SYMPTOM ATTRIBUTION IN SERVICE MEMBERS WITH MTBI AND PTSD

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Conflicts of Interest

This presenter has no conflicts of interest, financial or otherwise, to report.

Introduction

- 379,519 diagnosed TBI cases in service members since 2000[1]
- TBI, including mTBI, known to cause neuropsychiatric, cognitive, and somatic sequelae
- TBI and PTSD highly comorbid
- Strong overlap of PTSD and post-concussion syndrome

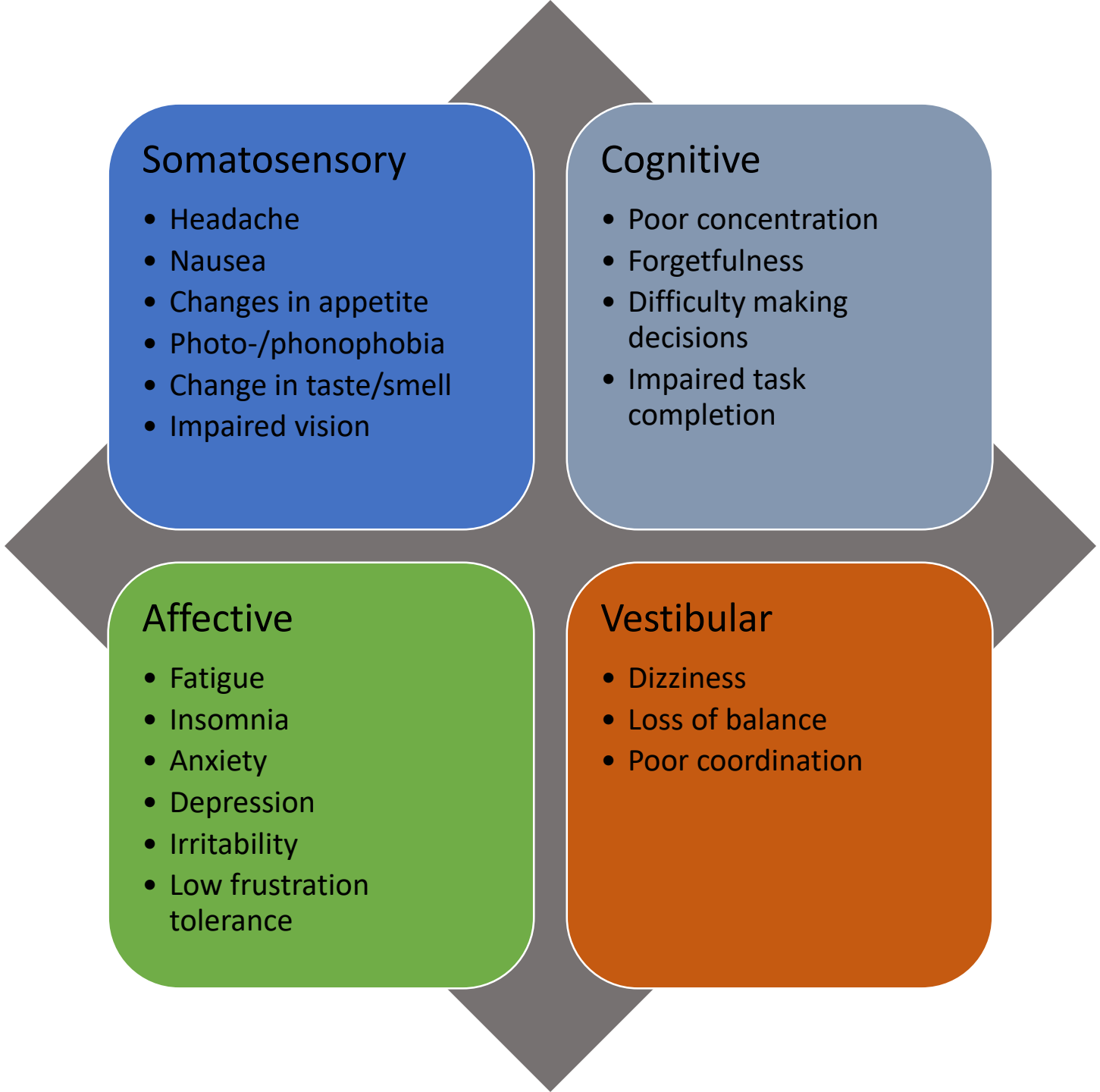
1. Defense and Veterans Brain Injury Center. DoD Worldwide Numbers for Traumatic Brain Injury. 2017. http://dvbic.dcoe.mil/files/tbi-numbers/worldwide-totals-2000-2017_feb-14-2018_v1.0_2018-03-08.pdf

Credit: Lynn Johnson, “Behind the Mask: Revealing the Trauma of War,” National Geographic, Feb 2015

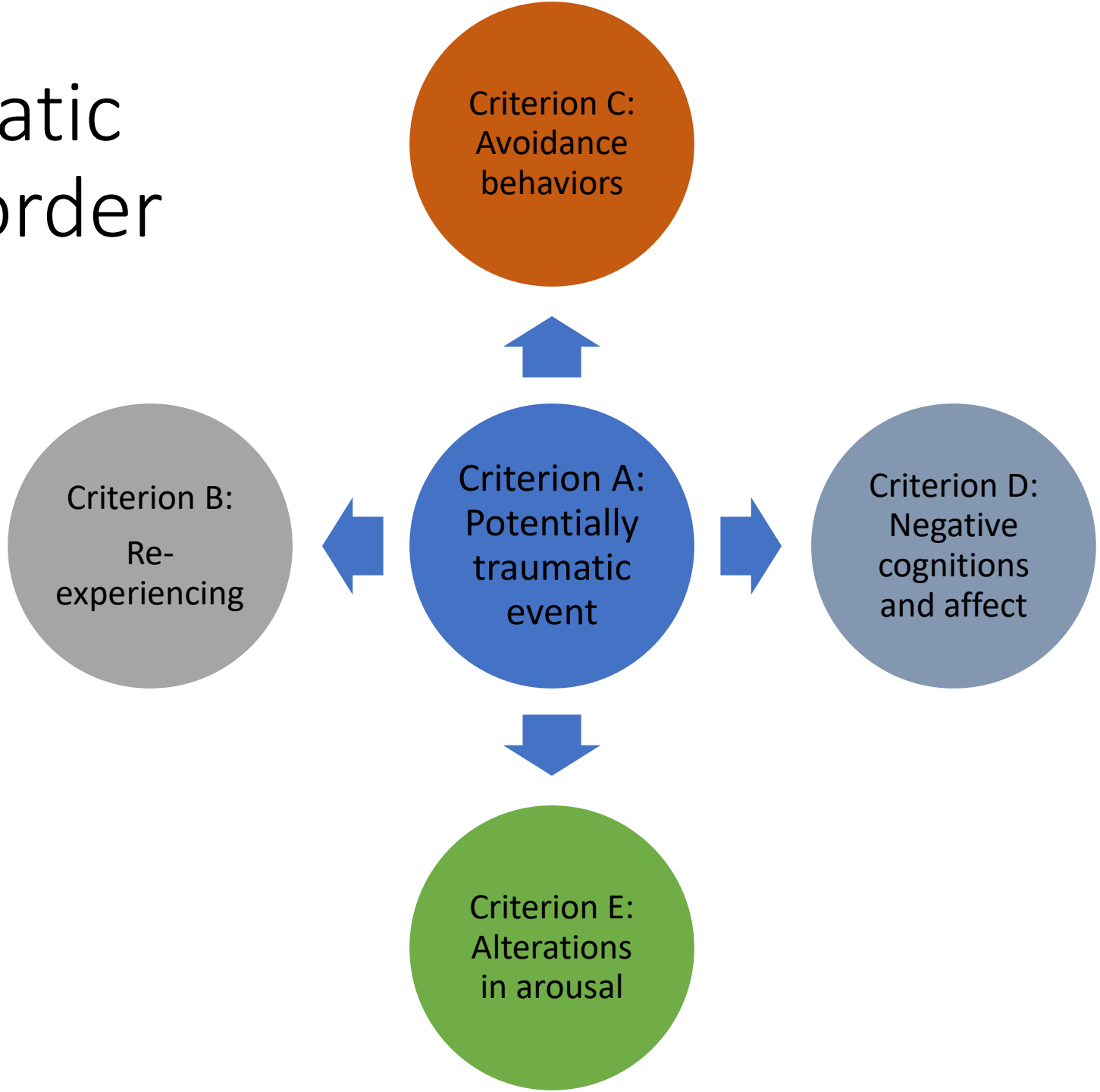
TBI and PTSD

- Damage to cortical and subcortical networks regulating fear and anxiety
- Psychological trauma of index TBI event
- Severity of PTSD predicts severity of post-concussion symptoms
- Importance of symptom attribution
- Need for integrated diagnosis and management

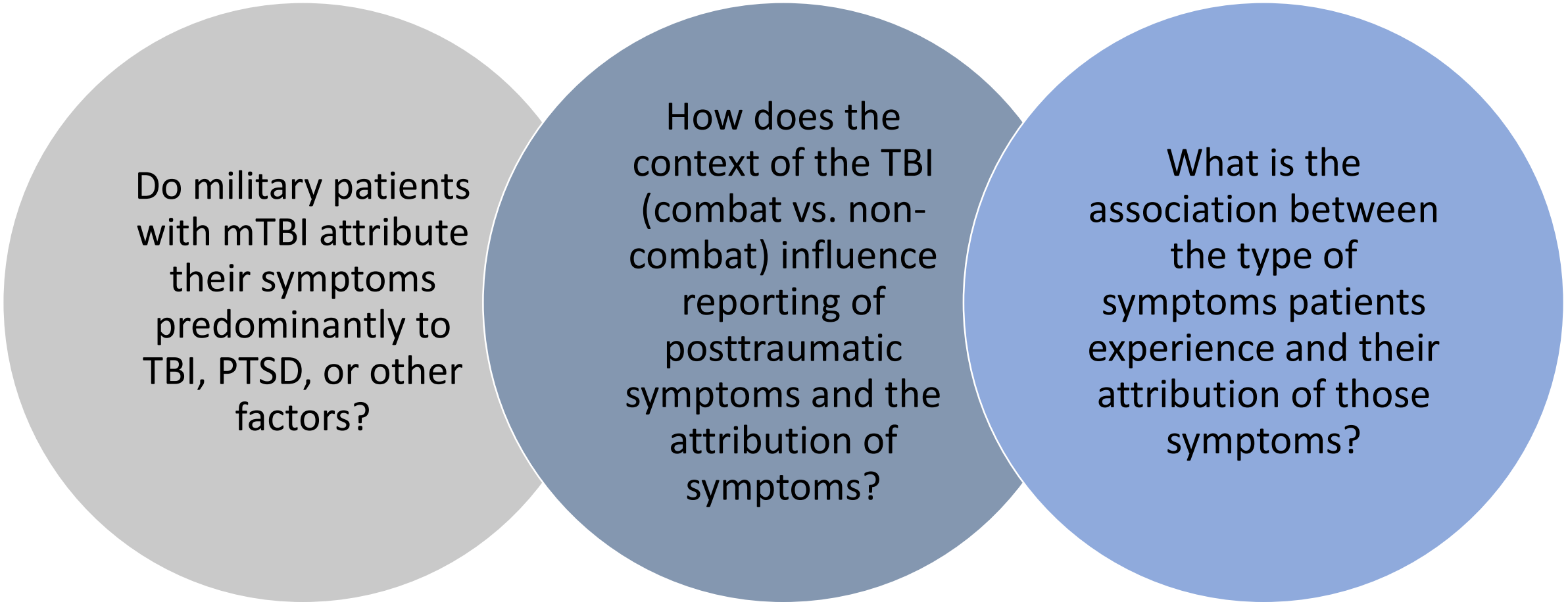
Post-Concussion Syndrome



Posttraumatic Stress Disorder



Research Questions



J Head Trauma Rehabil

Differences in Posttraumatic Stress Disorder, Depression, and Attribution of Symptoms in Service Members With Combat Versus Noncombat Mild Traumatic Brain Injury

Morgan Hardy, MD, MPH; Jan Kennedy, PhD; Matthew Reid, PhD; Douglas Cooper, PhD

Objective: This study compares combat-related mild traumatic brain injury (mTBI) to non-combat-related mTBI in rates of posttraumatic stress disorder (PTSD) and depression after injury, severity of postconcussive symptoms (PCSs), and attribution of those symptoms to mTBI versus PTSD. **Participants:** A total of 371 active duty service members (SMs) with documented history of mTBI, divided into combat and non-combat-related cohorts. **Design:** Retrospective cohort study. **Main Measures:** Diagnoses of PTSD and depression based on medical record review and self-report. PCSs measured using Neurobehavioral Symptom Index. Attribution of symptoms based on a rating scale asking how much mTBI, PTSD, depression, deployment, or readjustment stress contributed to current symptoms. **Results:** Prevalence of PTSD was significantly higher after a combat-related mTBI, compared with a noncombat mTBI ($P = .001$). Prevalence of depression did not differ between the 2 groups. PCSs were high in both combat and noncombat mTBIs, with no statistical difference between groups. SMs with PTSD reported higher PCS, regardless of combat status. SMs without PTSD attributed symptoms mainly to mTBI, whereas SMs with PTSD, regardless of combat status, were much more likely to attribute symptoms to PTSD, depression, and deployment/readjustment stress. **Conclusions:** This research contributes to our understanding of the complex interplay between mTBI and PTSD in both combat and noncombat injuries within the military population and the importance of addressing both simultaneously. **Key words:** *combat*, *mild traumatic brain injury*, *military healthcare*, *postconcussion syndrome*, *postconcussive symptoms*, *posttraumatic stress disorder*

TRAUMATIC BRAIN INJURY (TBI) has been called the "signature injury" of the wars in Iraq and Afghanistan because of its significant prevalence in these conflicts.[1–4] According to data from the Defense and Veterans Brain Injury Center (DVBIC), approximately 379 519 service members have been diagnosed with a TBI from the year 2000 until 2018, of which more than 80% are classified as mild traumatic brain injury (mTBI).[5] One study found an mTBI prevalence of 22% in a returning US Army brigade combat team.[6] Mild TBI has been associated with a constellation of somatic, cognitive, and neuropsychiatric symptoms—often labeled postconcussive symptoms (PCS)—which in some cases may persist for months or even years after the initial injury.[3,7–13]

Patients with a history of mTBI often have a high prevalence of mental health conditions, including posttraumatic stress disorder (PTSD) and depressive disorders.[4,14–16] mTBI symptoms strongly overlap with symptoms of PTSD—including impaired concentration, mood lability, and insomnia.[3,4,17] Indeed, mTBI is an independent risk factor for the development of PTSD, depression, and other psychiatric conditions.[3,18,19] It has been posited that head trauma can damage cortical

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The authors declare no conflicts of interest.

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Patient Attribution of Posttraumatic Symptoms to Brain Injury Versus PTSD in Military-Related Mild TBI

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Objective: Persistent cognitive, somatic, and neuropsychiatric symptoms following mild traumatic brain injury (TBI) are influenced by posttraumatic stress disorder (PTSD), particularly in military patients. The authors evaluated the degree to which military service members with a history of mild TBI attributed posttraumatic symptoms to TBI versus PTSD.

Methods: Service members (N=372) with mild TBI were surveyed about the severity of posttraumatic symptoms across four symptom clusters (cognitive, affective, somatosensory, and vestibular) with the Neurobehavioral Symptom Inventory (NSI). Participants rated the degree to which they believed TBI, PTSD, or other conditions contributed to their symptoms. Differences in cognitive, affective, somatosensory, and vestibular symptom severity were evaluated across participants with TBI, PTSD, or combined TBI-PTSD attribution. Logistic regression was used to evaluate the association between symptom profiles and attribution.

Results: Participants attributed symptoms mostly to TBI, followed by insufficient sleep, PTSD, chronic pain, depression, and deployment-readjustment stress. PTSD and combined TBI-PTSD attribution were associated with higher total NSI scores (39.5 and 51.6, respectively), compared with TBI attribution only (31.4) ($F=29.08$, $df=3, 358$, $p<0.01$), as well as higher scores in every symptom category. More severe affective symptoms were associated with decreased odds of TBI attribution (odds ratio=0.90, 95% CI=0.83–0.97) and increased odds of PTSD attribution (odds ratio=1.14, 95% CI=1.03–1.26). A PTSD diagnosis was highly associated with PTSD attribution (odds ratio=2.44, 95% CI=1.07–5.58).

Conclusions: The nature and severity of posttraumatic symptoms appear to play a role in patient beliefs about the causes of symptoms, whether from TBI or PTSD.

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Traumatic brain injuries (TBIs) and their potential for long-term sequelae have garnered significant public attention in the past decade, particularly within active duty military and veteran populations (1–3). Data published by the Defense and Veterans Brain Injury Center (DVBIC) estimate that at least 379,519 service members sustained a TBI between 2000 and 2018, of which more than 80% were classified as mild (4). Patients with TBI, including mild TBI, often experience persistent somatic, cognitive, and neuropsychiatric symptoms, including headaches, dizziness, cognitive impairment, sensory deficits, anxiety, irritability, and depression (5–11). Although estimates of symptom prevalence differ, one study found that at least 53% of patients with TBI reported three or more symptoms 1 year after injury (9).

However, the concept of postconcussion syndrome (PCS), as these persistent symptoms are termed, remains controversial because of the subjective nature of diagnosis and the potential for misdiagnosis (12). PCS lacks specificity and overlaps heavily with various psychiatric disorders (13–15). In many cases, PCS is clinically indistinguishable from conditions such as posttraumatic stress disorder (PTSD) and major depressive disorder. This is especially true in military patients, given the high coprevalence of TBI, PTSD, and depression in this population (3, 14, 16). Indeed, research has demonstrated that the presence of PTSD in combat veterans is much more predictive of the presence and severity of PCS than the actual brain injury itself (14–20). The controversial nature of PCS as a diagnosis has led researchers to advocate for the more inclusive term of "posttraumatic symptoms" to describe all persistent symptoms after a TBI, accounting for the multiple contributing neurologic and psychiatric etiologies (21). This is important, given that inadequate treatment of PTSD and major depressive disorder appears to worsen outcomes for TBI (22). Conversely, the presence of TBI appears to complicate treatment of PTSD and major depressive disorder (23).

Other important factors contributing to the persistence of posttraumatic symptoms after a TBI are the attributions of symptoms and expectations about recovery (24–26). Multiple studies have suggested that patients misattribute many incidental or unrelated symptoms to their TBI, resulting in overall higher burden of symptoms (24, 25). Such patients

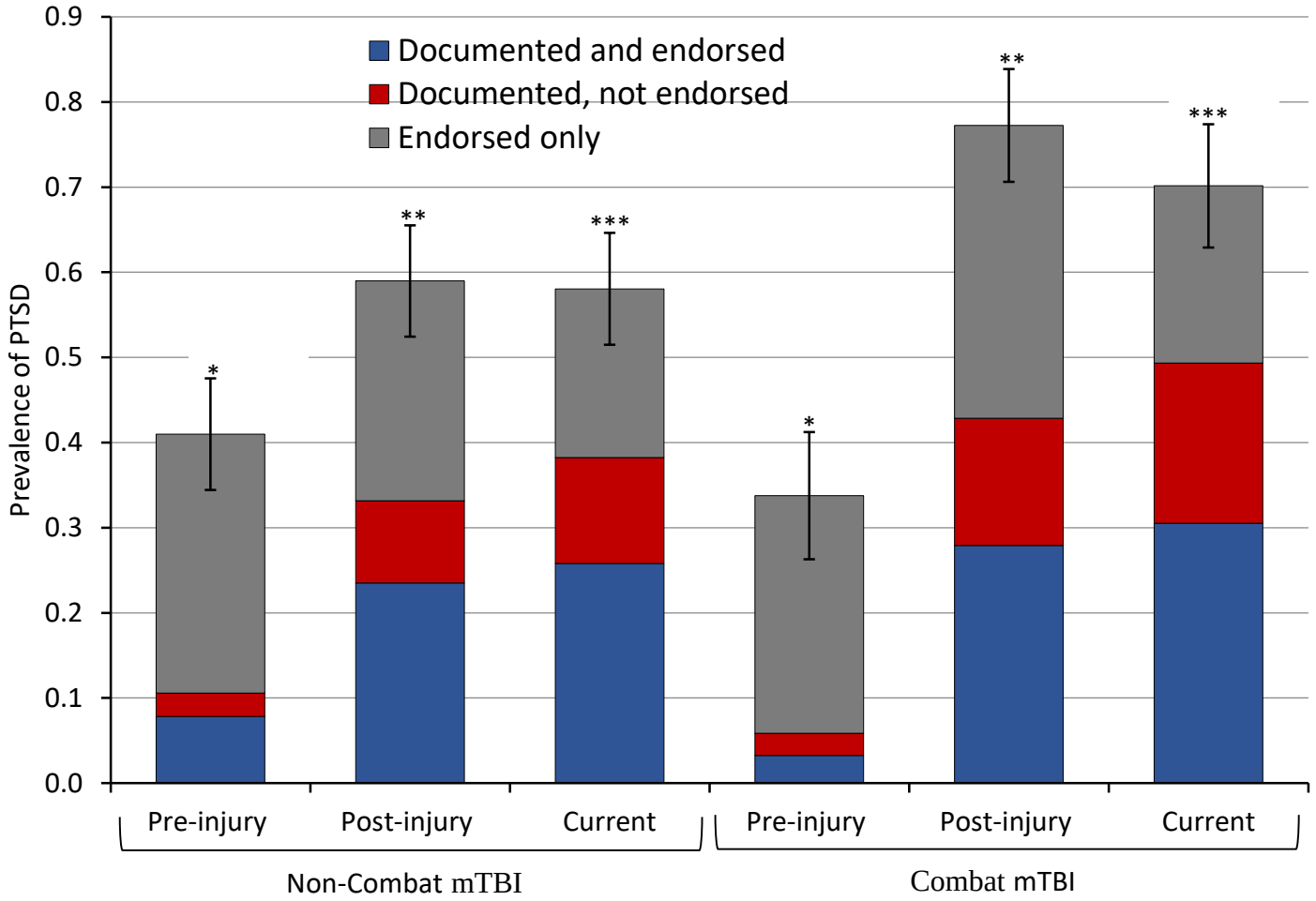
Methods

- DVBIC San Antonio TBI data repository, 2014-2017
- PTSD diagnoses—chart review, self report
- Neurobehavioral Symptom Inventory (NSI)
  - Affective
  - Cognitive
  - Somatosensory
  - Vestibular
- Attribution of current symptoms

Study Population

- 372 active duty service members
- ~87% male
- Mean age of 36.3
- 80% White, 20% Black, 27% Hispanic/Latino any race
- 91% Army, 5% Air Force, 2% Navy, 2% Marine Corps
- Median time in service: 14.4 years
- 42% combat-related TBI, 58% non-combat

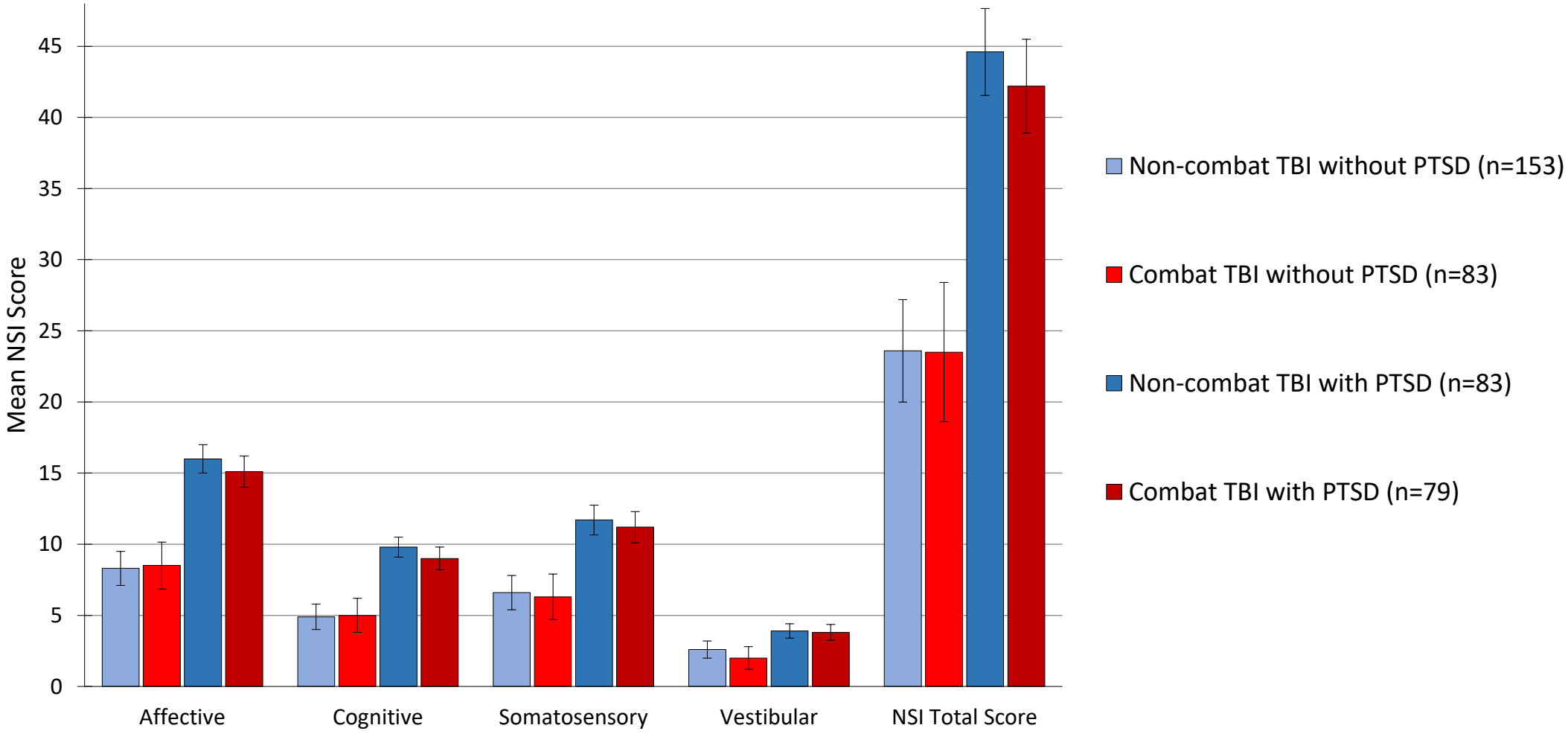
Pre- and Post-Injury Prevalence of PTSD



Combat to non-combat statistical intergroup comparisons: *Chi-squared p-value: 0.24 **Chi-squared p-value: 0.003 ***Chi-squared p-value: 0.08

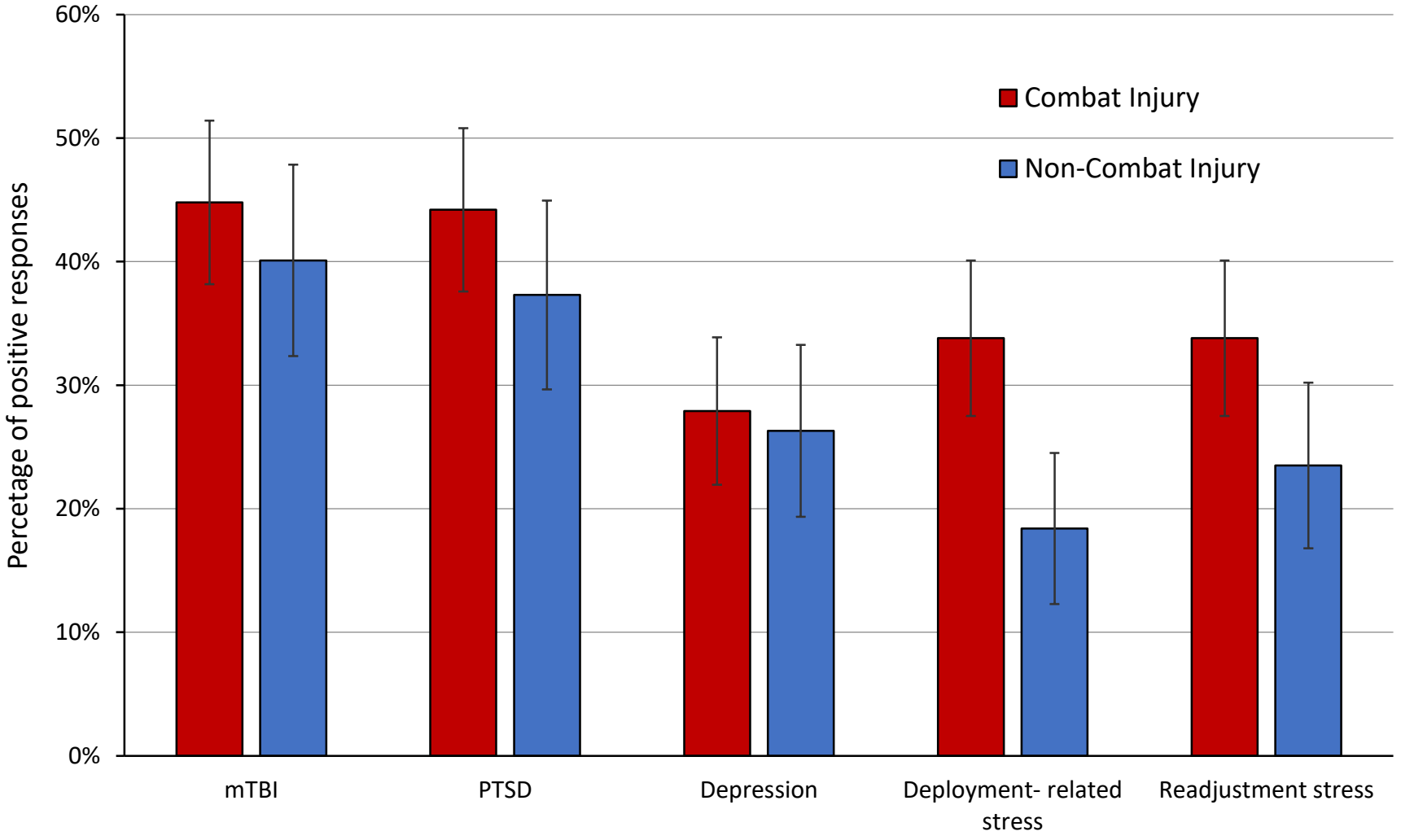
Hardy et al. *J Head Trauma Rehabil,* 2019.

NSI Scores for Combat and Non-Combat Injury, Stratified by PTSD



Hardy et al. *J Head Trauma Rehabil,* 2019.

Attribution Stratified by Combat Injury



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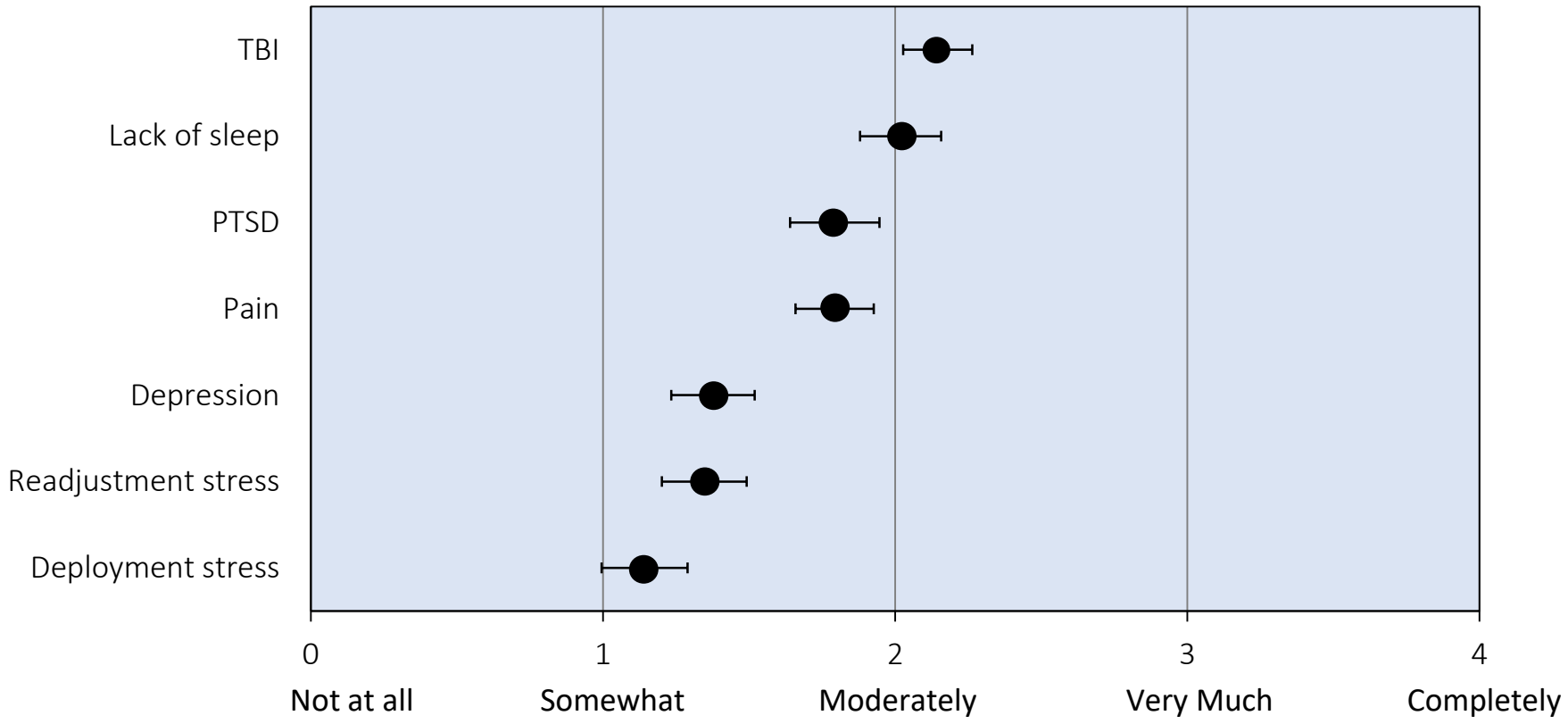
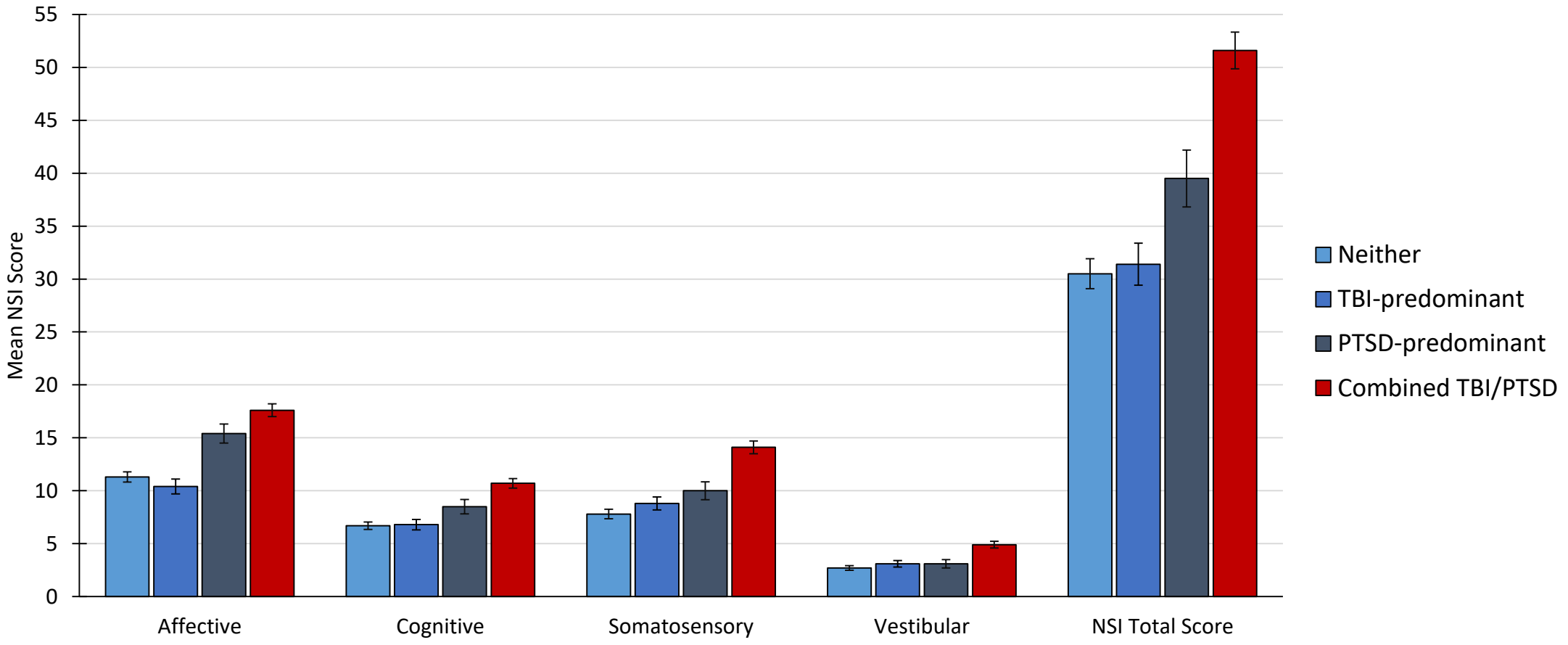
Attribution of Posttraumatic Symptoms



Hardy et al. *J Neuropsychiatry Clin Neurosci,* 2019.

NSI Scores, Stratified by Attribution Category



Hardy et al. *J Neuropsychiatry Clin Neurosci,* 2019.

Conclusions

- High prevalence of PTSD after both combat and non-combat injuries
- Combat not associated with higher post-concussion symptom burden
- PTSD diagnosis associated with higher post-concussion symptom burden, regardless of combat status
- Symptom attribution to PTSD associated with higher post-concussion symptom burden
- TBI patients recognize role of PTSD and other conditions in post-concussion symptoms

Clinical Implications

- Context of injury matters in treatment of TBI patients
- Importance of diagnosing and addressing PSTD during TBI recovery period, especially in combat TBI
- Treatment of post-concussion syndrome and PTSD overlap, but also differ significantly