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Multidimensional Cognitive-Communication Assessment for Concussion

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January 17, 2024

TO: Office of the Vice President for Research and Creative Scholarship

FROM: Catherine Off (PI), Professor & School Chair, School of Speech, Language, Hearing, & Occupational Sciences

Thank you for funding "***Multidimensional Cognitive-Communication Assessment for Concussion***" (M25275) for the 2022-2023 funding cycle. The following report details the progress made and the future directions related to this project. A no-cost extension was granted by Dr. Quindry on 4/18/23.

BACKGROUND & SIGNIFICANCE

Up to 503 out of every 100,000 individuals in the United States are living with mild traumatic brain injury (mTBI), also known as concussion. The economic impact of concussion is substantial, accounting for about 44% of the 56-billion-dollar annual cost of TBI in the United States. Approximately 15% of mTBI survivors will experience persisting symptoms. In typical cases, symptoms last 2-4 weeks, but for those with persisting symptoms, symptoms last 3.35 years, on average. Objective measures designed to document the cognitive effects of brain injury often do not capture subtle symptoms reported by patients three or more months post-injury. Subjective self-report changes are likely to represent global distress and over interpretation of symptoms rather than real life challenges at that time point. Relying on one assessment to effectively and completely document cognitive-communication deficits following concussion is futile, as many individuals demonstrate varying outcomes dependent on the tool used. When using standardized measures, 40% of individuals show evidence of objective cognitive impairment despite self-reports of being symptom free. Conversely, individuals with concussion report deficits that are not observable on objective cognitive testing. Finally, individuals with concussion report limited to no satisfaction with current post-injury care methods, suggesting that available evaluation techniques result in a mismatch between their daily experiences and rehabilitative professionals' assessment of functioning. Using a combination of assessment techniques to document real-world functioning is recommended by researchers and clinicians alike. Reconciling the difference between self-perceived changes and objective, observable cognitive deficiencies is a critical component to the assessment process for individuals with concussion.

AIM

The long-term purpose of this research is to explore an ecologically valid, multidimensional assessment protocol that can identify and characterize persisting yet subtle, cognitive-communication symptoms following concussion.

METHODS

Research Design. This project was a quasi-randomized experimental study aimed at identifying the relationship between self-report, standardized, and functional cognitive measures used to evaluate persisting symptoms of concussion. **Participants.** We aimed to recruit 10 participants with persisting symptoms of a single concussion; and 10 participants without brain injury (IRB#113-22). We were successful in recruiting 10 participants without brain injury, and 3 participants with concussion. Only 1 participant with concussion met inclusionary criteria. **Procedures.** Participants completed the research protocol as follows across 2 sessions (4-6 total hours). These procedures occurred across a 1-2 week period for each participant, with no more than three weeks passing between initial screening and completion of the protocol. **Initial Screening.** Following consent and enrollment all participants completed the Brain Injury Screening Questionnaire (BISQ) to document the presence or absence of brain injury. During session #1, participants completed 4 self-report measures using Qualtrics survey software and were administered

a battery of standardized cognitive assessments. During session #2, participants completed functional cognitive tasks focused on task planning and task execution in natural settings: (1) in the presence of the researcher(s) within a natural environment (i.e., university campus, local neighborhood); (2) independently in their home environment.

INITIAL RESULTS

Data was collected beginning late summer 2022 through fall 2023 – extending past the original 1-year period of funding to attempt to recruit additional participants with concussion. Preliminary data stemming from the 10 healthy control participants (8 female, 2 male, 18-26 years old) and 1 participant with concussion (female, 20 years old) are summarized below. Additional analyses are currently being conducted. Dissemination of these results will be withheld until additional recruitment of participants with concussion is feasible.

Table 1. Descriptive Statistics for Cognitive Standardized Measures

Measure & Scoring	Type of Assessment	Mean Healthy Controls	SD Healthy Controls	Participant with Concussion
COWAT (no max)	Standardized Cognitive	93.38	13.96	109
WAIS-IV (0-16)	Standardized Cognitive	7.25	1.6	5
HVLT-R (0-12)	Standardized Cognitive	10.88	1.25	12
Delis-Kaplan (0-100)	Standardized Cognitive	90.25	12.25	93
NEURO-QOL	Self-Report	40.78	7.28	58
BRIEF-A	Self-Report	24.2	14.68	49
QOLIBRI	Self-Report	62.3	11.27	48
PROMIS	Self-Report	46.67	9.46	80
Planning Time (min)	Functional Cognitive	16.40	7.868	6
Execution Time (min)	Functional Cognitive	28.89	8.07	25
Tasks Attempted (X/12)	Functional Cognitive	11.33	1.11	10
Tasks Completed (X/12)	Functional Cognitive	9.78	1.92	3
Rules Broken	Functional Cognitive	0.56	0.73	2
Total Score (5)	Functional Cognitive	81%	16%	25%

Preliminary analysis of these pilot data suggests that our single participant with concussion falls within normal limits for standardized cognitive testing, but reports significantly reduced quality of life across self-report measures compared to healthy controls. Data from the functional cognitive assessment demonstrate that our single participant with concussion fared much worse than the healthy control participants for the number of tasks completed, reflecting a significant impairment of functional cognition. These preliminary results provide support that additional research is needed to better understand the range of challenges observed in individuals with concussion. As collaborators on campus who are interested in examining concussion continue to increase, my lab will work to move this line of research forward. Formalized collaborative efforts (e.g., direct referral from clinical providers) to recruit individuals with concussion are needed to make this line of research successful in Missoula.