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Faith M. Urbanik  
*A. T. Still University*

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## A Cognitive Protocol for Individuals with Concussion

Faith Urbanik, OTDS; Jyothi Gupta, PhD, OTR/L, FAOTA; Amanda Miller, OTR/L, NDT-OT, MLD/CDT, V2FIT, AIB-VR/CON

Occupational Therapy Doctoral Program, A. T. Still University, Mesa, AZ

### Introduction

- Approximately 3.8 million sports-related concussions occur annually in the United States
- A concussion is identified as a mild traumatic brain injury (mTBI) that is caused by a direct blow to the head, neck, or face and is accompanied by headache, dizziness, decreased concentration, nausea, memory problems, irritability, fatigue, visual and sleep disturbances, sensitivity to noise, judgement problems, depression, and anxiety
- When symptoms persist several months to a year following injury, it becomes post-concussion syndrome (PCS)
- Memory is the most common impairment following mTBI and attention, orientation, and problem-solving impede an individual's ability to successfully return to work
- Aims:** This pilot study aim is to assess the efficacy of the addition of a bottom-up cognitive protocol to standard OT treatment for improved cognitive outcomes for individuals with concussion or PCS and to demonstrate that having participants practice cognitive exercises for various cognitive subdomains will result in improvement in these subdomains

### Methods

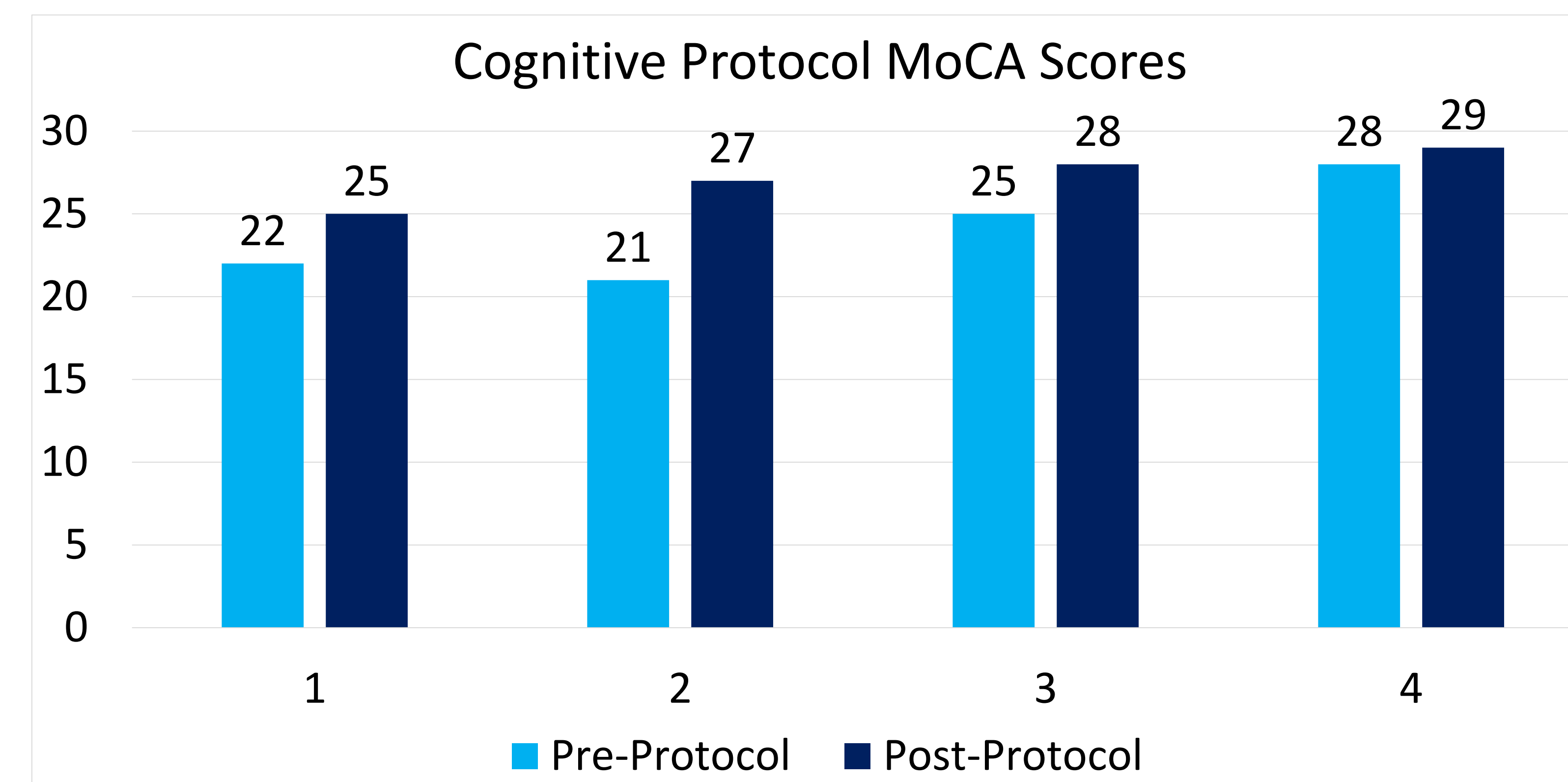
- Design and setting:** A pilot study with an experimental group and a matched control group that took place at Barrow Neurological Institute's (BNI's) Outpatient Neuro Rehabilitation Center upon approval from BNI's and ATSU's Institutional Review Board
- Participants:** Adults ages 18 years or older, who are three days to six months post-concussion with mTBIs, namely concussions or PCS, were included in this study ( $n = 8$ )
- The control and experimental group data for each participant was procured from Well Sky Rehabilitation software according to inclusion criteria, using retrospective and prospective chart review, respectively
- A cognitive protocol was administered to experimental group participants over the course of 12 weeks for a maximum of three-half-hour weekly visits to improve subdomains of cognition. See *Table 1*
- The Montreal Cognitive Assessment (MoCA) was administered to the experimental group and the Post-Concussion Symptom Scale (PCSS) was administered to both groups before receiving the cognitive protocol and at discharge (12 weeks)

Subdomains of Cognition	Cognitive Exercise
Visuospatial function	Bioness Integrated Therapy System (BITS), Marsden ball, tangrams, educational strategies, Hart Chart decoding with accommodation
Executive function	Fictional scenarios that require participant to identify problem & brainstorm solutions, Multi-Matrix (cognitive load)
Naming	Naming items to 50-70 beats per minute on a metronome from pre-selected categories
Memory	Provided educational strategies for internal and external cognitive approaches with guided examples
Attention	Dual task of ball toss and following pre-selected verbal prompt, BITS complex array dual task
Language	Word and sentence unscramble, anagrams, word finding activities
Abstraction	Open and closed card sorting activities, SET game
Recall	Card matching, tangrams <i>quick presentation &amp; removal</i>
Orientation	Identifying personal and spatial awareness through a series of photographs provided by principal investigator

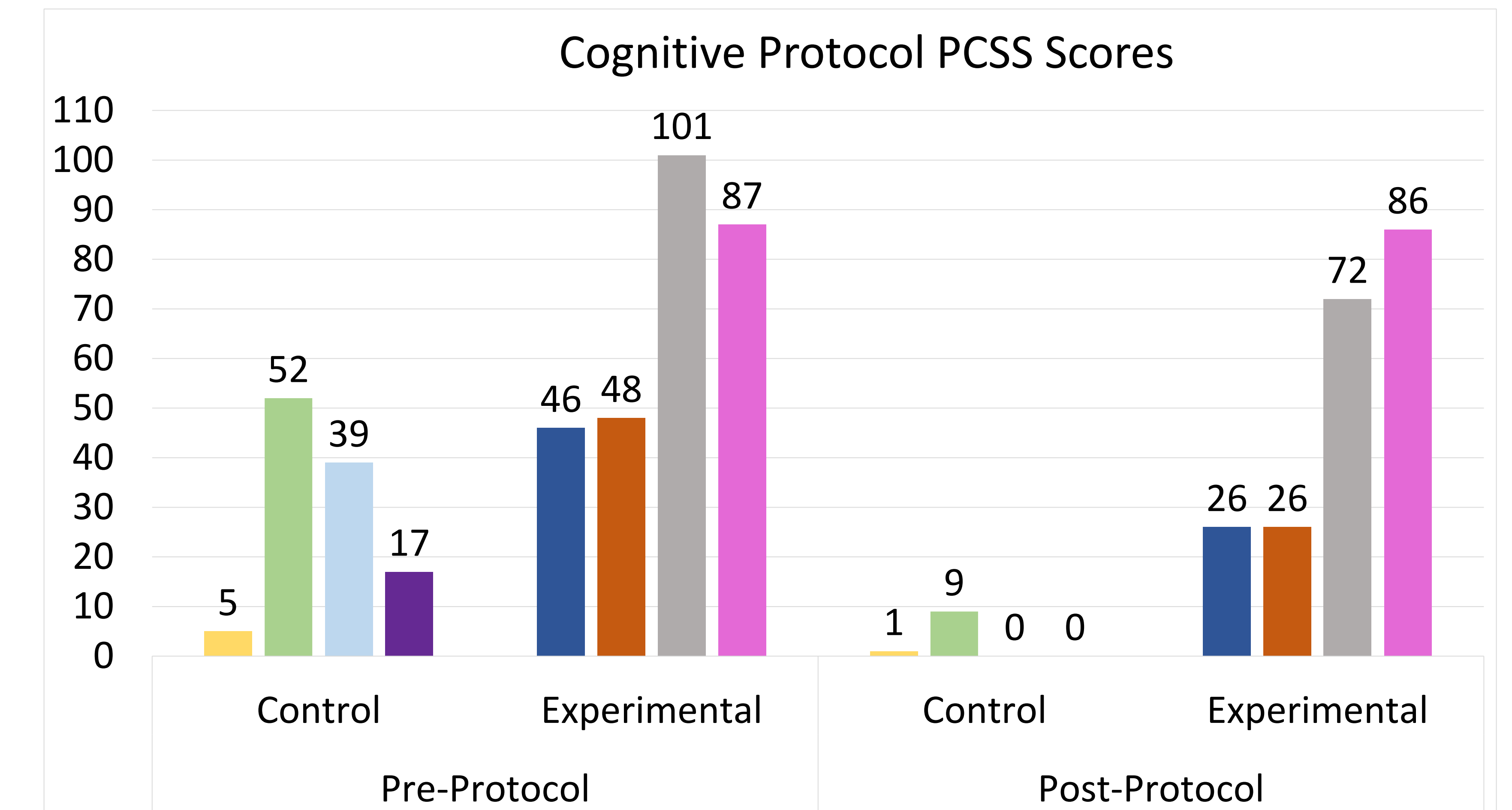
**Table 1: Cognitive Protocol for Subdomains of Cognition**

### Results

- This pilot study started with  $n = 12$ ; however, the results presented are based on  $n = 8$ , as four participants were excluded due to inability to obtain final assessment scores. Of these, two are male and six are female with ages ranging from 18 to 66
- The data trends in Figure 1 illustrate the respective MoCA scores from the experimental group at pre-intervention as compared to post-intervention. *Note: a mild cognitive impairment = 19-25/30*
- The data trends in Figure 2 illustrate the PCSS scores from the control and experimental group at pre-intervention as compared to post-intervention



**Figure 1: Cognitive Protocol MoCA Scores**



**Figure 2: Cognitive Protocol PCSS Scores**

### Discussion

- Figure 1 illustrates improvements on the MoCA post-intervention scores as compared to pre-intervention scores indicative of improved cognition among respective subdomains of cognition
- Figure 1 data support the hypothesis such that using a cognitive remediation approach allows for neuroplastic growth opportunities following an mTBI
- Figure 2 depicts improvements in physical manifestation of concussion symptoms, in areas of sleep, thinking, physicality, and emotionality, as evidenced by decreased participant report of symptoms on the PCSS
- Limitations include COVID-19, self-report measures,  $n = 8$ , and determining effectiveness of the protocol void of standard OT care

### Implications for OT Practice

- This pilot study affirms the importance of an occupational therapy-led cognitive remediation approach for successful mTBI rehabilitation as occupational therapy practitioners can facilitate neuroplastic changes. The implementation of a cognitive protocol among standard occupational therapy care notably improves the prognosis for individuals with mTBIs as evidenced by improved cognitive outcomes allowing for success in return to work or school.

### References

- See Citations List

### Acknowledgements

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