NIH Toolbox Cognitive Assessment in Patients with Drug-Resistant Temporal Lobe Epilepsy vs Controls

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Introduction

- The gold standard for assessing cognitive function for drug-resistant epilepsy (DRE) is comprehensive neuropsychological assessment.
- The information provided assists in surgical planning and prediction of postsurgical cognitive outcomes.
- The NIH Toolbox Cognition Battery (NIHTB-CB) was developed to assess key components of cognition.
- It is a quick iPad-based assessment that is easy to administer, score, and interpret. It is also a cost-effective method to execute and can track trends over time.
- The NIH Toolbox measures have been widely used and validated among individuals with various clinical conditions, but to our knowledge, no studies have been published in patients with drug-resistant epilepsy.
- In this study, we aim to demonstrate that the NIHTB-CB is sensitive enough to identify cognitive differences between drug-resistant temporal lobe epilepsy (TLE) patients and age/gender-matched controls.

Methods

- Patients with TLE undergoing pre-surgical evaluation at our Level IV NAEC (National Association of Epilepsy Centers) Epilepsy Center were screened.
- Patients who were age 18 or older, had confirmed TLE by continuous video EEG monitoring, and who had drug-resistant epilepsy were included in the study.
- Healthy control subjects were matched based on age and gender.
- All participants underwent NIHTB-CB testing. Scores were adjusted for age, gender, race, and education.
- T scores were compared between groups with an unpaired t-test with unequal variances

Figure 1. Participant characteristics

	TLE patients (N=15)	Controls (N=18)
Age - year (Mean ± SD)	**41 ± 11**	**38 ± 11**
Handedness		
Right	**14**	**17**
Left	**1**	**1**
Sex		
Male	**8**	**10**
Female	**7**	**8**
Race – number (%)		
White	**8**	**15**
Black	**7**	**1**
Asian	**0**	**2**
Education		
High school	**7**	**1**
College	**7**	**5**
Masters and beyond	**1**	**12**
English first language (Yes)	**15**	**16**
Epilepsy diagnosis		
Dominant temporal	**7**	**N/A**
Non-dominant temporal	**6**	**N/A**
Bi-temporal	**2**	**N/A**
Duration of epilepsy – year	**15 ± 18**	**N/A**

Figure 2. Mean T - scores for NIHTB-CB measures

Cognitive domain	Test	Mean TLE patients	Mean Controls	P - value
Attention and executive function	**Flanker Inhibitory Control and Attention Test**	**39**	**52**	**0.001**
	Dimensional Change Card Sort Test	**42**	**56**	**0.004**
Episodic memory	**Picture Sequence Memory Test**	**49**	**55**	**0.15**
Working memory	**List Sorting Working Memory Test**	**40**	**52**	**0.003**
Processing speed	**Pattern Comparison Test**	**37**	**55**	**0.004**
Language	**Oral Reading Recognition Test**	**52**	**62**	**0.05** ←
	Picture Vocabulary Test	**47**	**55**	**0.1**

Results

- 33 subjects were recruited: 15 TLE patients with a mean age of 41 and 18 control participants with a mean age of 38.
- There was a notable difference between groups in education and race.
- As assessed by the NIHTB-CB, the control participants scored significantly higher than the TLE patients on measures of attention and executive function, working memory, and processing speed.
- There was a trend towards significance in the language domain.
- There was no difference in episodic memory.

Conclusion

- Control participants performed significantly better than TLE patients across most cognitive domains (attention/executive function, working memory, and processing speed).
- NIH toolbox cognitive battery can be used as an adjunct test in patients with drug-resistant temporal lobe epilepsy.
- It will be a particularly useful tool to assess cognitive trends over time in this population group, especially if a patient is undergoing surgery vs neurostimulation.

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