

The TIME Study: Topographical Memory in Transient Epileptic Amnesia prior to Treatment.

Matthew Lomas¹, Sharon Savage^{1,2}, John Baker¹, Adam Zeman¹

¹Medical School, University of Exeter, Exeter, UK; ²Psychology Department, University of Exeter, UK

Background

- Transient epileptic amnesia (TEA) is a sub-syndrome of temporal lobe epilepsy (TLE).¹
- Seizures manifest as brief spells of amnesia.¹
- In a third of TEA cases, patients report interictal disturbance of memory for familiar places and routes.¹
- Similar problems have been observed in clinical populations with other temporal lobe pathologies (e.g. TLE² and Alzheimer's³).
- Here, we describe the first empirical investigation into topographical memory performance in a group of pre-treatment TEA patients.

Hypothesis

Participants with TEA will perform at a lower level than a group of healthy matched controls.

Method

- Patients with TEA and control participants were recruited to 2 groups. See Table 1 for further information.

Table 1

Demographic characteristics of participants.

Group	Total N	M Age	Gender Distribution
TEA	16	64.4	13m to 3f
Control	26	64.0	19m to 7f

- Eligibility criteria for TEA included:
 - ≥ 2 amnesic episodes
 - within 2 weeks of starting treatment.
- Healthy controls were matched to patients on age, gender distribution, education history.
- All participants were cleared of other history of neurological conditions or psychiatric disorders.
- We report the results on measures of:
 - IQ (Wechsler Test of Adult Reading)
 - Visuospatial processing (Rey & Modified Taylor Complex Figure Copy - CFT)
 - Visuospatial recognition memory (Warrington's Recognition Memory Test for Faces - WRMT)
 - Topographical memory (4 Mountains Test – 4MT).³
- The 4MT is illustrated in Figure A. Participants inspect images of mountain landscapes for 10", then identify the same location at a different angle from a choice of four.

- One point is awarded for each correct answer (max. 30).

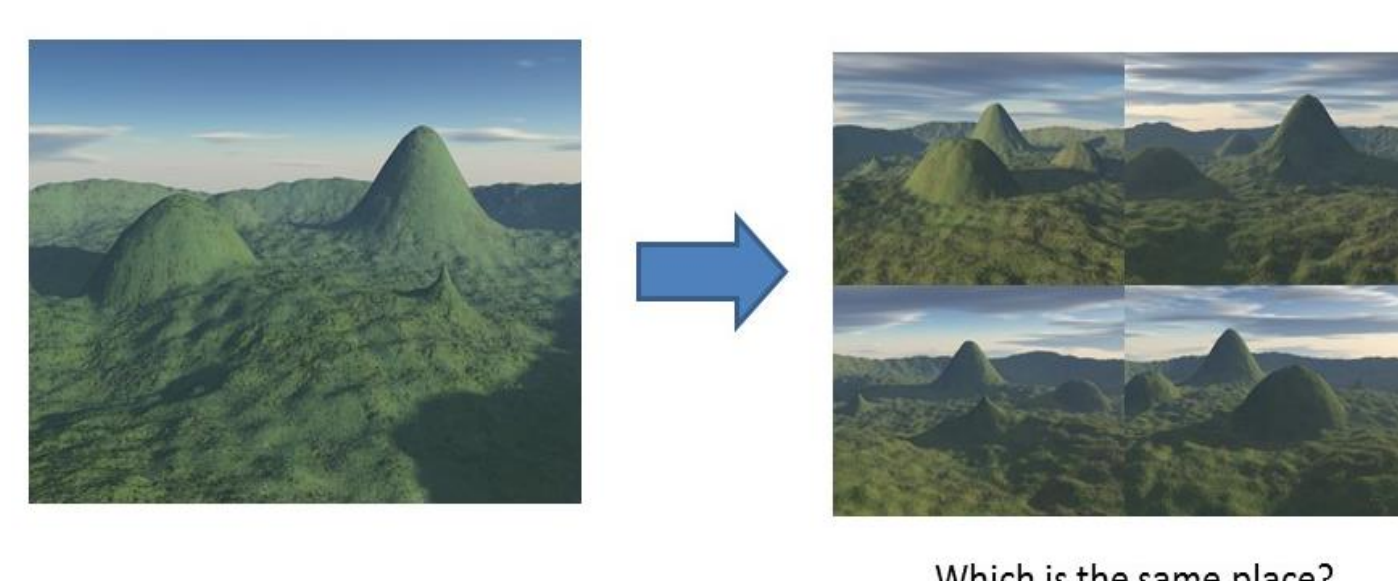


Figure A: An example of stimuli used in the 4MT.

- Prior to assessment, all patients were asked if they had experienced topographical amnesia.

Results

- 62.5% participants in the TEA group reported experiencing interictal topographical amnesia.
- Group means were compared independently for the aforementioned measures with one-way ANOVAs.
- No significant differences were found between groups, for measures of age ($F = .02, p = .89$); IQ ($F = 3.4, p = .07$); visuospatial processing (CFT, $F = .07, p = .79$) and visuospatial recognition (WRMT, $F < .01, p = .98$). See Table 2 for further details.
- In comparison of performance on the 4MT, the control group correctly identified more locations on average than the TEA group. This difference was found to be significant ($F = 12.7, p < 0.01$). See Figure 1 for a group comparison.

Table 2

Comparison of task performance.

Measure	TEA	Control
M IQ	106.1	110.3
M CFT (36)	33.3	33.1
M WRMT (50)	41.3	41.3
M 4MT (30)*	16.2	21

Note: () = maximum score.

*Significance met at $p < 0.01$.

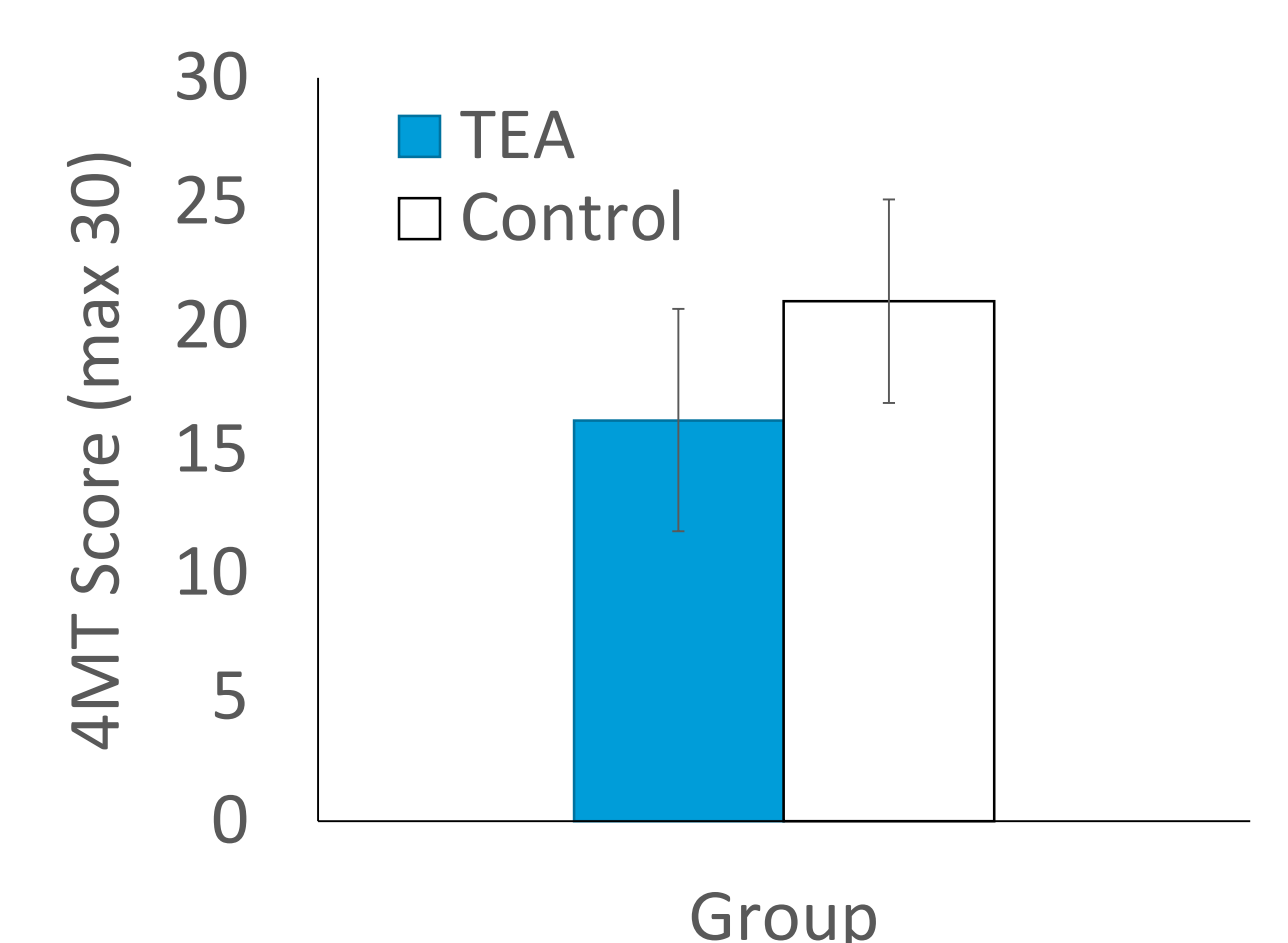


Figure 1. M performance on 4MT by group. Error bars represent standard deviation.

Discussion

- The results here document topographical memory impairment in TEA patients for the first time.
- This also indicates that the 4MT is a sensitive measure of topographical memory in the TEA population.
- Future testing will investigate whether treatment can help improve topographical memory in TEA.
- Additional research could investigate if TEA patients perform similarly on other tests of topographical memory.

Conclusion

Topographical memory disturbance is present and measurable in TEA with the 4 Mountains Test.

Contact Details

Our website is <https://projects.exeter.ac.uk/time/> and we can be contacted via email on time@exeter.ac.uk.

References

1. Butler, C. R., Graham, K. S., Hodges, J. R., Kapur, N., Wardlaw, J. M., & Zeman, A. Z. (2007). The syndrome of transient epileptic amnesia. *Annals of Neurology*, 61(6), 587-598. doi:10.1002/ana.21111
2. Bohbot, V. D., Kalina, M., Stepankova, K., Spackova, N., Petrides, M., & Nadel, L. (1998). Spatial memory deficits in patients with lesions to the right hippocampus and to the right parahippocampal cortex. *Neuropsychologia*, 36(11), 1217-1238. doi:10.1016/s0028-3932(97)00161-9
3. Chan, D., Gallaher, L. M., Moodley, K., Minati, L., Burgess, N., & Hartley, T. (2016). The 4 Mountains Test: A Short Test of Spatial Memory with High Sensitivity for the Diagnosis of Pre-dementia Alzheimers Disease. *Journal of Visualized Experiments*, (116). doi:10.3791/54454

Declaration of Interest

The researchers declare no conflict of interest. **Funded by:** The Dunhill Medical Trust [grant number R322/1113]; C.Butler: MRC Clinician Scientist award [MR/K010395/1]