PLASTICITY IN THE ADULT LANGUAGE SYSTEM: A LONGITUDINAL ELECTROPHYSIOLOGICAL STUDY ON SECOND LANGUAGE LEARNING.

Stein, M., Dierks, T., Brandeis, D., Wirth, M., Strik, W., & Koenig, T. (2006).

NAME

QUESTION

- Would there exist a faster processing sequence as a result of facilitated access to semantic information?

BACKGROUND – WHAT ARE ERPS?

- Event-related potentials
- Well established and sensitive method which is non-invasive
- Provides a high time resolution, which can detect subtle changes in activation time in the brain
- Modern ERPs can estimate the region of the brain activated

BACKGROUND - N400-LPC COMPLEX

- Late positive component (LPC)
- Peaks around 600 ms
- In recollection studies, this tends to be stronger with older items in comparison to with newly learned material

AUTHOR'S PROPOSAL

- Hypothesis:
  - N400 topography would not be a fuller indicator of easy access to long-term memory information
  - LPC topography would be an indicator of increased memory trace strength

METHOD - PARTICIPANTS

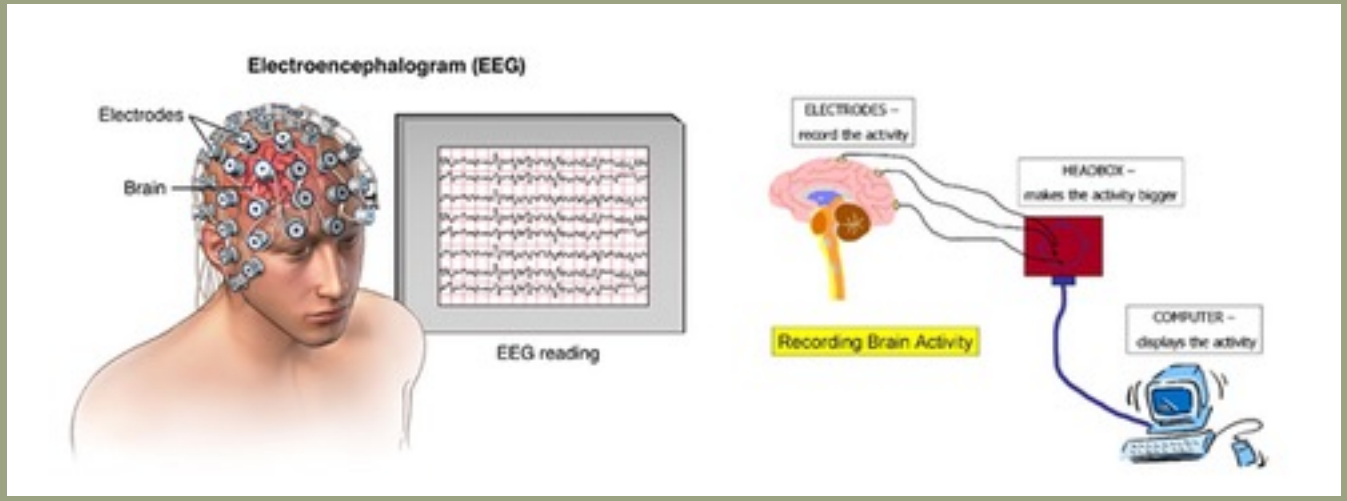
- 12 subjects (3 male, 9 female), with a mean age of 17
- English as their first language, all right-handed
- 3 participants had been exposed to German learning before, the other 9 had no notable exposure prior to exchange

METHOD – STIMULUS MATERIAL

- Nouns were shown to participants in three different languages (English, German, and Romansh)
- Words divided into 4 groups with 300 in each group (100 from each language)
- Any German or Romansh words with similarities to English words were excluded

PROCEDURE AND DATA ANALYSIS

- Placed in an electrically and sound-shielded room, where they sat 75cm away in front of a computer
- Words appeared separately on screen, 600ms per word
- After 150 words, there was a break
- Right index finger indicates “I know”, Left index finger indicates “I don’t know”
- EEG was recorded attached to scalp electrodes, and 2 electrodes below the eyes



PROCEDURE AND DATA ANALYSIS

- Following this, 2 language proficiency tests were conducted
- First:
  - Multiple-choice with 100 sentences requiring participants to fill in the blanks
- Second:
  - Vocabulary; translate 40 German words to English

RESULTS

- ERPs from day 1 to day 2 showed a difference between 396 and 540 ms
- With English words, there was an activation difference between 472 and 644 ms
- No differences observed with Romansh words

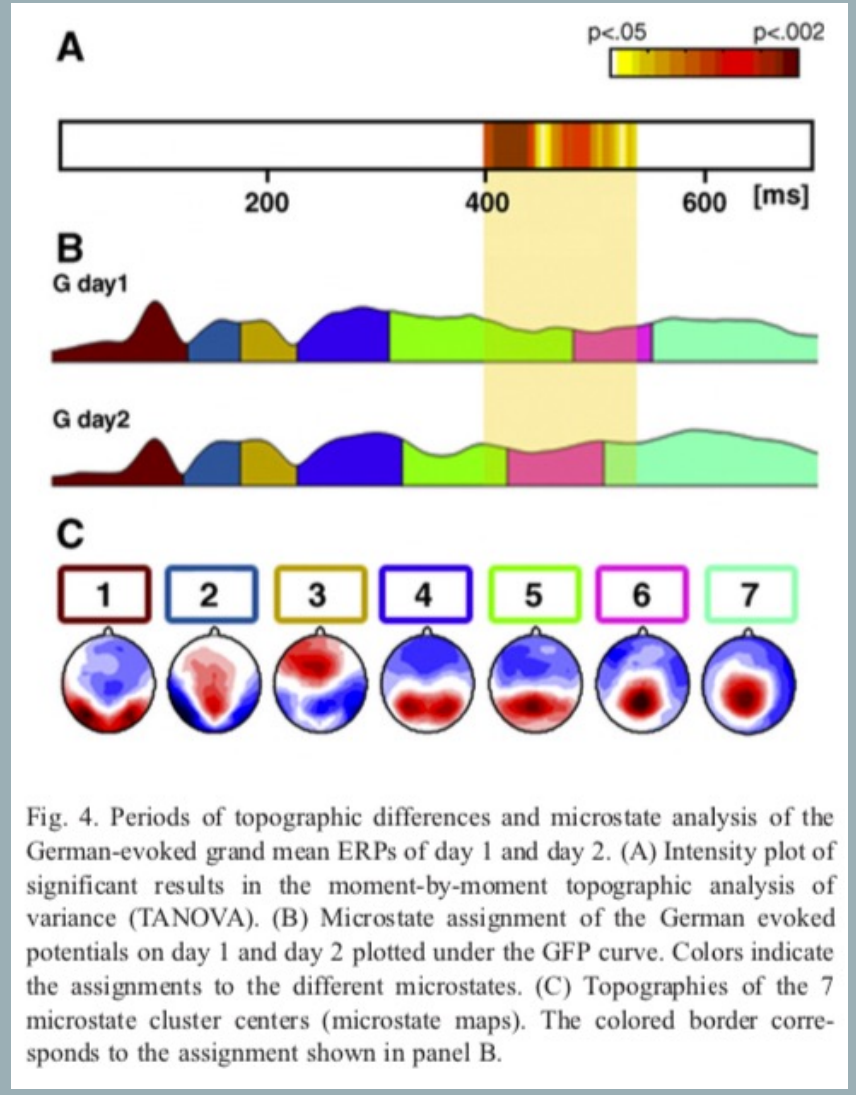


Fig. 4. Periods of topographic differences and microstate analysis of the German-evoked grand mean ERPs of day 1 and day 2. (A) Intensity plot of significant results in the moment-by-moment topographic analysis of variance (TANOVA). (B) Microstate assignment of the German evoked potentials on day 1 and day 2 plotted under the GFP curve. Colors indicate the assignments to the different microstates. (C) Topographies of the 7 microstate cluster centers (microstate maps). The colored border corresponds to the assignment shown in panel B.

TAKE AWAY

- As hypothesized by the researchers, there did seem to be a shorter processing time on Day 2
- Indication that higher L2 proficiency results in faster word processing
- This is supported by shorter frontal activation

THANK YOU!