, mean (SD)	8.14 (5.42)	15.87 (5.16)*
Sleep Hygiene Index, mean (SD)	34.22 (8.03)	18.91 (6.44)*

^a For Study I, potentially traumatic events experienced were assessed with the Stressful Life Events Screen Questionnaire-Revised (SLESQ-R). For Study II, potentially traumatic events experienced were assessed with the The Modified Trauma Assessment for Adults: Self Report Version (TAA). Categories of events were matched as closely as possible. ^b PTSD for Study 1 was measured with the PCL which has a total score range of 17-85. PTSD for Study 2 was measured with the PDS which has a total score range of 0-51. Therefore, means comparisons were not conducted. * $p < 0.001$.

Conversely, DeViva et al. found that hypervigilance did not account for unique variance in PTSD-related insomnia.¹⁶ They have suggested that vigilance *at night, in the dark, or in sleep contexts* may be more relevant to the sleep of trauma survivors than daytime vigilance.^{12,17}

A convergence of data suggested that fear of sleep might have a role in maintaining trauma-related sleep disturbances over time, yet tools for assessing fear of sleep were limited. Therefore, Zayfert et al. created the Fear of Sleep Inventory¹² (FoSI) to facilitate further study of fear of sleep and nighttime vigilance. To date, no published information exists describing the psychometric properties of the FoSI, although preliminary work examining the FoSI has been conducted.^{12,17} Moreover, no factor analytic studies have explored the underlying dimensions of the measure. Therefore, the present research had two aims. The first aim was to assess the psychometric properties of the original 23-item FoSI

and revise as necessary to improve its properties. The second aim was to evaluate the revised measure to establish its psychometric properties, including its convergent and discriminant validity.

To achieve these aims, two studies were conducted. Study I was carried out in a large college sample and evaluated the internal consistency and factor structure of the original FoSI. Based on this initial analysis, a subset of items was chosen, creating a short form (SF), to improve the internal structure and convergent validity of the measure. Convergent validity was then tested with the FoSI-SF. Study II sought to examine and replicate the psychometric properties of the FoSI-SF in a clinical sample of trauma-exposed adults experiencing chronic nightmares. This sample was appropriate for this study because all participants experienced a trauma, but not all met full criteria for PTSD. Therefore, the sample included a range of PTSD symptomatology. The study was primarily exploratory, and a specific factor structure was not specified a priori. We hypothesized that fear of sleep would be strongly related to PTSD and insomnia. We hypothesized that fear of sleep would be weakly to moderately related to a measure of sleep hygiene behavior because the changes in sleep behavior typically associated with fear of sleep (e.g., sleeping with a light on to feel safe, sleeping during the day, sleeping on the couch to feel safe), are not the focus of standard sleep hygiene measures. Fear of sleep is unlikely to result in typical poor sleep hygiene behaviors such as eating close to bedtime or drinking caffeine in the afternoon. We also hypothesized the clinical sample would score significantly higher on the FoSI-SF than the non-clinical sample.

STUDY I

The aim of Study I was to explore the psychometric properties of the FoSI in a large undergraduate sample and to determine which of the original 23 items could best capture the fear of sleep construct. The factor structure of the FoSI items, their reliability, and their dimensionality were tested using methods recommended by Clark and Watson.¹⁸ A second aim of Study I was to examine convergent and discriminant validity of the final version of the FoSI.

Methods

Sample and Procedures

A sample of 292 undergraduate students enrolled in psychology courses at a large public university in the southern US participated in Study I. Participants completed an on-line survey that included measures of traumatic experiences, the FoSI, and measures assessing PTSD symptoms, insomnia, and sleep hygiene. Participation was voluntary, and students received extra credit or partial course credit for completing the study. **Table 1** reports demographic information for the student sample. All study procedures were approved by the institutional review board (IRB). The total number of potential traumatic events experienced ranged from 0 to 11, with 29% ($n = 84$) reporting no trauma history.

Measures

An early unpublished version of the *Fear of Sleep Inventory* (FoSI) included 38 rationally derived items regarding the

following aspects of fear of sleep: avoidance and dread of nightmares or re-experiencing, fear of loss of vigilance, and night-time vigilant behaviors.¹⁹ The 4-point Likert scale was modified to a 5-point scale (0 = *Not at all* to 4 = *Nearly every night*) to increase variability and the item pool was reduced to 23 items in a prior unpublished analysis resulting in a total score range of 0–92.¹² The 23-item version demonstrated excellent internal consistency ($\alpha = 0.95$) and temporal stability over a 1-week period ($r = 0.89$).¹² The current study employed the 23-item version of the measure. The FoSI also includes 4 supplemental items to assess the experience of trauma in a sleep context, which were not used in this study.

The *Stressful Life Events Screen Questionnaire-Revised* (SLESQ-R)²⁰ is a 13-item self-report questionnaire that measures lifetime exposure to traumatic events. For each type of event, participants were asked to indicate whether they experienced such an event, their age at the time of occurrence, and other specific items related to the event including, but not limited to the following: the frequency of the event, the duration, and whether or not anyone died or was hospitalized as a result of the experience. This measure was included to assess experiences of potentially traumatic events.

The *PTSD Checklist* (PCL-S) is a widely used measure of PTSD symptoms.²¹ The measure contains 17 items rated on a 5-point Likert-type scale ranging from 1 (*Not at all*) to 5 (*Extremely*). In the current sample, the reliability was high ($\alpha = 0.96$).

The *Sleep Hygiene Index* (SHI)²² is a 13-item scale developed to assess sleep hygiene as well as stimulus control behaviors in adults. Items were derived from the first edition of the *International Classification of Sleep Disorders*²³ diagnostic criteria for inadequate sleep hygiene.

Sample items include “I do important work before bedtime (for example: pay bills, schedule, or study);” “I use alcohol, tobacco, or caffeine within 4 h of going to bed or after going to bed;” “I sleep in an uncomfortable bed;” and “I stay in bed longer than I should two or three times a week.” Items are rated on a 5-point Likert-type scale, ranging from 0 (*Never*) to 4 (*Always*) for a possible total-score range of 0–52. The SHI has shown adequate internal consistency ($\alpha = 0.66$) and test-retest reliability ($r = 0.71$).²² The convergent validity of the SHI was supported by correlations with diagnostic sleep hygiene criteria, sleepiness, and sleep quality. In the current sample, $\alpha = 0.77$.

The *Insomnia Severity Index* (ISI)²⁴ was utilized to evaluate insomnia. Seven items assessing the following variables are rated on a 4-point scale: perceived severity of insomnia, sleep satisfaction, degree to which sleep problems interfere with daily functioning, noticeability of sleep impairment, and degree of concern about sleep impairment. A total score ranging from 0–28 can be derived. The ISI has shown good internal consistency ($\alpha = 0.74$) and concurrent validity with sleep diary measures of sleep efficiency ($r = -0.19$).²⁵ In the current sample, the internal consistency was high ($\alpha = 0.86$).

Data Analysis

Exploratory principal factor analyses (EFA) were conducted on the 23-item FoSI to identify the measure’s simple structure and to determine the relationships of its items to its underlying dimensions. We were guided by the principle of identifying the maximum number of factors that remained psychologically

Table 2—Study I Final FoSI-SF items and promax rotation factor loadings

	Factor 1	Factor 2
1. I was fearful of letting my guard down while sleeping.	0.88	-0.11
2. I tried to stay as alert as I could while lying in bed.	0.85	-0.08
3. I was fearful of the loss of control that I experience during sleep.	0.82	-0.08
4. I woke up in the night and I was terrified of returning to sleep.	0.82	0.02
5. I avoided going to sleep because I thought I would have really bad dreams.	0.80	0.01
6. I awoke in the middle of the night from a nightmare, and avoided returning to sleep because I might go back into the nightmare.	0.75	0.02
7. I was afraid to close my eyes.	0.73	0.20
8. I felt that it was dangerous to fall asleep.	0.71	0.14
9. I was aware of being especially vulnerable when I’m asleep.	0.71	0.09
10. I stayed up late to avoid sleeping.	0.63	0.04
11. I tried to stay alert to any strange noises while going to sleep.	0.60	-0.02
12. Being in the dark scared me.	0.04	0.81
13. I slept with a light on to feel safer.	-0.09	0.76

Factor 1 = Fear of loss of control; Factor 2 = Fear of darkness. Bold type indicates factor loadings.

meaningful. We also sought dimensions that would be robust to sample differences and that were not contaminated by PTSD symptoms. Across all EFAs, factors were rotated using both varimax (factors are orthogonal) and promax (factors can be correlated) rotations. Subsequently, Cronbach α and Pearson product-moment correlation coefficients were utilized to examine convergent and discriminant validity of the final FoSI items.

Results

The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = 0.92 (“superb” according to Hucheson and Sofroniou).²⁶ Initial EFA with the original 23 items indicated unclear factor structure. Using eigenvalues greater than 1 led to extraction of 4 factors. Seven items loaded onto multiple factors, and 2 items did not load onto any factors. One factor emerged that appeared to reflect PTSD symptoms closely, rather than fear of sleep distinctly. An examination of the items revealed wording that reflected PTSD symptoms (e.g., “I had dreams about a past traumatic experience”). These items were removed.

In contrast, 13 items had clear loadings onto 2 factors, with no cross-loadings. EFA was repeated with only these 13 items and a clearer 2-factor structure emerged, accounting for 60.21% of the total variance. **Table 2** presents the factor loadings of the 13 items from the promax rotation. Eleven of the items loaded highly onto a single factor. A review of these items suggested themes related to a *fear of loss of control*. Items loading onto Factor 2 represented *fear of darkness*.

Item analyses were performed on the resulting 13 items (henceforth, the FoSI-SF) and its 2 factors. Internal consistency

was high for the total scale ($\alpha = 0.93$), as well as for Factor 1 ($\alpha = 0.94$) and Factor 2 ($\alpha = 0.76$). The average inter-item correlations (AIC) for the total scale score and Factor 1 were 0.53 and 0.59, respectively. The inter-item correlation for the 2 items on Factor 2 was 0.61. The total score was only slightly above a recommended range,¹⁸ consistent with the idea that it does not reflect multiple dimensions, but rather a narrow, unitary one. Factor 1 and Factor 2 were above the recommended range, suggesting the items measure narrow dimensions.

Convergent and discriminant validity of the FoSI-SF were assessed by examining correlations with the PDS, ISI, and SHI shown in **Table 3**. It was expected that the fear of sleep measure would show moderate relationships with measures of PTSD and insomnia (convergent validity), but lower correlations with the measure of sleep hygiene SHI (discriminant validity). The results supported these hypotheses as the FoSI-SF was moderately correlated with the PCL and the ISI and showed a much weaker, yet significant, correlation with the SHI. The means and standard deviations of the total score and each factor are presented in **Table 4**.

Summary

In summary, the results of EFA in Study 1 found 13 of the 23 items had a clear factor structure that was internally consistent and not contaminated by items tapping PTSD symptomatology rather than the fear of sleep construct. These items comprise the FoSI-SF and demonstrated improved psychometric properties over the FoSI-23. The FoSI-SF also demonstrated good convergent validity with PTSD and insomnia symptoms and relative discriminant validity with sleep hygiene in a relatively large student population.

STUDY II

The aim of Study II was to extend the evaluation of the psychometric properties of the FoSI-SF to a clinical sample of

trauma-exposed adults experiencing chronic nightmares. The reliability and validity of the total 13 items and each factor were tested. We also examined whether there were significant differences between the non-clinical and the clinical sample in FoSI-SF total scores.

Methods

Sample and Procedures

Data for Study II were drawn from a larger randomized clinical trial of cognitive behavioral therapy for chronic nightmares in a community sample in the Midwest. Participants were recruited via fliers, newspaper and radio advertisements, and clinician referrals. Individuals interested in the study completed a brief phone screen and, if eligible, were scheduled for an evaluation. Participants completed self-report measures through an online survey while they were in the clinic. However, 12% ($n = 8$) completed the measures in pencil and paper format due to technical difficulties (there were no significant differences in total scores between the 2 groups).

Participants were adults 18 years or older who reported experiencing a traumatic event at least three months prior to the initial evaluation and experiencing nightmares at least weekly for the previous month. Nightmares were defined as dreams that involved negative emotions and caused awakenings. The 3-month criterion for trauma exposure allowed for natural recovery to take place after a traumatic experience. Exclusion criteria included psychosis, developmental disability, suicidal intent, current or past manic episodes, apparent psychosis, and untreated drug or alcohol abuse or dependence in the past 6 months. All procedures were approved by the IRB and informed consent was obtained from all participants.

The study included a total of 67 participants. Of these, 36% were married, 25% were divorced or widowed, and 39% were never married. Only 6% of participants in the clinical sample were students, but 72% had at least some college education; 52% were employed, 30% were unemployed, and 12% were retired. See **Table 1** for additional demographic information.

All participants had experienced at least one traumatic event. Participants reported a range of 1-16 potentially traumatic events. The sample varied in terms of PTSD symptom presentation. Based on a structured interview, 65.7% ($n = 44$) met diagnostic criteria for PTSD at the time of the assessment. The mean total scores for the month prior to the assessment were in the moderate range (mean = 55.5, SD = 23.9), with a range of 6 to 109. Participants reported that within the past week they had experienced a mean of 4.5 nightmares (SD 4.2), a mean of 3.2 nights with nightmares (SD 2.08), and a mean of 1.8

Table 3—Convergent and discriminant validity coefficients in the student sample ($N = 292$)

	PTSD Checklist	Insomnia Severity Index	Sleep Hygiene Index
Fear of Sleep Inventory-Short Form	0.48*	0.39*	0.27*
PTSD Checklist	—	0.38*	0.22*
Insomnia Severity Index		—	0.45*
Sleep Hygiene Index			—

* $p < 0.001$ (two-tailed).

Table 4—Comparison of the FoSI-SF factors in the student sample and the clinical sample

	Study I ($N = 292$)		Study II ($N = 67$)		Mean Score Comparisons	
	Mean	SD	Mean	SD	t_{357}	d
Total FoSI-SF	4.80	7.72	17.90	12.56	8.85*	1.26
Factor 1	3.92	6.77	15.63	11.12	8.92*	1.27
Factor 2	0.89	1.60	2.27	2.93	4.20*	0.58

* $p < 0.001$ (two-tailed).

Table 5—Convergent and discriminant validity coefficients in the clinical sample (N = 67)

	PTSD Checklist	Clinician Administered PTSD Scale	Insomnia Severity Index	Sleep Hygiene Index
Fear of Sleep Inventory-Short Form	0.61**	0.57**	0.48**	0.19
PTSD Checklist	—	0.77**	0.64**	0.32**
Clinician Administered PTSD Scale		—	0.49**	0.16
Insomnia Severity Index			—	0.28*
Sleep Hygiene Index				—

* $p < 0.05$ (two-tailed); ** $p < 0.001$ (two-tailed). Clinician Administered PTSD Scale Total frequency and severity score for the past month.

nights with more than one nightmare (SD 2.0). Mean nightmare severity rated on a scale ranging from 0 (*not at all disturbing*) to 4 (*extremely disturbing*) was 3.9 (SD 0.85).

Measures

The FoSI-SF, the ISI, and the SHI (described above) were employed in Study II. Cronbach α in the current study for the ISI and the SHI were 0.78 and 0.66, respectively. Study II also included the following measures.

STRUCTURED INTERVIEWS

The *Clinician Administered PTSD Scale* (CAPS)²⁷ was used to assess PTSD diagnosis and severity. The CAPS is considered the “gold standard” interview for assessing PTSD²⁸ and was used to determine PTSD diagnosis and to obtain a measure of PTSD symptom frequency and intensity. Individuals who experienced a Criterion A traumatic event with or without PTSD were included in the study. The “F1/I2” rule (frequency coded at least 1 and intensity coded at least 2 for the past month) was used to determine symptom presence and diagnosis. This rule has demonstrated adequate reliability, sensitivity of 0.91, and specificity of 0.71.²⁸ Graduate students in a clinical psychology program conducted all assessments. Regular group supervision meetings were also conducted to ensure adherence to the assessment protocol.

SELF-REPORT MEASURES

The *Modified Trauma Assessment for Adults: Self Report Version* (TAA)²⁹ assesses the experience of 14 types of traumatic events. Four items were added to assess for hate crimes and childhood physical abuse. Follow-up items assess perceived threat and age of occurrence. Additional items were added to ascertain if the individual experienced nightmares related to each type of event.

The *Posttraumatic Stress Diagnostic Scale* (PDS)³⁰ is a self-report measure designed to yield a diagnosis of PTSD and continuous scores for the frequency of PTSD symptoms as an indication of PTSD severity. The measure contains 17 items rated on a 5-point Likert-type scale, ranging from 0 (*Not at all or only one time*) to 5 (*5 or more times per week/almost always*). For the purposes of this study, PTSD diagnosis was determined by the CAPS, so only the 17 items assessing the frequency of PTSD symptoms were used as a measure of PTSD symptom severity. Internal consistency was 0.92 for the total severity score and ranged from 0.78 to 0.84 for each of the clusters. Test-retest reliabilities were 0.83 for the total severity

score and ranged from 0.77 to 0.85 for the clusters. Moderate to strong correlations were also found between the PDS and other symptom measures.³⁰ In the current study, the PDS demonstrated excellent internal consistency ($\alpha = 0.92$).

The *Trauma Related Nightmare Scale* (TRNS)³¹ consists of open-ended, dichotomous, and Likert-scale items to assess nightmare frequency, disturbance, and characteristics. For the current study, the TRNS was utilized to assess nightmare frequency. Also, one item that assesses fear of sleep (i.e., “In general, how fearful are you to go to sleep?”) rated on a Likert scale (i.e., 1 = *Not at all* to 5 = *Extremely*) was used to examine the validity of the FoSI.

Data Analysis

Cronbach α and Pearson product-moment correlation coefficients were utilized to examine the reliability and validity of the total score for the 13-item FoSI and for each factor. One-sample t -tests were used to determine if there were significant differences between the non-clinical and the clinical sample in FoSI-SF total scores, FoSI-SF factor scores, total ISI, and total SHI.

Results

Internal consistency was high for the total FoSI-SF ($\alpha = 0.90$), Factor 1 ($\alpha = 0.91$) and Factor 2 ($\alpha = 0.88$). As in Study I, the AICs for the total score (0.43) and Factor 1 (0.49) were within the recommended range of 0.2–0.5. Similar to Study I, the inter-item correlation for Factor 2 (0.80) was above the recommended range. Correlations were performed to examine convergent and discriminant validity with the PDS, the CAPS interview, the ISI, and the SHI, and are presented in **Table 5**. The FoSI-SF was significantly and moderately correlated with the PDS, the CAPS, and the ISI. These moderate correlations suggest the FoSI-SF is related to PTSD (measured by self-report and by structured interview) and insomnia, and yet it is not redundant with these constructs. The total score of the FoSI-SF was also significantly correlated ($r = 0.80$, $p < 0.001$) with a single item on the TRNS examining fear of sleep. In this clinical sample, the FoSI-SF was not significantly correlated with the SHI, more robustly demonstrating discriminant validity.

Means, standard deviations, and effect sizes for the FoSI-SF for both study samples are presented in **Table 4**. As expected, the results of one-sample t -tests indicated the clinical sample scored significantly higher than the non-clinical sample on the total FoSI-SF as well as both factors. The clinical sample also scored significantly higher than the non-clinical sample on the ISI ($t_{66} = 12.25$, $p < 0.001$; see **Table 1**). Conversely, the

non-clinical college student sample scored significantly higher than the clinical sample on the SHI ($t_{66} = -19.46, p < 0.001$).

Summary

In summary, analyses examining the reliability and validity of the FoSI-SF in the clinical sample in Study-II largely replicated findings from Study I. The FoSI-SF demonstrated good internal consistency, good convergent validity with measures of PTSD symptoms (assessed by a self-report measure and a structured interview) and insomnia symptoms, and discriminant validity with a measure of sleep hygiene. Results also show that the clinical sample of chronic nightmare sufferers scored significantly higher on the FoSI-SF than a non-clinical sample of college students.

DISCUSSION

Sleep difficulties are a distressing and frequently reported symptom of PTSD,^{9,32} and they have been found to be rather resistant to PTSD treatments.^{8,32-35} Thus it is vital for researchers and clinicians to understand more clearly the relationships between PTSD and sleep disturbances, including nightmares as well as sleep onset and maintenance difficulties. The FoSI¹² was created to provide a means to assess fear of sleep, a variable that may account for important variance in the relationship between trauma and sleep difficulties. In Study I, we used factor analysis to guide further item reduction based on a large non-clinical student sample. The psychometric properties of the abbreviated version, FoSI-SF, were examined in a non-clinical and a clinical sample. Overall, the results support the utility of the FoSI-SF as an internally consistent measure specific to the fear of sleep construct. The final items represented both fear of loss of control and fear of darkness. The pattern of correlations also supports the convergent and discriminant validity of the FoSI-SF. The FoSI-SF showed modest correlations with PTSD and insomnia symptoms and a weaker correlation with sleep hygiene behaviors. The finding of a significant relationship between the FoSI-SF and the SHI may be due to the significantly worse sleep hygiene scores of the student sample relative to the clinical sample. These data suggest that the construct measured by the FoSI-SF is related to, but distinct from, PTSD and insomnia.

Study II sought to further examine internal consistency and validity of the FoSI-SF in a clinical sample of trauma-exposed individuals experiencing chronic nightmares. Findings largely replicated those of Study I. The FoSI-SF demonstrated high internal consistency and good convergent and discriminant validity. These findings suggest the FoSI-SF provides an assessment of a distinct construct.

The FoSI and the FoSI-SF have both research and clinical utility. The FoSI-SF is suitable for use in research, as this version was shown to have a clear factor structure and has limited contamination of items assessing PTSD symptoms. The FoSI is a tool enabling researchers to further examine the relationship of fear of sleep to sleep disturbances and PTSD symptoms and may lead to better understanding of the mechanisms underlying trauma-related sleep problems. A clearer understanding of these relationships may guide future mechanistic and intervention research.

Clinically, the FoSI can help to identify unhelpful thoughts and behaviors within treatment for PTSD or insomnia. For example, the FoSI can help to raise awareness of potential unhelpful thoughts around safety and sleep that might be targeted in cognitive therapy for PTSD. For example, using therapy to address such thoughts as, "It is dangerous to fall asleep," might help patients to achieve more balanced thinking about safety and to improve sleep. Patients experiencing fear of darkness may be assigned *in vivo* exposure tasks to reduce fears of darkness, an exercise that can decrease nighttime anxiety and improve sleep. For clinical purposes, practitioners may wish to use the 23-item version of the FoSI that includes some clinically, but not statistically, relevant items (e.g., "I repeatedly checked the locks on the doors and windows at bedtime"). The 23-item version of the FoSI is shown in the appendix. Addressing sleep difficulties in the context of cognitive behavioral interventions may lead to improved clinical outcomes for PTSD broadly, as well as specifically, with regard to sleep. Such an approach may be particularly relevant when sleep is a primary presenting complaint, and when standard treatment for PTSD has not fully resolved sleep problems. Similarly, the FoSI can bring attention to unhelpful thoughts and behaviors in cognitive behavioral therapy for insomnia that may not otherwise be apparent.³⁶ It is worth noting that individuals with sleep impairment display a wide range of behaviors affecting sleep. Further research is needed to ascertain whether the abbreviated FoSI retains sensitivity to the range of clinically significant behaviors that clinicians aim to identify among their patients.

Several limitations of this study restrict interpretation of these findings. First, the FoSI items were derived based on clinical phenomena that may not have relevance for nonclinical populations. As such, the student sample in Study I, on which the factor analysis and item reduction were performed, displayed low mean scores on the FoSI. It is possible that item loadings used to select items for the abbreviated measure were affected by differential patterns of endorsement in the student sample. Therefore, these results need to be replicated in a clinical population. A second limitation of Study I is that students often have more variable sleep schedules than the general population. No information was available to enable exclusion of respondents with significantly atypical sleep schedules, such as daytime sleepers, or those with unusually abbreviated, lengthy, or interrupted sleep schedules. Third, the measures used in these studies were limited. Although the patterns of correlations supported the discriminant validity of the FoSI-SF, future studies should use additional measures of discriminant validity. Fourth, the clinical sample consisted of individuals seeking help for nightmares, which affect only a subset of individuals with PTSD. It is possible that a different factor structure would emerge for individuals with PTSD who do not experience nightmares. Fifth, this analysis was based on a single self-report assessment of insomnia—the ISI—without objective corroboration of sleep patterns via sleep diaries, actigraphy, or polysomnography. Finally, it is possible that relationships of the FoSI-SF with measures of sleep impairment might be attenuated if potentially confounding variables known to affect sleep, such as nightmare frequency and depression, are controlled in the analysis. The absence of measures of

depression and nightmares limits interpretation of the fear of sleep construct as assessed by the FoSI-SF.

Overall, data from the current study support the psychometric properties of the FoSI and point to the potential utility of continued investigation of the fear of sleep construct. The factor structure reported here needs to be replicated in clinical samples exhibiting greater impairment in sleep, trauma exposure, and posttraumatic distress. In particular, it will be useful to determine whether and to what extent fear of sleep is a factor underlying sleep problems of individuals who do not experience nightmares, or whose nightmares have remitted. Also, future study of the psychometric properties of the FoSI should expand to other clinical populations for whom sleep disruptions are associated with vigilance, such as veterans and active duty military personnel. The ways in which these populations try to cope with PTSD symptoms or sleep problems may be different from the two populations researched in these studies. For example, the FoSI item which asks about sleeping with a weapon may be a low-frequency behavior in the two populations in the present studies but may occur more frequently in other groups. Such a safety behavior may result in lower ratings on other FoSI items (e.g., one may not feel that it is as dangerous to fall asleep or that one's guard is down) and may be an important treatment target. It will also be important for future research to differentiate between fear of sleep and sleep avoidance in individuals with PTSD. The latter may result in a diagnosis of behaviorally induced insufficient sleep syndrome rather than insomnia. Future research should also include objective measures of sleep, consider sleep schedules, and control for potentially confounding factors such as nightmare frequency and depression.

ABBREVIATIONS

CAPS, Clinician Administered PTSD Scale
EFA, exploratory factor analysis
FoSI, Fear of Sleep Inventory
FoSI-SF, Fear of Sleep Inventory-short form
ISI, insomnia severity index
OEF, Operation Enduring Freedom
OIF, Operation Iraqi Freedom
PCL-S, PTSD checklist
PDS, Posttraumatic Stress Diagnostic Scale
PTSD, posttraumatic stress disorder
SLESQ-R, Stressful Life Events Screen Questionnaire-Revised
SHI, sleep hygiene index
TAA, Trauma Assessment for Adults
TRNS, Trauma Related Nightmare Scale

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Appendix—The 23-item version of the FoSI

Below is a list of things that people sometimes think or do in relation to sleep. Please rate how often each occurred in the past month.

	Not at all	A few times per month	Once or twice per week	Several times per week	Nearly every night
1. I was fearful of letting my guard down while sleeping.*	0	1	2	3	4
2. Little noises around the house woke me up.	0	1	2	3	4
3. I woke up in the night and I was terrified of returning to sleep.*	0	1	2	3	4
4. I stayed up late to avoid sleeping.*	0	1	2	3	4
5. When lying in bed I thought about a traumatic experience.	0	1	2	3	4
6. I had dreams about a past traumatic experience.	0	1	2	3	4
7. I slept with the windows closed regardless of the weather to feel safer.	0	1	2	3	4
8. I was fearful of the loss of control that I experience during sleep.*	0	1	2	3	4
9. I used lots of blankets (regardless of weather) to feel safe at night.	0	1	2	3	4
10. I avoided going to sleep because I thought I would have really bad dreams.*	0	1	2	3	4
11. I repeatedly checked the locks on the doors and windows at bedtime.	0	1	2	3	4
12. Being in the dark scared me.*	0	1	2	3	4
13. I slept with a light on to feel safer.*	0	1	2	3	4
14. I was aware of being especially vulnerable when I'm asleep.*	0	1	2	3	4
15. I slept with something or someone in bed with me to help me feel safe.	0	1	2	3	4
16. I awoke in the middle of the night from a nightmare, and avoided returning to sleep because I might go back into the nightmare.*	0	1	2	3	4
17. I slept with the television on to feel safe.	0	1	2	3	4
18. I was afraid to close my eyes.*	0	1	2	3	4
19. I felt that it was dangerous to fall asleep.*	0	1	2	3	4
20. I kept a weapon near my bed at night.	0	1	2	3	4
21. I tried to stay as alert as I could while lying in bed.*	0	1	2	3	4
22. I slept on a couch or somewhere other than my bed to feel safe.	0	1	2	3	4
23. I tried to stay alert to any strange noises while going to sleep.*	0	1	2	3	4

* Items retained on the FoSI-SF.