

Statistical Analysis Plan for DOD2: Can Early Initiation of Rehabilitation With Wearable Sensor Technology Improve Outcomes in mTBI?

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Statistical Analysis Plan

To evaluate differences in primary and secondary outcomes (all but Patient Global Impression of Change and Dynamic Visual Acuity), we used linear mixed-effect (LME) models with an intention-to-treat design. This statistical approach factors in the 6-week wait as well as the intervention time for the later physical therapy (PT) group, and allowed us to include data from all participants even those who withdrew or were lost to follow-up. Each LME model contained fixed effects for PT onset group (earlier or later PT), time since injury, and the group x time since injury interaction. The interaction effect examined the difference of change in the outcomes over time based on the group. The later PT group served as the reference. Both linear and quadratic time since injury were assessed in the model, and linear time was included in the final model. The full LME models also included apriori covariates of age, gender, and initial SCAT symptom severity total score, and random intercepts to account for within-participant correlations. Outcomes were assessed for normality assumptions in the LME models and were log transformed if necessary. We accounted for participants that withdrew or were lost to follow-up using inverse probability weighting in the model and sensitivity analyses were performed for inverse probability weights.

Primary Outcome

- 1) Dizziness Handicap Inventory (DHI)

Secondary Outcomes:

- 2) Neurobehavioral Symptom Inventory (NSI)
- 3) Quality of Life After Brain Injury (QOLIBRI)
- 4) Return to Activity Question
- 5) Vestibular/Ocular-Motor Screening (VOMS) Tool
- 6) Mini-Balance Evaluation Systems Test (Mini-BESTest)
- 7) Modified Balance Error Scoring System (mBESS)
- 8) Automated Neuropsychological Assessment Metrics (ANAM)
- 9) Instrumented Sway
- 10) Instrumented Walking
- 11) Complex Navigation Task
- 12) Central Sensorimotor Integration (CSMI) Test
- 13) Auditory Processing

Other Pre-specified Outcomes

- 14) Post-concussion Symptom Scale From the Sport Concussion Assessment (SCAT) Tool Version 5
- 15) Insomnia Severity Index (ISI)
- 16) Head Impact Test (HIT) – 6

Statistical Analysis Plan for Patient Global Impression of Change (Secondary Outcome)

The Patient Global Impression of Change (PGIC) is an ordinal variable where participants rate their global assessment of change on a scale from 1 to 7. To test whether the group with Earlier PT had larger improvements in the PGIC than the Later PT group, we conducted a Mann-Whitney U test to assess group differences in PGIC scores.

Statistical Analysis Plan for Dynamic Visual Acuity (Secondary Outcome)

We used a linear mixed-effect (LME) model with an intention-to-treat design. The LME model contained fixed effects for PT onset group (earlier or later PT), time point (pre-PT or post-PT), and the group x time point interaction. The interaction effect examined the group difference of change in the outcomes between time points. The later PT group and pre-PT time point served as the references. The full LME model also included apriori covariates of age, gender, initial SCAT symptom severity total score, days since injury before starting PT, and random intercepts to account for within-participant correlations. Outcomes were assessed for normality assumptions in the LME models and were log transformed if necessary. We accounted for participants that withdrew or were lost to follow-up using inverse probability weighting in the model and sensitivity analyses were performed for inverse probability weights.