

ACUTE AND CHRONIC EXPOSURE TO BLAST: AGGREGATED FINDINGS FROM THE ENVIRONMENTAL SENSORS IN TRAINING (ESIT) MULTI-YEAR STUDY

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Abstract: Across years 2018-2023, U.S. Public Law has stipulated that the U.S. Department of Defense (DoD) measure and record exposure to blast for military service members and study the effects of such exposures, with an intent to prevent or mitigate deleterious effects, especially on brain health. The Environmental Sensors in Training (ESiT) research program at the Walter Reed Army Institute of Research (WRAIR) concluded in 2023 with over 800 enrolled research volunteers exposed to a variety of weapons and explosives in routine tactical training and findings showed associations among outcome measures following acute exposure to blast as well as associations with chronic exposure to blast and other individual differences. In general, ESiT used repeated measures of self-reported symptomology, simple cognitive performance, hearing ability, oculomotor function, and physiological markers of neurotrauma from blood-based assays. Following acute blast exposure, we have observed blast magnitude-related changes in each of our outcome measures and correspondence across outcome measures (e.g.,[1]). There may be a closer correspondence between blast magnitude and objective biomarkers than between blast magnitude and subjective reporting of symptoms. Following chronic exposure to blast, our epidemiologic studies of medical records revealed exposure-related effects in diagnoses of tinnitus, post-concussion syndrome, traumatic brain injury, and deficits in hearing, vestibular, and cognitive function. Associations between study variables may be affected by important considerations in measurement sensitivity, measurement administration, and individual differences in susceptibility. Although the acute effects are transient and not currently diagnoseable as injury, they prompt concern for effects that are believed to accumulate over time and continued exposure, and they reveal effects that can be expected to impair performance and increase risk to safety in tactical training environments.

[1] Boutté, A.M., et al., (2021). *Neurotrauma biomarker levels and adverse symptoms among military and law enforcement personnel exposed to occupational overpressure without diagnosed traumatic brain injury*, in *JAMA Netw Open*, 4(4): e216445.