# The VHA TBI Screening Questionnaire Effectively Identifies Individuals with TBI-Related Multi-Sensory Effects

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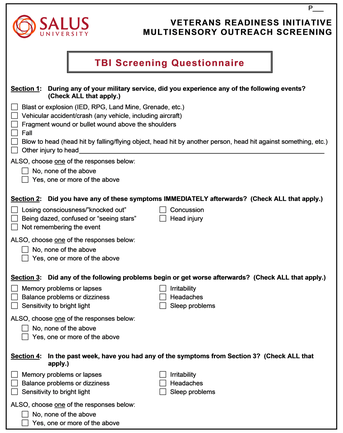
## Background

Service members and Veterans affected by TBI at any level are known to also be affected by vision, hearing, and balance dysfunctions which can affect their reintegration to duty, employment, and life. One arena where this is especially important is in post-deployment and post-service education, because multi-sensory dysfunctions can be substantial barriers to success in these pursuits.

Symptoms associated with blunt head trauma, sudden forceful bodily injury, blast, and/or noise exposure include: blurred vision, headache, dizziness, bodily imbalance, light and noise sensitivity, hearing impairment, ringing in the ears, eye strain, double vision, loss of place or difficulty sustaining focus while reading, forgetfulness, difficulty maintaining attention for extended periods of time, and difficulty with organization and time management. These symptoms may reflect damage to the visual, auditory, vestibular and/or cognitive-communication systems and their complex inter-related pathways for peripheral and central processing in the brain. Because they are often co-morbid with other conditions including post-traumatic stress, these symptoms may cause diagnostic confusion and can be overlooked or discounted by those experiencing them which is concerning because such lingering symptoms can interfere with rehabilitation can affect school and workplace performance and negatively impact employability by limiting sensorimotor and/or cognitive-linguistic endurance.

This study reports the outcomes of multisensory screening of prior Service members (average age: 31.4yrs +/- 8.2 SD) in educational settings for dysfunctions of vision, hearing, balance, and tinnitus. This program was notable for its use of VA's four-question TBI Screening Tool (**Figure 1**), a multi-sensory screening test battery and a multi-sensory symptom survey under development by this research group.



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SALUS UNIVERSITY

VETERANS READINESS INITIATIVE
MULTISENSORY OUTREACH SCREENING

TBI Screening Questionnaire

Section 1: During any of your military service, did you experience any of the following events? (Check ALL that apply.)

- ☐ Blast or explosion (IED, RPG, Land Mine, Grenade, etc.)
- ☐ Vehicular accident/crash (any vehicle, including aircraft)
- ☐ Fragment wound or bullet wound above the shoulders
- ☐ Fall
- ☐ Blow to head (head hit by falling/flying object, head hit by another person, head hit against something, etc.)
- ☐ Other injury to head_____

ALSO, choose one of the responses below:
☐ No, none of the above
☐ Yes, one or more of the above

Section 2: Did you have any of these symptoms IMMEDIATELY afterwards? (Check ALL that apply.)

- ☐ Losing consciousness/"knocked out"
- ☐ Being dazed, confused or "seeing stars"
- ☐ Not remembering the event
- ☐ Concussion
- ☐ Head injury

ALSO, choose one of the responses below:
☐ No, none of the above
☐ Yes, one or more of the above

Section 3: Did any of the following problems begin or get worse afterwards? (Check ALL that apply.)

- ☐ Memory problems or lapses
- ☐ Balance problems or dizziness
- ☐ Sensitivity to bright light
- ☐ Irritability
- ☐ Headaches
- ☐ Sleep problems

ALSO, choose one of the responses below:
☐ No, none of the above
☐ Yes, one or more of the above

Section 4: In the past week, have you had any of the symptoms from Section 3? (Check ALL that apply.)

- ☐ Memory problems or lapses
- ☐ Balance problems or dizziness
- ☐ Sensitivity to bright light
- ☐ Irritability
- ☐ Headaches
- ☐ Sleep problems

ALSO, choose one of the responses below:
☐ No, none of the above
☐ Yes, one or more of the above

**Figure 1. VRI TBI Screening Form 2018**

## Methods

A prospective chart review using data collected at outreach screening events for student Veterans on two community college campuses was approved by the Salus University Institutional Review Board.

The screening model targets working-age, post-9/11 prior Service members who are currently students; it is part of a larger initiative underway at Salus University called the Veterans Readiness Initiative (VRI). The screening protocol is designed to identify sensory system dysfunction associated with head trauma. In addition to VA's four questions, the protocol includes a customized, multisensory symptom -rating intake interview (Intake Interview) and hands-on screening tests for visual acuity, functional vision, hearing acuity, functional hearing, balance, tinnitus, attention, and memory.

Open screening events were hosted at partnering community college campuses from 2015 to 2018. The screenings were conducted by inter--professional teams of students from Salus University's Audiology, Optometry, and Speech-Language Pathology programs, overseen by faculty preceptors. Sixty-five (65) prior-service Veterans were screened. (**Figures 2-3**) Education about the impact of sensory and cognitive-communication dysfunction on performance and employability was provided, as were links to follow-up care by on-site VA staff members.

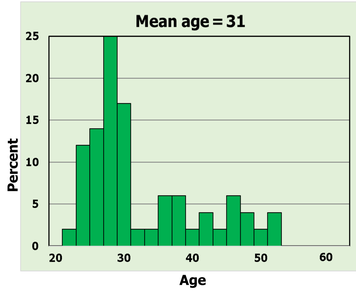


**Figure 2. Histogram of ages of prior Service members screened for TBI and multi-sensory vision, hearing, and balance at community college Veteran screenings.**

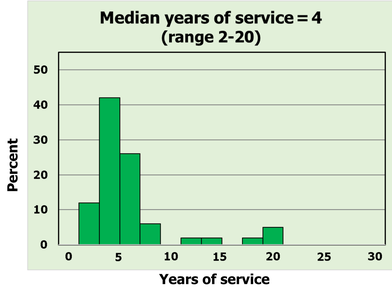


**Figure 3. Histogram showing length of total service for prior Service members (and Veterans) screened for TBI and multi-sensory vision, hearing, and balance at community college Veteran screenings.**

High rates of sensory dysfunction, positive TBI screens (defined as "Yes" to all of VA's four questions), and self-reported symptoms have previously been reported. The present analysis explores whether prior Service members screening positively for TBI present a different sensory profile than those screening negatively. Individuals over age 50 are excluded to avoid any confounding effects of mainly age-related changes. The analysis also introduces the concept of symptom burden as a way to aggregate and quantify dysfunction experienced by the screening participants.

Individuals with and without a positive TBI screen were compared by chi-square or Fisher's exact tests for categorical variables. The significance level was set at 0.05.

## Results

This analysis includes 48 prior Service members under age 50, 17 of whom (35%) screened positive for TBI and 31 of whom (65%) screened negative. Those screening positive were more likely to have visual function, hearing, and tinnitus screening test failures than those who screened negative, but the differences were not statistically significant. (**Figure 4**)

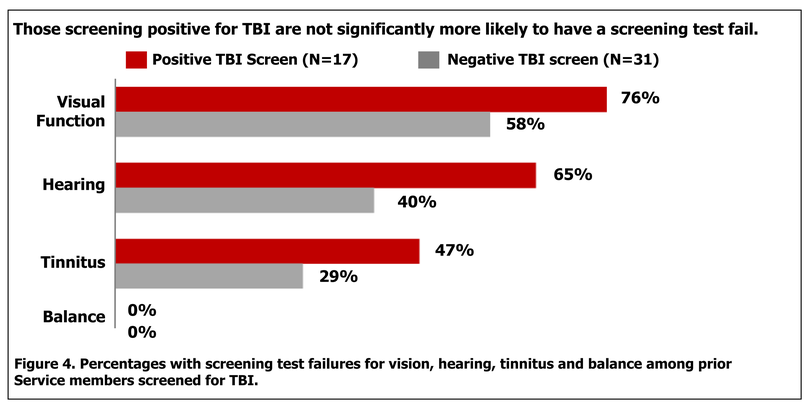


**Figure 4. Percentages with screening test failures for vision, hearing, tinnitus and balance among prior Service members screened for TBI.**

In contrast, the differences in symptom burden between the two groups were more dramatic and statistically significant. (**Figure 5**) And, the pattern of non-significant differences for screening failures and large, significant differences for symptom burdens held when multiple sensory systems were considered. (**Figure 6**)

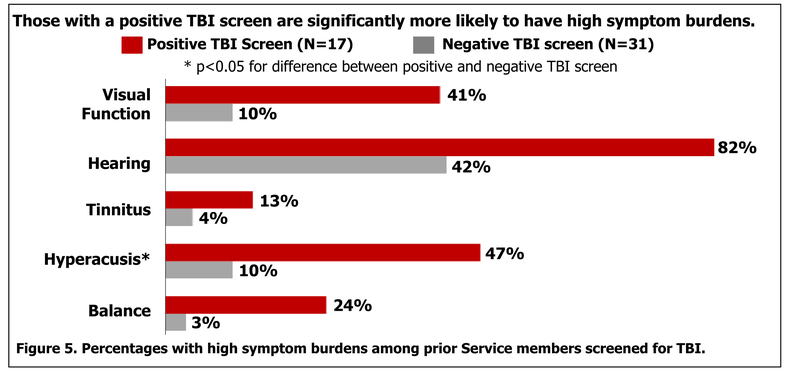


**Figure 5. Percentages with high symptom burdens among prior Service members screened for TBI.**

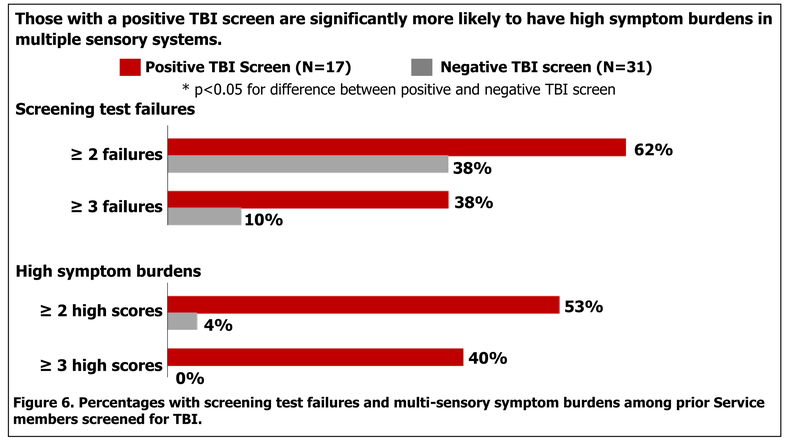


**Figure 6. Percentages with screening test failures and multi-sensory symptom burdens among prior Service members screened for TBI.**

## Conclusions

The VA's four-question TBI screening tool effectively identifies individuals with TBI-related sensory symptoms. The concept of symptom burden quantifies the level of screening participant experienced dysfunction with statistically significant differences in high symptom burden between individuals with positive and negative TBI screens. This result suggests that an easy-to-use-or-administer multisensory questionnaire completed at the same time as VA's four questions could improve access to or shorten the timeline for accessing TBI-related specialty services. An important next step will be to validate this symptom burden survey.

Classification: UNCLASSIFIED

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