



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Screening Tools

AccWalker App

Recent research has demonstrated that blast exposure can lead to several forms of neural scarring, affecting components such as cortical blood vessels, the junctions between gray and white matter, and structures lining the ventricles (*Shively et al. 2016*). To better understand the effects of repetitive short-term low-level blast exposure, this work examined changes in neurocognitive testing and neuromotor functioning of Service members exposed to multiple subclinical head perturbations as a result of their participation in heavy weapons (i.e., shoulder-fired weapons) training. The primary question addressed was whether neuromotor performance decline was present in this study population. After being tested for neurocognitive decline, the participant pool was split into two groups (with and without neurocognitive decline) and tested for neuromotor decline, as it is presently unclear if a decline in one domain (i.e., neurocognitive) generally leads to a decline in another (i.e., neuromotor). The researchers hypothesized that neuromotor decline would be observed in participants who exhibited neurocognitive decline and vice versa.

Research is underway at Defense and Veterans Brain Injury Center (DVBIC) supported network sites, Uniformed Services University of the Health Sciences (Bethesda, Maryland), Naval Hospital Camp Pendleton (Camp Pendleton, California), Naval Medical Center San Diego (San Diego, California), as well as the Space and Naval Warfare Systems Command (San Diego, California), the University of North Carolina (Greensboro, North Carolina), and Temple University (Philadelphia, Pennsylvania). Study participants (n = 59) consisted of active duty U.S. Navy personnel trainees newly exposed to heavy weapons training who participated in a 21-day Desert Warfare Training Program. This training included repetitive low-level blast exposure as part of the rocket fire training, which consisted of repetitive firing from shoulder-mounted rocket launchers such as M2CG 94mm (Carl Gustaf), M72 LAW 66mm (light anti-tank weapon), and rocket-propelled grenades with varying munitions. Prior to blast exposures, participants completed a battery of neurocognitive tests and a neuromotor test. The neuromotor test was developed by researchers at the University of North Carolina, Greensboro (Greensboro, North Carolina), who created an Android-based smartphone application (AccWalker App) to capture changes in neuromotor functioning following blast exposure.

Approximately seven days later, participants took part in shoulder-mounted rocket launcher training while outfitted with pressure blast gauge sensors. Within 30 minutes of completing this initial rocket launcher training day, participants were re-tested on the neurocognitive battery of tests and on the neuromotor test; they were then re-tested on these measures again at 24 hours and 72-to-96 hours after completing the training. Trainees with identified neurocognitive decline after low-level blast exposure performed the stepping-in-place task slower and with a higher level of variability in stride time immediately after exposure to blast, compared to trainees without neurocognitive decline.





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Researchers presented data from the first step in developing an objective, portable, field-based, and cost-effective screening tool to measure neuromotor function in a dynamic balance test (*Rhea et al. 2017*). The study demonstrated that neuromotor decline accompanied neurocognitive decline in a subset of participants repeatedly exposed to low-level blast from heavy weapons training. This suggests that neurological dysfunction affects multiple domains of performance.

All participants in this study were exposed to subconcussive low-level blast; this data adds to a growing body of research showing that repeated subclinical head trauma can affect neurological functioning. These findings could impact screening techniques for low-level blast exposure and influence DoD leadership decisions made regarding appropriate medical care.

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