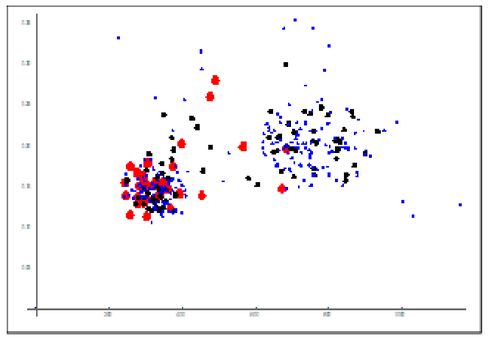
VIST Neuro-ID: Non-Invasive Tool to Assess and Detect Concussion

Technical Description: The Virtual Immersive Sensorimotor Test for Neurological Impairment Detection (VIST Neuro-ID) **uses an immersive virtual reality (VR) headset, collects sensor-based measures, detects biomarkers of impairment using machine learning (ML) algorithms, and displays easily interpretable results so clinicians can *see* a patient's deficits**. With these features, the VIST Neuro-ID can provide unparalleled decision support for effective concussion management.

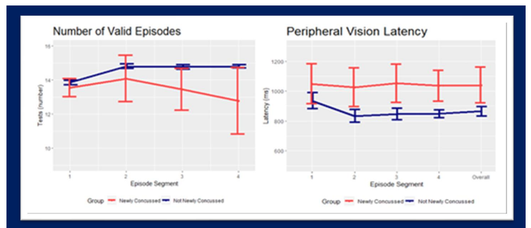
Relevance to DOD: The Neuro-ID is the **first device to identify and quantify specific deficits of brain function, allowing Service Members to receive targeted rehabilitative treatment for the identified deficits, thusly promoting recovery.**

Early Results: Sensor based data has been collected on 1041 individuals with and without a concussion. We are currently working with SouthWest Research Institute (SwRI) to identify metrics of performance within each of the 8 tests.

We have identified: ***Poorer performance and consistency on the smooth pursuit test in individuals with acute concussion. Individuals with acute concussion demonstrate peripheral vision perception is accurate, but the cortical processing time is delayed.***



Localization of acutely concussed (red), previously concussed (black), and participants with no history of concussion (blue) in a two-feature space derived from gaze fixation in smooth pursuit.



Peripheral vision test. Acutely concussed subjects displayed decreased numbers of valid tests (i.e., eyes did not fixate on central object) in the last quartile of testing (left) ($p<0.02$). In all episode segments, concussed subjects required more time to make a choice, with significant differences in the 3rd and 4th segments (right).

Next Steps: Initial analytics on collected data will be complete by May 1, 2024. This data will be used to support a Phase I STTR with the National Institute of Neurological Disorders and Stroke (NINDS). We will be using the metrics to build a machine learning classifier for concussion and will develop the fully functional prototype for clinical validation studies.

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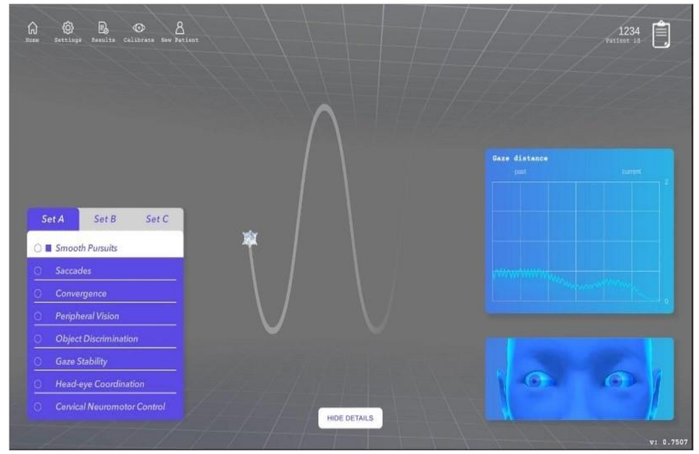

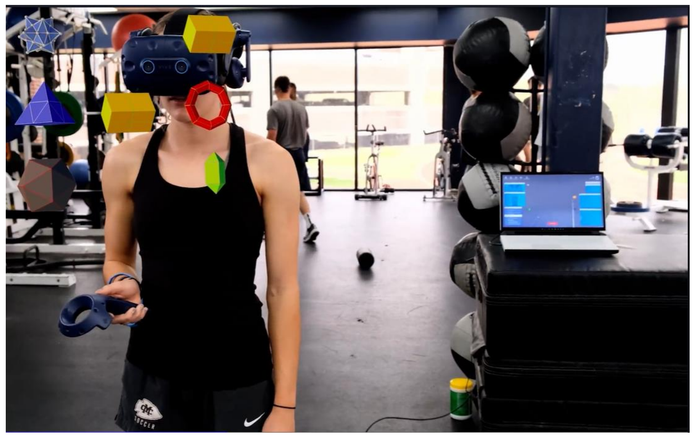

The VIST Neuro-ID makes an invisible injury visible by detecting subtle functional impairments inherent to concussion so that personalized and targeted treatment can be initiated for enhanced management.