



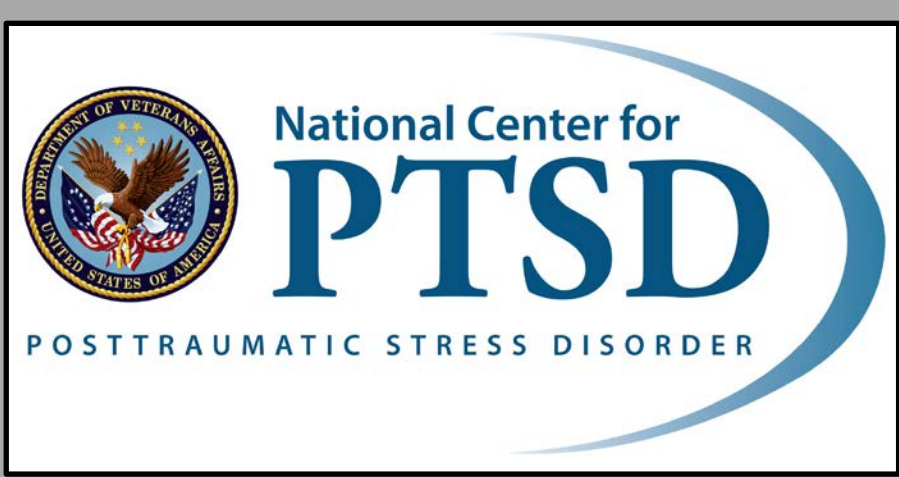
# Differences in sleep between veterans with PTSD and other mental health conditions among consecutive referrals for polysomnography to a Veterans Affairs sleep clinic

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## Background

- Individuals diagnosed with posttraumatic stress disorder (PTSD) are more likely to have sleep apnea (SA) than those without PTSD
- Zhang et al (2017) reported an aggregate prevalence rate of 63% among individuals with PTSD, and 7% among individuals without PTSD in a meta-analysis
- Reasons for this comorbidity remain unclear
- Few studies have examined whether SA in individuals with PTSD differs from SA in other populations
- Among individuals diagnosed with PTSD, SA is associated with:
  - Increased severity of PTSD and sleep disturbance (Krakow et al., 2002; Miller et al., 2018)
  - Increased reports of suicidal ideation (Gupta & Jarosz, 2018)
  - Decreased effectiveness of PTSD treatments (Mesa et al., 2017; Reist et al., 2017)
- Co-occurring SA complicates the presentation of PTSD and presents treatment challenges
  - Treatment of SA by CPAP in individuals with PTSD is associated with decreased PTSD symptoms (El-Solh et al., 2017; Orr et al., 2017)
  - Comorbid PTSD is associated with lower CPAP adherence rates among individuals with SA compared to individuals with SA alone (Zhang et al., 2017)

## Aims

- Examine the frequency of PTSD diagnosis among a sample of veterans referred to a Veterans Health Administration (VHA) sleep clinic for in-laboratory polysomnograms.
- Determine whether referrals diagnosed with PTSD differed from those with other mental health conditions (OTH MH) and those with no mental health conditions (NO MH) in rate of SA diagnosis and polysomnogram results.
- It was hypothesized that PTSD cases diagnosed with SA will have higher rates of hypertension and higher BMI scores than SA cases without comorbid PTSD.

## Method

### Participants

200 consecutive veterans receiving diagnostic in-laboratory polysomnograms (PSGs) in the sleep clinic of a VHA medical center in southern New England (June-December 2015)

### Exclusion criteria:

- (1) referrals for titration of CPAP
- (2) referrals receiving “split-night” PSGs
- (3) referrals completing ambulatory PSGs

### Measures

#### Medical records reviewed for:

- Presence/absence of PTSD, other mental health diagnoses, insomnia, nightmares
- Hypertension
- Gender, era of military service, age
- Height and weight at the time of PSG; BMI
- Medication at the time of PSG

#### Sleep study results reviewed to record:

- Time in bed, sleep onset latency, wake time after sleep onset, total sleep time, sleep efficiency, percentage of sleep time spent in stage N1, stage N2, stage N3, and REM sleep, latency to REM sleep, latency to stage N2 sleep
- Apnea/hypopnea index (AHI)
- Average and nadir blood oxygen saturation, average heart rate

### Analyses

- ANOVAs and chi-square analyses were used to compare referrals for PSGs with PTSD, OTH MH, and NO MH on demographic and clinical variables
- Chi-square analyses were used to compare the frequency of SA diagnosis, nightmares, and prescribed medication in PTSD, OTH MH, and NO MH cases
- ANOVAs and chi-square analyses were used to compare PTSD, OTH MH, and NO MH cases diagnosed with SA on the results of PSGs

## Results

- Among 200 cases receiving in-laboratory polysomnograms over a seven-month period, there were 59 (29.5%) NO MH cases, 62 (31.0%) PTSD cases, and 79 (39.5%) OTH MH cases
- SA was diagnosed in 105 cases (52.5%)
- Rates of SA diagnosis did not differ by MH diagnosis
- PTSD cases did not differ from either group on any sleep variable (see Table 1)
- NO MH cases had significantly less sleep, significantly lower stage N2 sleep percentage, and significantly higher mean AHI than OTH MH cases (see Table 1)
- NO MH cases were prescribed psychiatric medications at a significantly lower rate than PTSD and OTH MH cases,  $\chi^2(2) = 51.4$ ,  $p < .001$ .
- Rates of prescription of medications for medical conditions did not differ among the groups

**Table 1: Sleep and demographic variables by mental health diagnosis in veterans diagnosed with sleep apnea**

Variable	PTSD, n = 33, (mean (SD)/ n (%))	OTH MH, n = 37, mean (SD)/ n (%)	NO MH, n = 35, mean (SD)/ n (%)	F, df, p/ $\chi^2$ , df, p
Age	<b>59.3 (11.7)<sup>a</sup></b>	<b>60.6 (13.9)</b>	<b>67.3 (14.2)<sup>a</sup></b>	<b>3.7, 2, .03</b>
Body-mass index	32.3 (6.8)	31.1 (6.1)	31.9 (4.9)	.4, 2, .69
Female gender	3 (8.6%)	2 (6.5%)	4 (10.8%)	.8, 2, .65
Service era				<b>6.4*, 2, .04</b>
Wartime	22 (66.7%)	7 (18.9%)	7 (20.0%)	
Non-wartime	6 (18.1%)	10 (27.0%)	4 (11.4%)	
Unknown	5 (15.2%)	20 (54.1%)	24 (68.6%)	
Diagnosis of hypertension	12 (36.3%)	13 (35.1%)	11 (30.5%)	.3, 2, .86
Time in bed (minutes)	444.5 (57.9)	455.4 (53.1)	422.2 (73.9)	2.7, 2, .07
Sleep onset latency (minutes)	35.4 (45.4)	40.1 (44.3)	29.9 (38.2)	.5, 2, .59
Wake time after sleep onset (minutes)	96.1 (62.3)	92.1 (64.1)	111.6 (69.6)	.9, 2, .41
Total sleep time (minutes)	<b>299.1 (85.0)</b>	<b>313.3 (88.6)<sup>a</sup></b>	<b>257.9 (107.8)<sup>a</sup></b>	<b>3.4, 2, .04</b>
Sleep efficiency (%)	68.4 (18.0)	69.6 (18.0)	60.9 (24.3)	1.9, 2, .15
% total sleep time in stage N1 sleep	16.0 (10.4)	16.5 (11.1)	21.7 (22.9)	1.4, 2, .26
% total sleep time in stage N2 sleep	<b>63.9 (12.3)</b>	<b>67.1 (11.7)<sup>a</sup></b>	<b>58.2 (20.1)<sup>a</sup></b>	<b>3.2, 2, .04</b>
% total sleep time in stage N3 sleep	6.1 (8.8)	3.3 (5.9)	6.2 (8.6)	1.6, 2, .20
% total sleep time in REM sleep	13.6 (7.4)	12.9 (9.8)	12.1 (8.1)	.3, 2, .76
Latency to N2 sleep (minutes)	9.3 (27.6)	11.9 (28.7)	15.5 (37.4)	.3, 2, .72
Latency to REM sleep (minutes)	114.1 (72.4)	142.0 (88.6)	131.1 (88.4)	.9, 2, .41
Apnea-hypopnea index	<b>14.2 (14.5)</b>	<b>9.4 (4.0)<sup>a</sup></b>	<b>18.9 (22.2)<sup>a</sup></b>	<b>3.5, 2, .03</b>
Sleeping oxygen saturation (%)	93.6 (1.9)	93.0 (2.2)	92.9 (1.6)	1.2, 2, .32
Nadir oxygen saturation (%)	84.3 (4.5)	84.2 (4.9)	86.3 (3.6)	2.5, 2, .09
Sleep heart rate (beats per minute)	63.1 (9.5)	66.6 (11.5)	59.9 (10.1)	2.9, 2, .06

*Note:* Means with the same superscript were significantly different

## Conclusions

- Neither hypothesis was supported; the three groups did not differ in BMI or rate of hypertension, suggesting that these variables may not be related to the higher prevalence of SA in individuals diagnosed with PTSD.
- Results suggest that veterans with PTSD receiving in-laboratory PSGs in a VHA sleep clinic do not have more severe sleep disruption or sleep-breathing problems than veterans with OTH MH diagnoses or NO MH.
- PTSD cases were younger than NO MH cases at referral and when diagnosed with SA.
- Results indicate that PTSD and OTH MH concerns are common in veterans referred for sleep studies.
- It would be beneficial for VHA mental health providers and sleep clinics to collaborate.

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