

# Effects of Task Structure on Metacognitive Ability in Traumatic Brain Injury

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## BACKGROUND

Metacognition is a higher order process that involves the ability to reflect on one's own mental processes. Studies in healthy students demonstrate that metacognitive accuracy may be influenced by the structure of the task (Lodewyk, Winne, & Jamieson-Noel, 2009). Healthy individuals have been found to be more aware of their performance when tasks involve a hierarchical or linear structure, and worse when the tasks do not provide an organized structure. These findings have yet to be replicated for individuals sustaining traumatic brain injury (TBI). In this study, structural manipulations were made by altering the sequence of item difficulty in two tasks to investigate the effect of task structure on metacognitive performance in adults with moderate to severe TBI.

### Hypotheses:

1. All participants will demonstrate better metacognitive accuracy on ordered sequence tasks than randomly sequence tasks.
2. Healthy participants will demonstrate better metacognitive accuracy than adults with TBI on both ordered sequence and random sequence tasks.
3. There will be a main effect of task structure (ordered or random) on metacognitive functioning.

References: Lodewyk, K.R., Winne, P.H. & Jamieson-Noel, D.L. (2009). Implications of task structure on self-regulated learning and achievement, *Educational Psychology*, 29 (1), 1-25.

## METHODOLOGY

### PARTICIPANT DEMOGRAPHICS

	N	Age	Years of Education	Time Post Injury
TBI (Average GCS=5.5) (8 female, 10 male)	18	33.2 years (SD=13.9)	14.0 years (SD=2.6)	5.4 years (SD=5.4)
Healthy Adults (12 female, 8 male)	20	34.4 years (SD=14.7)	14.9 years (SD=2.3)	--

### STIMULI

#### Modifications to the Matrix Reasoning Subtest of the WAIS-III

<i>Ordered Sequence</i> (13 stimuli)	<i>Random Sequence</i> (13 stimuli)
• Set of stimuli where sequence of items was preserved so that difficulty increased as task progressed.	• Items were shuffled to create a set of stimuli where the difficulty of items did not follow a hierarchical pattern.

### MEASUREMENT OF METACOGNITION:

- Retrospective Confidence Judgments (RCJs): after every item of the tasks, participants were required to report using a 6-point Likert scale how certain they felt their answer was correct.
- Goodman and Kruskal's gamma coefficients were calculated for each participant for each task.

## RESULTS

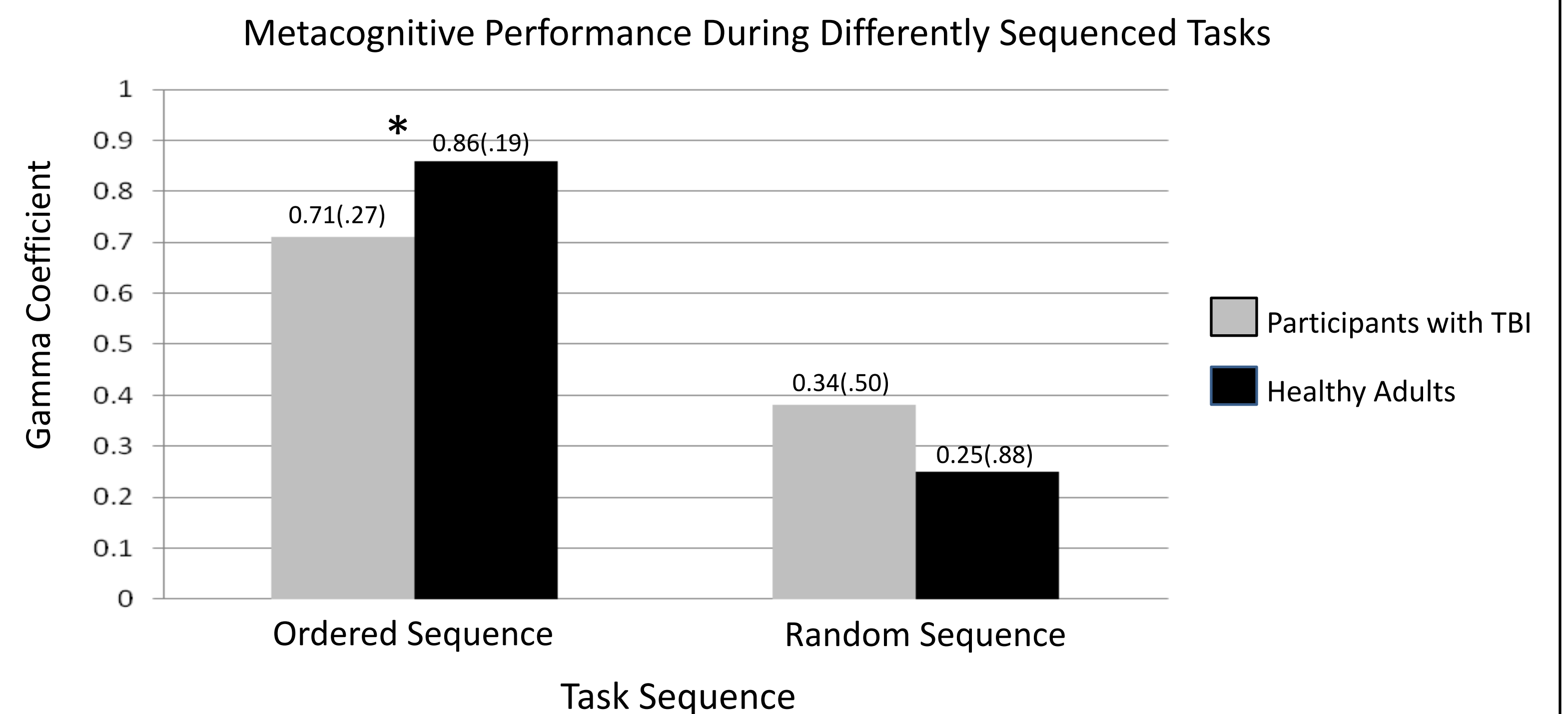


Figure 1. Graph of metacognitive accuracy during an ordered sequence and randomly sequenced task. \* denotes statistical significance at the  $p=0.05$  level. Mean values and standard deviations are listed.

ANALYSIS	RESULTS
Within each group (healthy adults and TBI), was metacognitive accuracy different for ordered sequence tasks and random sequence tasks? → Paired sample t-test	TBI: $t(15)=2.43, p=0.028^{**}$ Healthy Adults: $t(19)=4.85, p=0.000^{*}$
Did the metacognitive performance of healthy adults differ than participants with TBI for each task (ordered or random)? → Independent sample t-test	Ordered Sequence: $t(34)=-2.018, p=0.05^{**}$ Random Sequence: $t(36)=0.74, p=0.47$
Was there a significant main effect of task structure? → Repeated measures ANOVA	$F(1, 34)=25.22, p=0.000^{*}$ ; partial eta squared=0.43
Was there a significant interaction between task structure and group membership (TBI or healthy adult)? → Repeated measures ANOVA	$F(1, 34)=0.276, p=0.209$ ; partial eta squared=0.05

Table 1. Table listing data analyses and results. \* denotes significance at  $p \leq 0.001$ , \*\* denotes significance at  $p \leq 0.05$ .

## CONCLUSION

- The findings suggest that there is a trend for all participants to have better metacognitive accuracy when completing an ordered, structurally sequenced task than a randomly sequenced task.
- In terms of metacognitive performance, healthy adults appear to benefit more than adults with TBI from using a sequentially ordered task.
- Results from the repeated measures ANOVA confirm that sequence structure (ordered or random) has a significant main effect on metacognitive performance; findings did not indicate a significant interaction effect of sequence structure and presence of brain injury (TBI or healthy).