

# TRAUMATIC BRAIN INJURY AND DIZZINESS: ASSOCIATIONS AND MEDIATING FACTORS

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## INTRODUCTION

Associations between traumatic brain injury (TBI) and dizziness have been previously reported.<sup>1,2</sup> It is well known that TBI is also associated with mental health (MH) conditions and sleep disturbances.<sup>3,4</sup> The extent to which MH conditions and sleep disturbances are associated with self-reported dizziness remains unknown. If present, these associations would suggest a mediated pathway between TBI and self-reported dizziness. In this poster, we examine those associations and evaluate potential mediators of the relationship between TBI and self-reported dizziness in post-9/11 Service members and Veterans.

## METHODS

**Participants (n=916)**  
 • Post-9/11 U.S. Service members (n=424) and Veterans recently separated from military service (n=492) enrolled in the Noise Outcomes In Service members Epidemiology (NOISE) Study.<sup>5</sup>

### Potential Mediators

- Mental Health (MH) Conditions:**
  - Post-traumatic stress disorder (PTSD): assessed with the Primary Care PTSD Screener (Yes = score of 4 or greater, No = score < 4).<sup>6</sup>
  - Anxiety & Depression: assessed with the Hospital Anxiety and Depression Screener (7 questions for both MH conditions; Yes = score ≥ 8, No = score < 8 on respective questions).<sup>7</sup>
- Sleep Disturbances:** assessed with Epworth Sleepiness Scale (Yes = score of 9 or greater, No = score < 9).<sup>8</sup>

### Self-Reported Exposures

- TBI History:** Reported TBI(s) or no reported TBI.
- TBI Cause:** Blast or other cause.

### Self-Reported Outcomes

- Dizziness:** Yes = reported sometimes/often dizzy, No= reported never/rarely dizzy.

### Statistical Analysis

- Cross-sectional analysis of baseline data
- Regressed MH conditions/sleep disturbances on varied TBI exposures
- Regressed dizziness on varied MH conditions/sleep disturbances
- Multivariate logistic regression models to estimate adjusted odds ratios (aOR) and 95% confidence intervals (CI)
- All aOR adjusted for: age, gender, race, military branch, service component, branch of longest military service, deployment status
  - aOR<sup>†</sup> also adjusted for blast history

## RESULTS

**Table 1:** Study sample demographics and prevalence of self-reported dizziness.

	Service members (n=424)	Veterans (n=492)
Age, mean (SD)	34.6 (8.7)	34.1 (9.3)
Sex ratio (m:w)	2:1	5.6:1
Years of service, mean(SD)	12.1 (7.5)	11.3 (8.5)
<b>Prevalence of self-reported dizziness</b>	<b>22.4%</b>	<b>30.0%</b>

## RESULTS CONTINUED

**Tables 2-5:** Varied TBI exposures by MH conditions/sleep disturbances. Displayed are the n (%) of the sample reporting TBI exposures by screening result for MH conditions/sleep disturbances.

TBI	TBI	Service Members		Veterans	
		PTSD	No PTSD	PTSD	No PTSD
TBI History	TBI	26 (49%)	27 (51%)	76 (59%)	53 (41%)
	No TBI	59 (16%)	312 (84%)	103 (29%)	258 (71%)
TBI Cause	Other TBI Cause	14 (64%)	8 (36%)	32 (70%)	14 (30%)
	Blast TBI Cause	12 (39%)	19 (61%)	44 (53%)	39 (47%)
	No TBI	59 (16%)	312 (84%)	103 (29%)	258 (71%)

TBI	TBI	Anxiety		No Anxiety	
		Anxiety	No Anxiety	Anxiety	No Anxiety
TBI History	TBI	28 (53%)	25 (47%)	87 (67%)	42 (33%)
	No TBI	96 (26%)	275 (74%)	160 (44%)	201 (56%)
TBI Cause	Other TBI Cause	13 (59%)	9 (41%)	36 (78%)	10 (22%)
	Blast TBI Cause	15 (48%)	16 (52%)	51 (61%)	32 (39%)
	No TBI	96 (26%)	275 (74%)	160 (44%)	201 (56%)

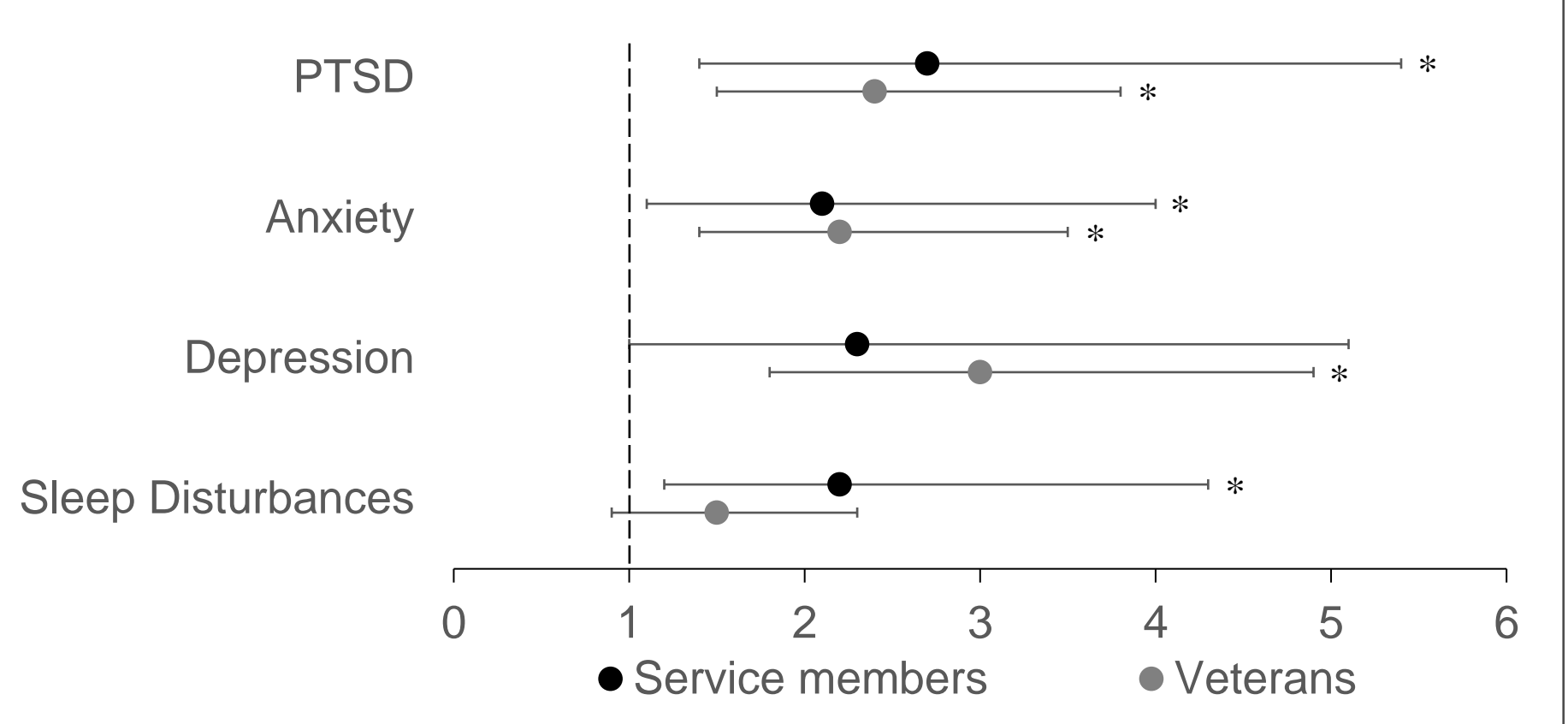
TBI	TBI	Depression		No Depression	
		Depression	No Depression	Depression	No Depression
TBI History	TBI	13 (25%)	40 (75%)	56 (43%)	73 (57%)
	No TBI	36 (10%)	335 (90%)	65 (18%)	296 (82%)
TBI Cause	Other TBI Cause	7 (32%)	15 (68%)	20 (43%)	26 (57%)
	Blast TBI Cause	6 (19%)	25 (81%)	36 (43%)	47 (57%)
	No TBI	36 (10%)	335 (90%)	65 (18%)	296 (82%)

TBI	TBI	Sleep Disturbances		No Sleep Disturbances	
		Sleep Disturbances	No Sleep Disturbances	Sleep Disturbances	No Sleep Disturbances
TBI History	TBI	34 (64%)	19 (36%)	65 (50%)	64 (50%)
	No TBI	157 (42%)	214 (58%)	138 (38%)	223 (62%)
TBI Cause	Other TBI Cause	13 (59%)	9 (41%)	26 (57%)	20 (43%)
	Blast TBI Cause	21 (68%)	10 (32%)	39 (47%)	44 (53%)
	No TBI	157 (42%)	214 (58%)	138 (38%)	223 (62%)

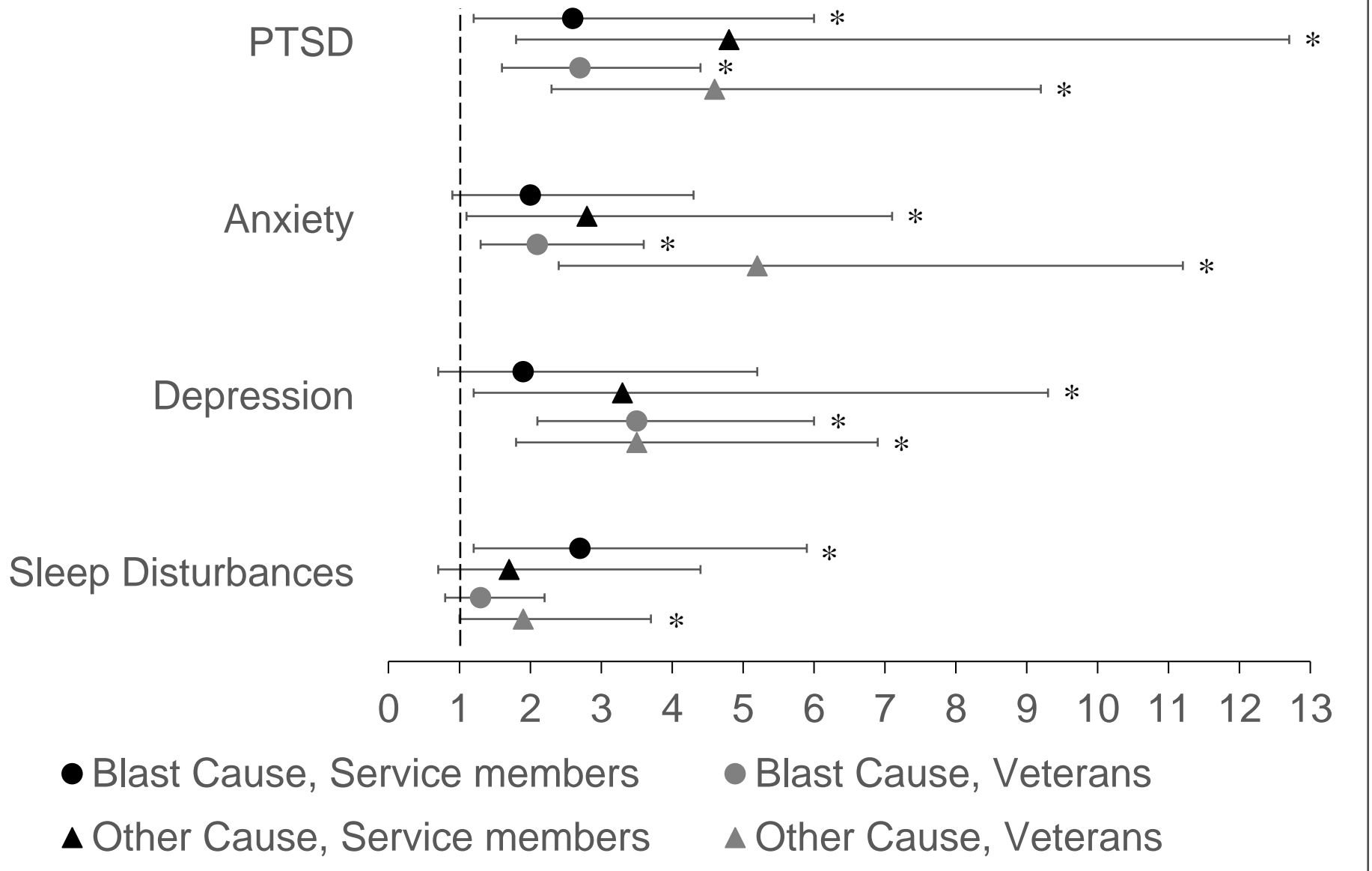
**Table 6:** MH conditions/sleep disturbances by self-reported dizziness. Displayed are the n (%) of the sample screening results for MH conditions/sleep disturbances by self-reported dizziness.

	Service Members		Veterans	
	Yes Dizziness	No Dizziness	Yes Dizziness	No Dizziness
PTSD	37 (44%)	48 (56%)	86 (48%)	93 (52%)
No PTSD	59 (17%)	280 (83%)	63 (20%)	248 (80%)
Anxiety	51 (41%)	73 (59%)	109 (44%)	138 (56%)
No Anxiety	45 (15%)	255 (85%)	40 (16%)	203 (84%)
Depression	22 (45%)	27 (55%)	65 (54%)	56 (46%)
No Depression	74 (20%)	301 (80%)	84 (23%)	285 (77%)
Sleep Disturbances	58 (30%)	133 (70%)	84 (41%)	119 (59%)
No Sleep Disturbances	38 (16%)	195 (84%)	65 (23%)	222 (77%)

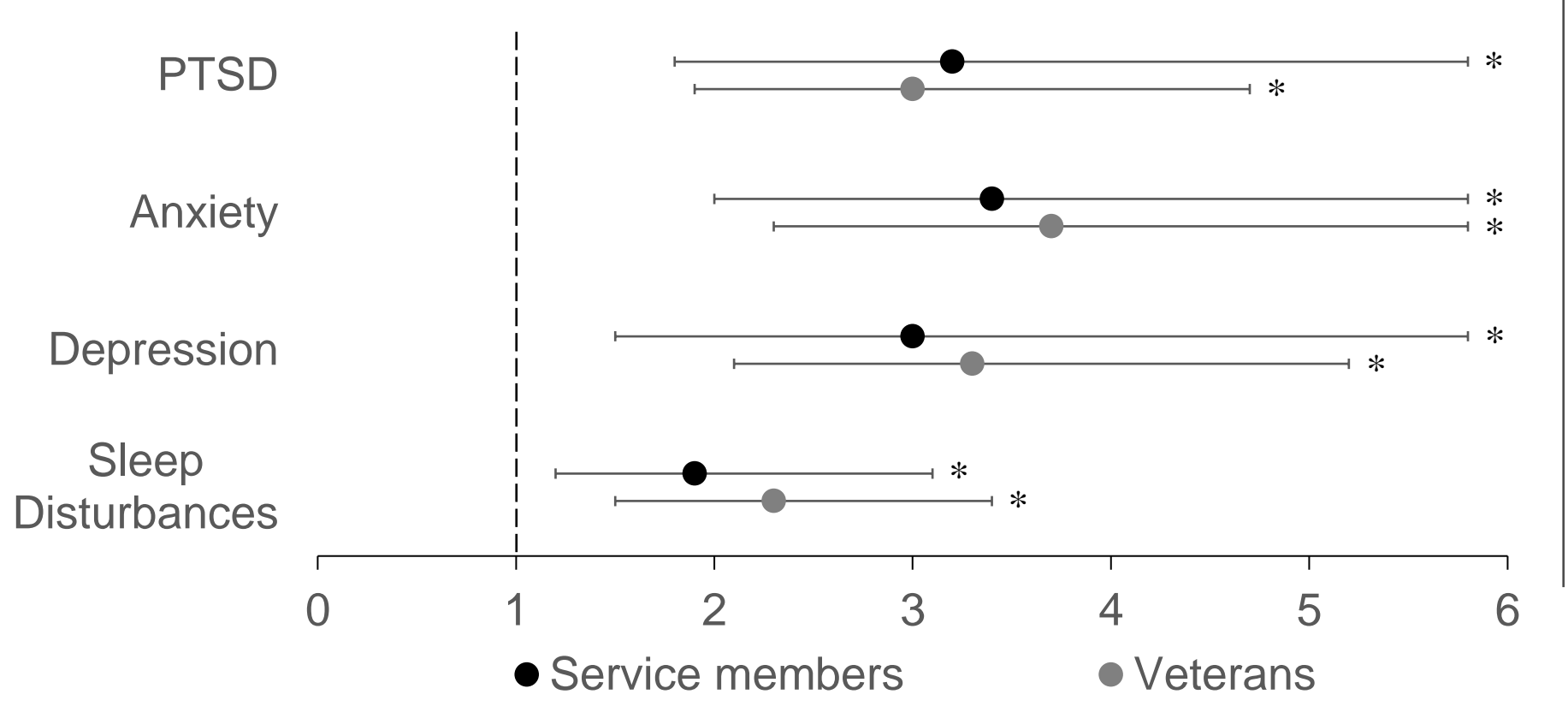
**Figure 1:** aOR<sup>†</sup> of MH conditions/sleep disturbances given TBI history. Error bars represent 95% CI. Significant associations are noted with an asterisk (\*).



**Figure 2:** aOR of MH conditions/sleep disturbances given TBI cause. Error bars represent 95% CI. Significant associations are noted with an asterisk (\*).



**Figure 3:** aOR<sup>†</sup> of dizziness given MH condition/sleep disturbance screening status. Error bars show 95% CI. Significant associations are noted with an asterisk (\*).



## DISCUSSION

- Our findings corroborate previously observed associations between TBI history and MH conditions/sleep disturbance history.
- Controlling for confounding factors, self-reported dizziness was more prevalent in Service members and Veterans who screened positive for MH conditions and sleep disturbances than in those who did not.
- This suggests that MH conditions and sleep disturbances mediate some of the observed association between TBI and dizziness in this population.
- TBI-related dizziness may be related to peripheral (auditory and vestibular systems) and/or central (neurological) dysfunction.<sup>2</sup> Possible mediators include psychological and physiological disruptions. An interprofessional approach may be warranted for assessment and treatment of self-reported dizziness in Service members and Veterans with TBI.
- Future research should examine if treatment of MH conditions and/or sleep disturbances helps mitigate self-reported dizziness in this population.

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