

ABSTRACT

Dizziness and instability are common outcomes of concussion and mild Traumatic Brain Injury (mTBI). Such problems decrease functional ability and patient safety, while adversely affecting cognition and affect. Nevertheless, the latest objective tests of balance/dizziness are not routinely used to aid assessment and diagnosis, nor to monitor recovery. This project intends to fill these gaps. We will develop an enhanced quantitative test battery for evaluating neurophysiological balance dysfunction associated with concussive events or mTBI. This project will deliver a portable initial screening instrument for immediate field assessment after injury, and a battery of sensitive clinic-based tests for monitoring results of therapy during the recovery period. Test sensitivity will be established on groups of military personnel who have or have not been exposed to blast (without concussion) or concussion (without blast). Specificity for differential diagnosis will be established by comparing to individuals diagnosed with PTSD and normal subjects attempting to malingering. This project will be coordinated with another funded effort to assist patients through the entire period of injury and recovery, allowing for initial assessment to aid diagnosis, objective monitoring of recovery, the establishment of criteria for deciding about fitness for returning to duty, and the development of an enhanced program of rehabilitation. A treatment program will be developed in coordination with our other funded effort, which emphasize individualized, automated training to decrease sway under conditions of enhanced balance feedback, to coordinate head-eye movement reflexes normally again, and to balance normally while cognitively engaged in a challenging mental task.

Based on incidence, disability, and cost, TBI is one of the most significant health problems worldwide (McCrae, 2007). In the United States, mild Traumatic brain injury (mTBI) accounts for ~ 90% of the new cases of medically diagnosed head injuries each year (Gottschall, et al., 2003). News reports (News Blaze, 2008) suggest that TBI is the leading cause of death and disability for young people (under age 15). TBI has received significant attention recently during the Global War on Terror. Estimates indicate that 88% -97% of personnel hospitalized in two assessments made in Iraq had been injured by explosions such as IED, mines, or mortars, and the majority of cases involved head injury (Taber et al., 2006). According to a Rand Corporation report cited in the Navy Times (2008), up to 320,000 troops who served in Iraq and Afghanistan suffered TBI. The vast majority of the cases are mild and came from exposure to an explosion, often from a roadside bomb. Most veterans with mild cases recover, but some are left with permanent problems. In a study by vonWild et al (2002), a total of 20.6% of TBI patient reported posttraumatic troubles. Glasgow Coma Scale (GCS) score They were 90.9% mild, 3.9% moderate, and 5.2% severe TBI.

This project consists of two experiments, the first of which entails an assessment and comparison of balance and visual performance among several patient groups of interest. The second experiment entails a comparison of rate of recovery of balance and visual function with or without the benefit of the rehabilitation program proposed. The methods for the first experiment to be performed are described in more detail than the second experiment, because the methods of the second experiment will depend to some extent upon the findings of the first, and because the second experiment involves individualized rehabilitation exercises which must be tailored to the needs of the patient. Relevance to Military Health Care: Head trauma due to explosions, vehicle accidents, and gunshot wounds is the most significant medical problem facing the military. One of the more disturbing and debilitating manifestations of even mild head trauma is loss of postural stability, often accompanied by dizziness/vertigo. This project delivers tools for assessing balance and associated problems due to mild head trauma and establishing rehabilitation programs and return-to-duty criteria. The Armed Forces Epidemiological Board (2006) has noted limitations in the identification and management of personnel who sustain a mTBI and has recommended tools to enhance post-injury neuropsychological assessment.