

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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