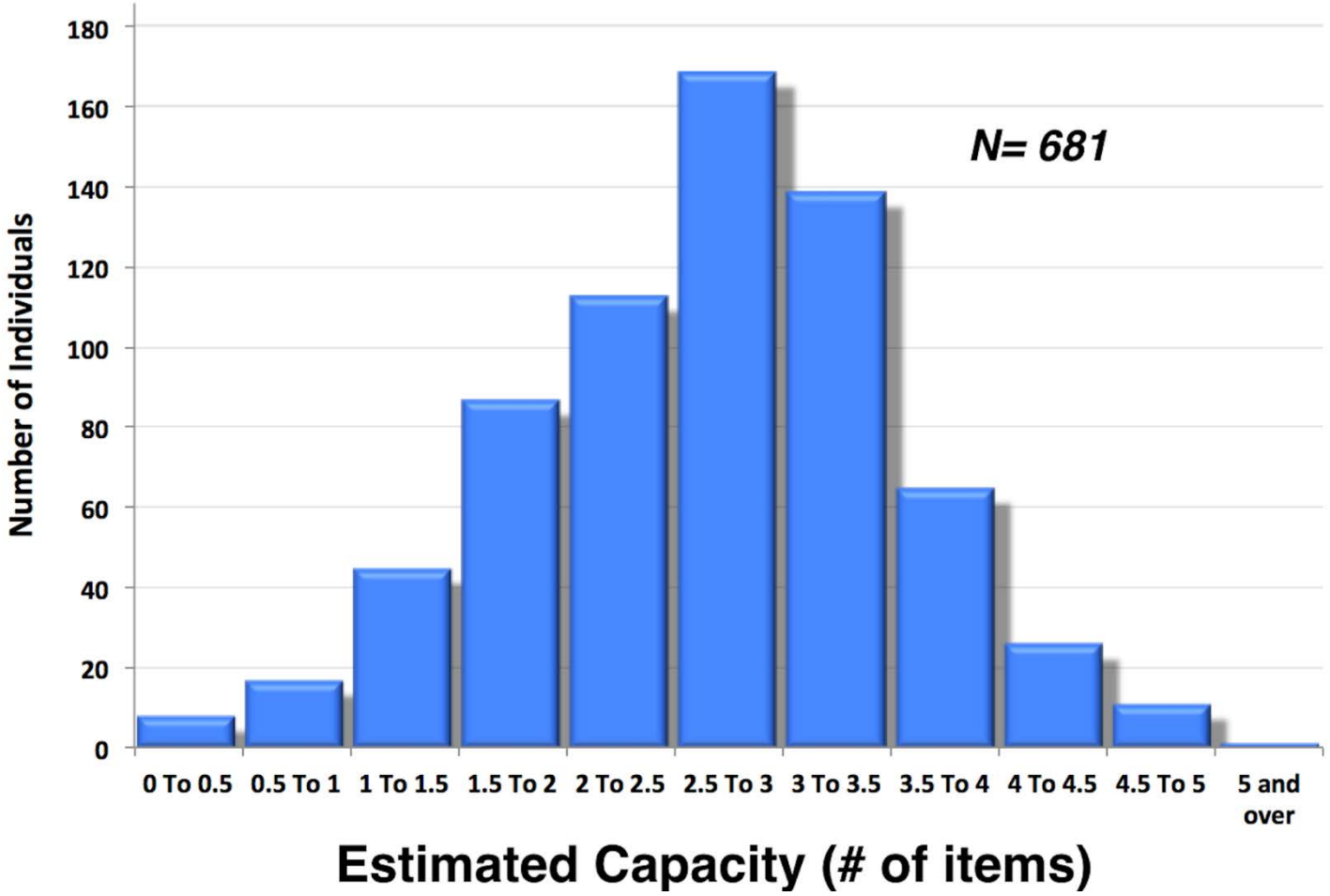
- **Working memory** – Online memory system where relevant information can be held "***in mind***".

- **Attention** – A ***selection process*** that controls the flow of information during perception and memory.

- Both working memory and attention are subject to ***sharp capacity limits*** that tend to be correlated across individuals.

- Both abilities ***predict broad measures of intelligence*** (e.g., IQ, scholastic achievement).

Individual differences in working memory capacity



- Core cognitive function
- **Robust** and **reliable** measures have been developed.
- Seemingly resistant to strong practice or training effects

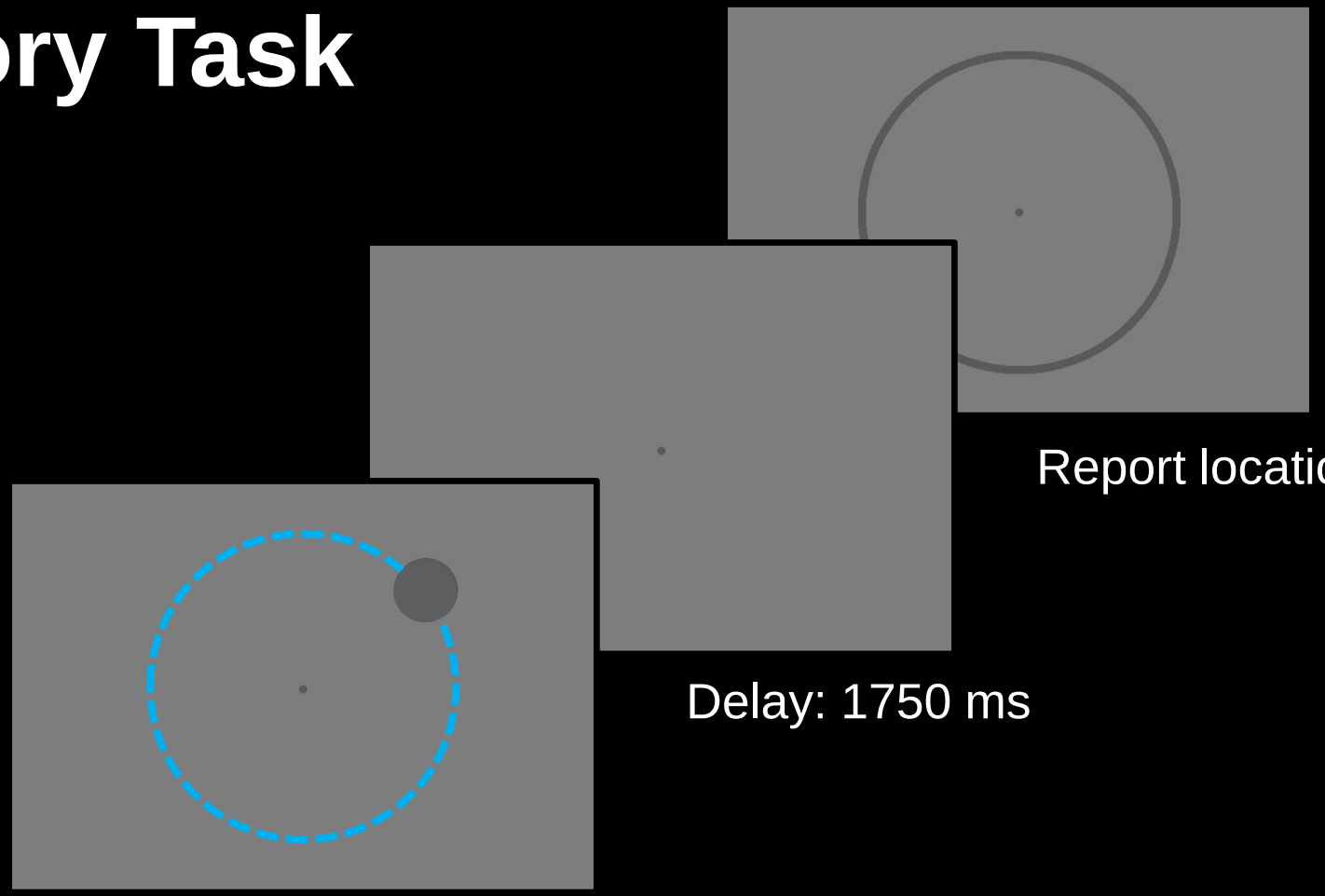
Neural Signatures of Online Storage and Attention

- There have been important advances in our ability to ***track*** online mental representations using ***neural activity.***

  -- Machine learning approaches allow ***decoding*** of complex neural signals to reveal the ***contents of memory***, or the current ***focus of attention***, without requiring an overt report.

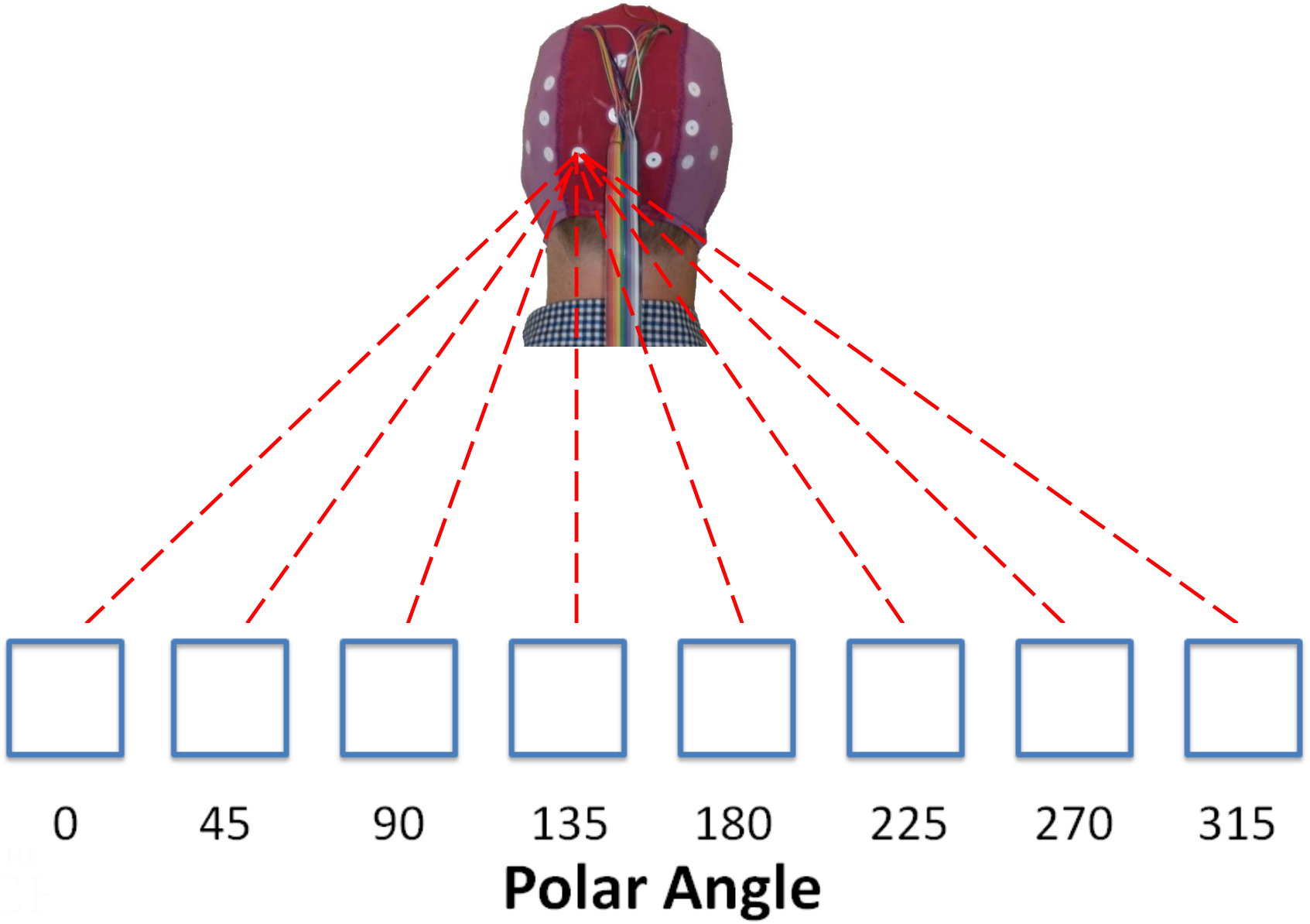
  -- These approaches may provide a path towards effective ***brain-computer interfaces***, improved ***diagnosis*** and ***assessment*** of cognitive function.

Spatial Working Memory Task

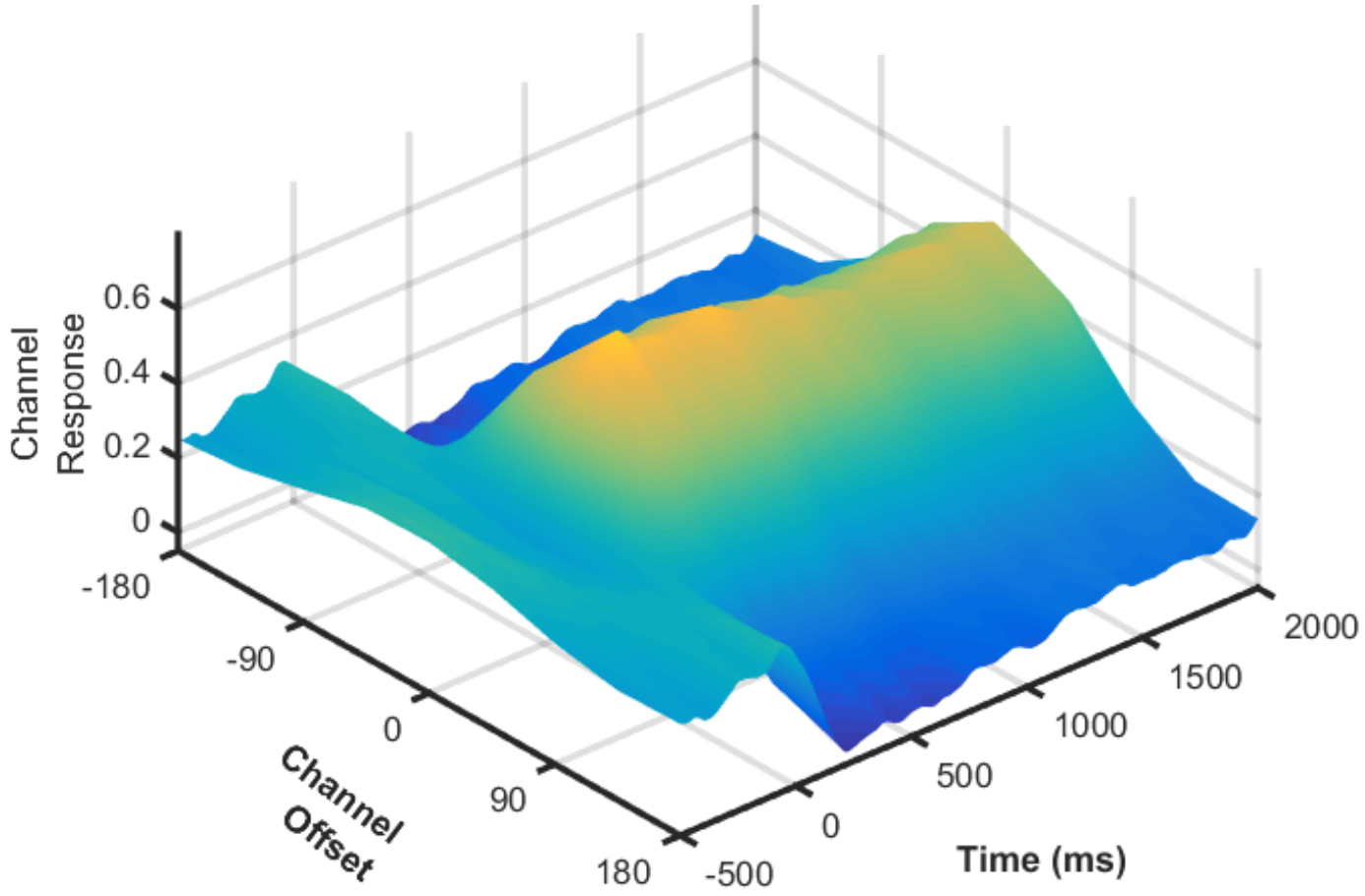


Foster, Sutterer, Serences, Vogel and Awh, 2016

Encoding model: ***Channel weights*** are estimated for each detector.



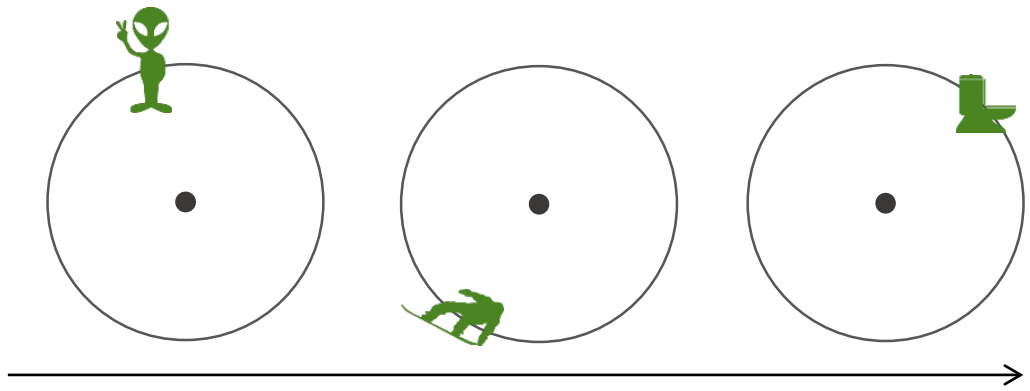
Alpha-band power tracks the remembered location with *high temporal precision*



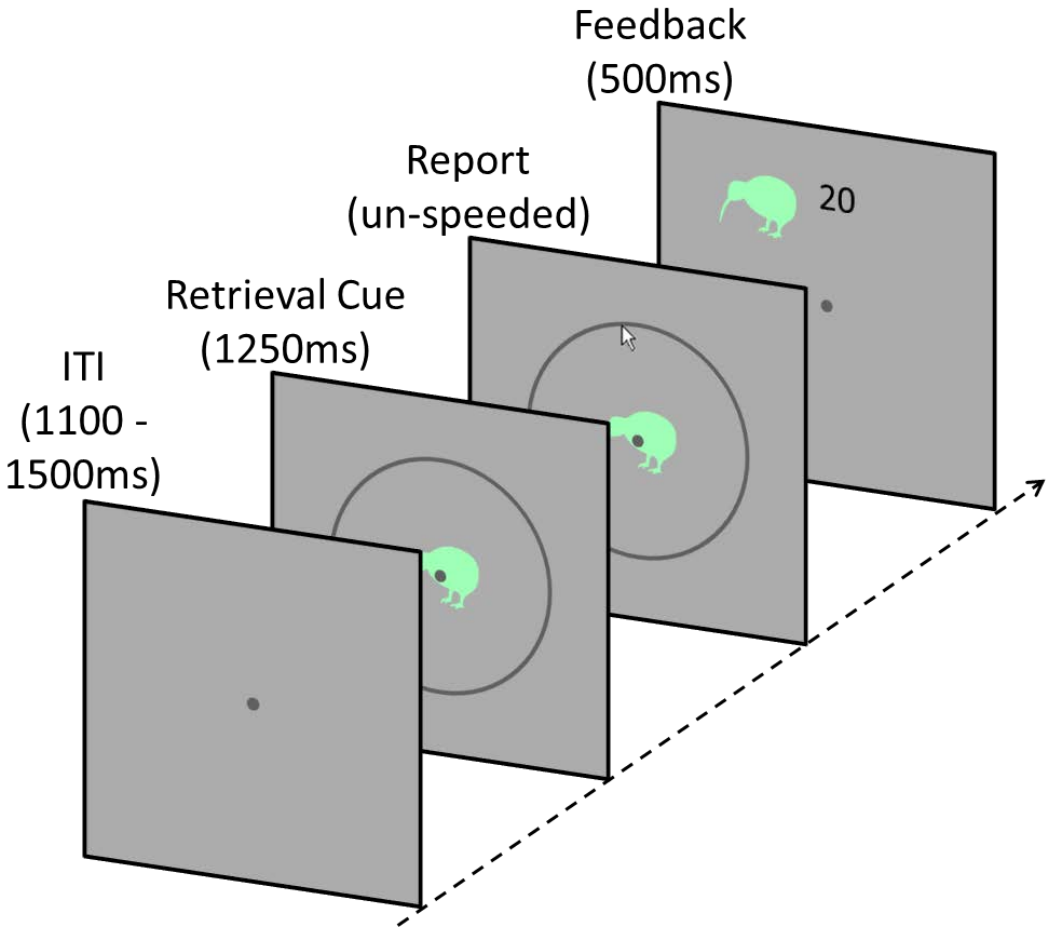
Foster, **Sutterer**, Serences, Vogel, Awh (2016) *J. Neurophysiol.*

Learning Task

Day 1: Learn 120 shape position associations



Day 2: Retrieve the location of each shape 7-8 times.



N = 27

Tracking retrieval from long term memory using rhythmic brain activity.