



Complete Mental Counts for Patients Recovering from Brain Injury

Public Health Relevance

The proposed touchscreen measures of mental functioning would inform interventions for neurocognitive disorders after traumatic brain injury, akin to how blood work informs interventions for infection-triggered immune disorders. Innovations in human-computer interaction enable patient recovery monitoring with exceptional sensitivity and high accessibility through voluntary interactions with standard touchscreen devices. The ultimate benefits are novel assessment reports that support timely and personalized interventions, leading to better patient outcomes and lower societal costs.

Abstract

1/ This project seeks to commercialize *MindCount*: a computerized assessment aid based on visuotactile measures of mental functioning to inform interventions for neurocognitive disorders after traumatic brain injury (TBI), akin to how complete blood counts inform interventions for immune disorders following infections. Inertial forces during TBI insults, such as rapid head acceleration-deceleration, can cause diffuse axonal injury throughout the brain, disrupting networks that control everyday mental functioning. There is a strong need for sensitive and accessible tools to monitor mental functioning and patient recovery. *MindCount* is a clinical decision support tool for prioritizing intervention targets and monitoring treatment response across neurobehavioral conditions, from neurocognitive to mood disorders. In research settings, *MindCount* can help elucidate dynamic interactions between mental domains and dimensions, from Movement Initiation and Dynamics in the Reflexive domain to Attention and Planning in the Cognitive domain. The ultimate benefits are actionable assessment reports that support timely and personalized interventions, leading to better patient outcomes and lower societal costs.

2/ Innovations in human-computer interaction enable exceptionally sensitive and highly accessible assessment of mental functioning based on spatiotemporal analyses of finger slides, tracks, and tap sequences. *MindCount* is deployable to any touchscreen device via software-as-a-service subscriptions, facilitating rapid distribution. A prior NSF SBIR project produced a test battery prototype and found systematic psychometric mappings, such as slower reactions given higher cognitive load. A subsequent clinical study found large case-control differences across *MindCount* measures, indicating clinical feasibility.

3/ This project aims to expand, validate, and productize *MindCount* as an aid for monitoring patient recovery. The proposed case-control studies are designed to verify the claims that *MindCount* can assess and monitor changes in mental dysfunction. Phase I will focus on post-TBI inpatients while Phase II will study them as they progress from inpatient to outpatient care. The primary success metric is large case-control differences across *MindCount* measures—as quantified by effect sizes—indicating clinically meaningful efficacy. Secondary success metrics include high usability, good test-retest reliability, and significant associations with reference tests, including patient outcomes. Target users and buyers have expressed enthusiastic interest.