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Introduction

Persistence of Symptoms in Mild Traumatic Brain Injury
- Mild traumatic brain injury (mTBI) is the most common type of brain injury, accounting for 75%[1] of the estimated 1.7 million people who sustain a TBI in the USA each year[2]
- Although about 80% of cognitive symptoms resolve 6 months post-injury following a mTBI, a subgroup of people experience a persistence of cognitive changes into the post-acute stage of recovery. These individuals report difficulty in social, vocational, and emotional functioning[3]
- **Problem:** Despite a persistence of functional cognitive deficits, neuropsychological test may not detect these mild impairments[4]

Language's Role in Cognition
- Cognitive-linguistic tasks, such as discourse, may be more sensitive tool to detect subtle cognitive-communication deficits in mTBI
- Discourse, or connected language used in context, is a complex linguistic task which requires multiple skills such a linguistic, attentional, memory, and executive functioning cognitive domains
- Differences in macro and micro linguistic analyses of language samples may reveal cognitive impairments in mTBI

Research Questions:

1. Do individuals who have had a TBI and experience persisting cognitive symptoms, yet no group differences on cognitive measures from a control group, have differences in micro and macrolinguisitc measures of discourse?

2. What factors correlate with discourse measures?

3. Is there a difference in discourse measures between the mTBI and severe TBI group?

Results

- A one-way ANOVA was conducted to determine a difference of participant (TBI vs. non-TBI) on propositional density without fillers (PDWOF). The result showed a significant difference between TBI (M: .49, SD: .02) and control (M: .52, SD: .02), $F_{(1,9)} = 6.33$, p= .03. This means that the control had a higher PDWOF than TBI group

Propositional Density Without Fillers		m	SD	Sig.
	TBI	.4896	.02155	.033
	Control	.5244	.02434	

To explore additional discourse variable, a one-way ANOVA was conducted. A bonferroni adjustment of .006 was used to reduce type-1 error. The results showed no significant difference on propositional density with fillers, cohesion, coherence, TTR, and words before the main verb discourse variables

- A second analysis was conducted to determine the correlation between cognitive, linguistic, and educational variables and discourse variables of both groups. A Kendall Tau correlation was conducted and results revealed a positive correlation between PDWOF and the STAI-1. However, due to limited cognitive overlap between the two tasks, results were determined to be spurious

- Lastly, a one way AVONA was conducted to determine if there were differences on all discourse measures between the mild and severe TBI participants. Results indicated no significant differences between these two groups

Methods

Participants:

n	Adults 18+ years
5	No significant neurological history
6	Mild closed-head injury
2	Severe closed-head injury

*Participants with TBI had a self-reported closed head injury and persisting cognitive symptoms at the time of testing. No other significant neurological impairments, learning disability, or language impairments were reported. Subject data used for this analysis were taken from a larger study examining the relationship between sentence processing and event related potentials.

Cognitive Testing:
- PHQ-9
- STAI-1 & 2
- DSF, DSB, DSO
- Shipley Vocab
- PNT
- Trails A & B
- Stroop Test
- COWA

Discourse Elicitation Task

The "Trip to New York" discourse task was administered by asking participants to describe how they would prepare for a trip to New York City. Specific instructions were in accordance with Kiran et al., 2005 and Kiran et al. 2006.

"Imagine that you are going on a vacation a week from now. You are travelling to NYC for a two-week stay. Think about all you will have to do to get ready to go, such as how you will get there, what you will bring, and what you will do. I want you to tell me all of your plans until I ask you to stop after about five minutes."

Transcription

The samples were audio-recorded and later transcribed verbatim. Each transcript was transcribed by two students, and then a third student checked for reliability. For all transcriptions, inter- and intrarater word-by-word agreement was >99%.

Text-Analysis Tools

Discourse samples were analyzed for the following variables: propositional density with and without mazes, cohesion, coherence, type token ratio (TTR), and words before main verb using the following automatic text analysis tools:
- Computerized Propositional Idea Density Rater (CPIDR)
- Coh-Metrix

Discussion

Cognitive-Linguistic Differences Between TBI and Control
- Results indicated that PDWOF, a microlinguistic measure of semantic complexity, was significantly higher in the control group. This may contribute to a measure of less cognitive reserve in the mTBI population
- Discourse which contains more propositionally complex sentences are found to be better organized, clear, and comprehendible to the listener[5]
- The TBI group seemed less skilled at applying the strategy of chunking of information compared to the control group. One explanation may be to due the disruption of specialized neural networks which sub-serve both linguistic and non-linguistic discourse functions, namely organizational and executive function abilities
- Lack of differences for other discourse measures may be due to compensatory strategies developed by TBI group or limitations with text analysis software

Severe and Mild TBI Differences
- There were no significant discourse differences between the mTBI and severe TBI group. This may be attributed to the heterogeneity of the TBI population, compensatory strategies, or lack of medical records to determine if injuries could be differentiated by severity

Conclusions

The findings of this study support the idea that discourse analysis may be a useful tool for determining subtle, cognitive-communication deficits in the TBI population that common neuropsychological tests may not detect. Such information may be important clinically for validating persisting cognitive symptoms and guiding effective therapy goals. Linguistic disruptions may reveal cognitive impairments due to diffuse damage of the brain.

Acknowledgments

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