



Introduction

Evolutionary, biological and abstract in itself, memory is one of the brain's most fascinating and complex subsystems which neuroscience and cognitive researchers strive to shed light on.

Declarative memory: all of the long-term memories that we can consciously recall. Declarative memory is usually described as consisting of two systems:

- Semantic memory: general knowledge of the world
- Episodic memory: context-specific personal memories

We are interested in the cases in which these two memory systems coincide.

One such area is personalized knowledge, that is, knowledge for which we have personal memories (Westmascott and Moscovitch, 2003).

Experimental Approach

Our aim is to compare the neural correlates of famous names for which participants have episodic memory (personal memories) against names for which they only have general knowledge (semantic memory).

We studied the differences in amplitude of the N400 event-related potential (ERP) component that indexes semantic processing (Kutas et al., 2006).

Materials and methods

Stimuli

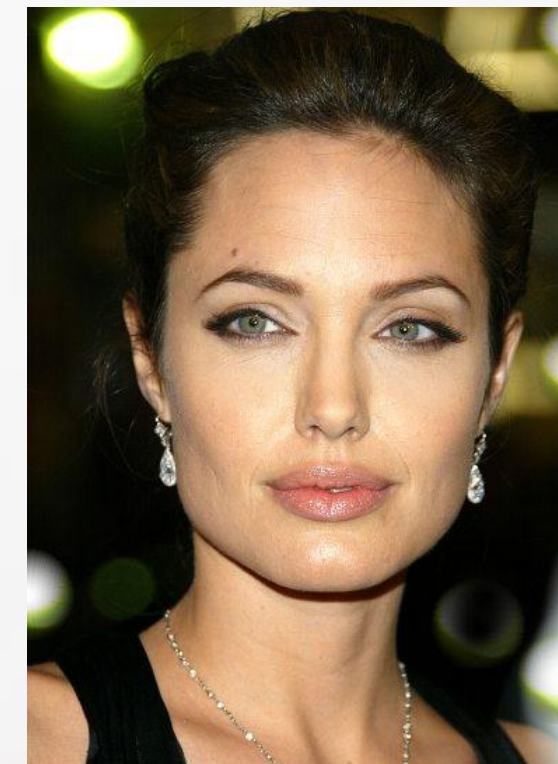
High Famous	Low Famous	Non Famous
Michael Jackson	Kate Middleton	Cindy Engel
Terry Fox	Wayne Gretzky	Lucy Ernest
Barack Obama	Bill Gates	Betty Wall
Al Gore	Lindsay Lohan	George Slim
Jack Layton	Sadam Hussein	Karim Call

High Famous (HF), Low Famous (LF) and Non-Famous (NF) name sets were constructed.

- Through an online-based quiz, 64 participants judged 125 names on a number scale based on level of fame, number of facts, personal memories and emotion associated to the name.
- HF (70%) and LF (30%) name sets differ by the personal memories associated to the names. They were matched for:
 - Categories (actor, politician, athlete);
 - Onset of their fame (first public event);
 - Frequency;
 - Length
- NF constructed with phone directory system, *Canada411*.

Task and data acquisition

Famous or Non-Famous ?



Data collection

The electroencephalogram has been an invaluable tool. With a -200 -0 ms pre-stimulus baseline, observation was made of the N400 wave, recorded post-stimulus.

Fame judgment Task

Following the presentation of HF, LF, NF names, participants indicate whether or not the name is that of a famous person. Their response and reaction times are recorded (850 ms post-stimulus).

Online-Quiz

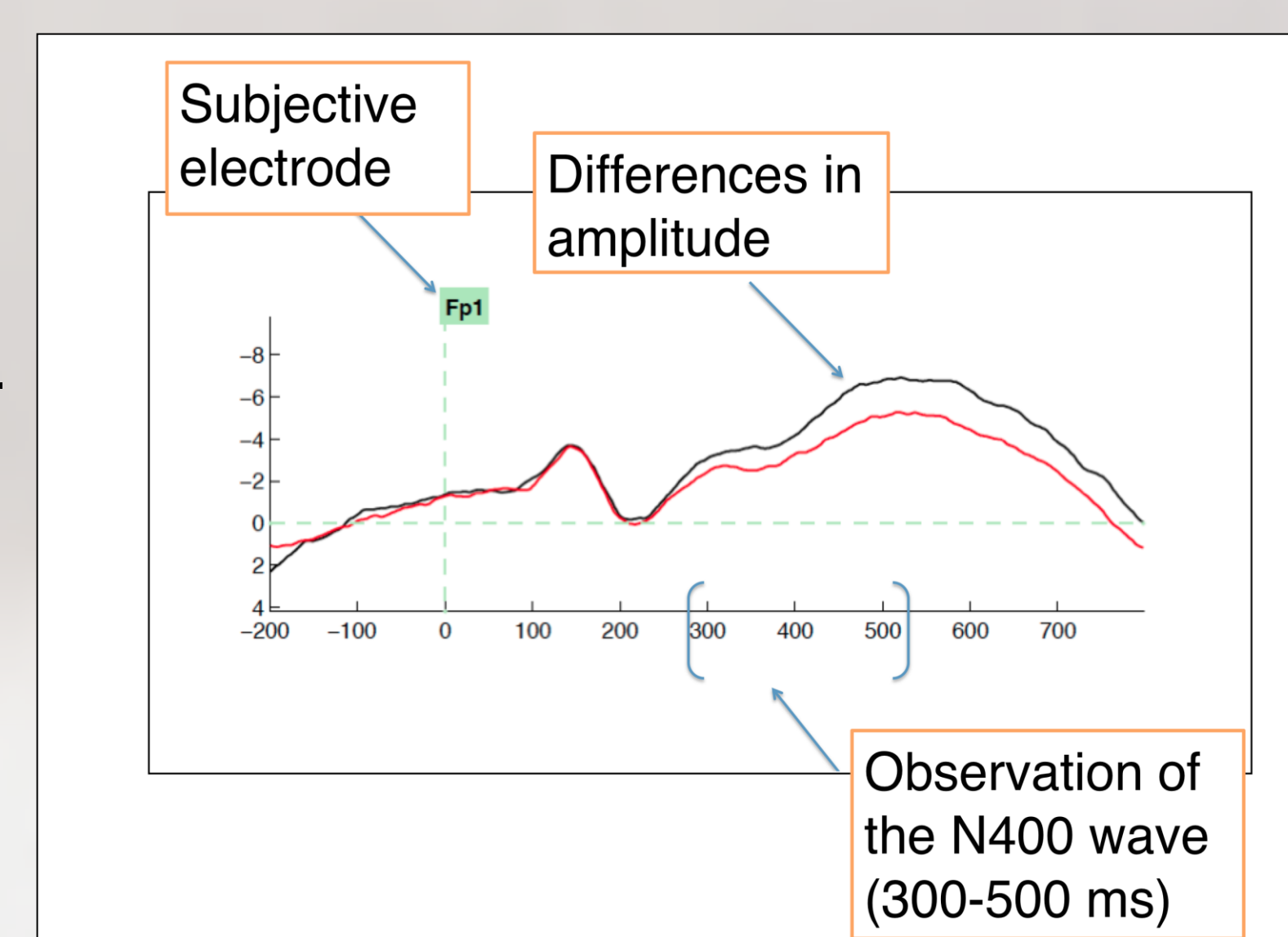
Participants specify the degree of personal memories held towards the stimuli (0= no personal memories associated with this name, 4= very vivid personal memories)

Data processing

Nineteen subjects EEG data were averaged, filtered and large artifacts were removed. Data was processed with a step function (Luck, 2005) of $\pm 150 \mu\text{V}$ voltage threshold and 200 ms movement windows with a 100 ms window step. Mean voltages were extracted 300-500 ms window post-stimulus (Kutas et al., 2006).

With the non weighted grand-average ERP, we may observe the N400 wave.

Software incl. E-Prime (recording of participants response); SPSS (statistical analysis); Microsoft Excel Spreadsheet; Matlab 7.12 (R2011a, The Mathworks) with EEG lab and ERP lab subcomponents



Experimental Results

Shorter reaction times were observed for names in which participants had personal memories.

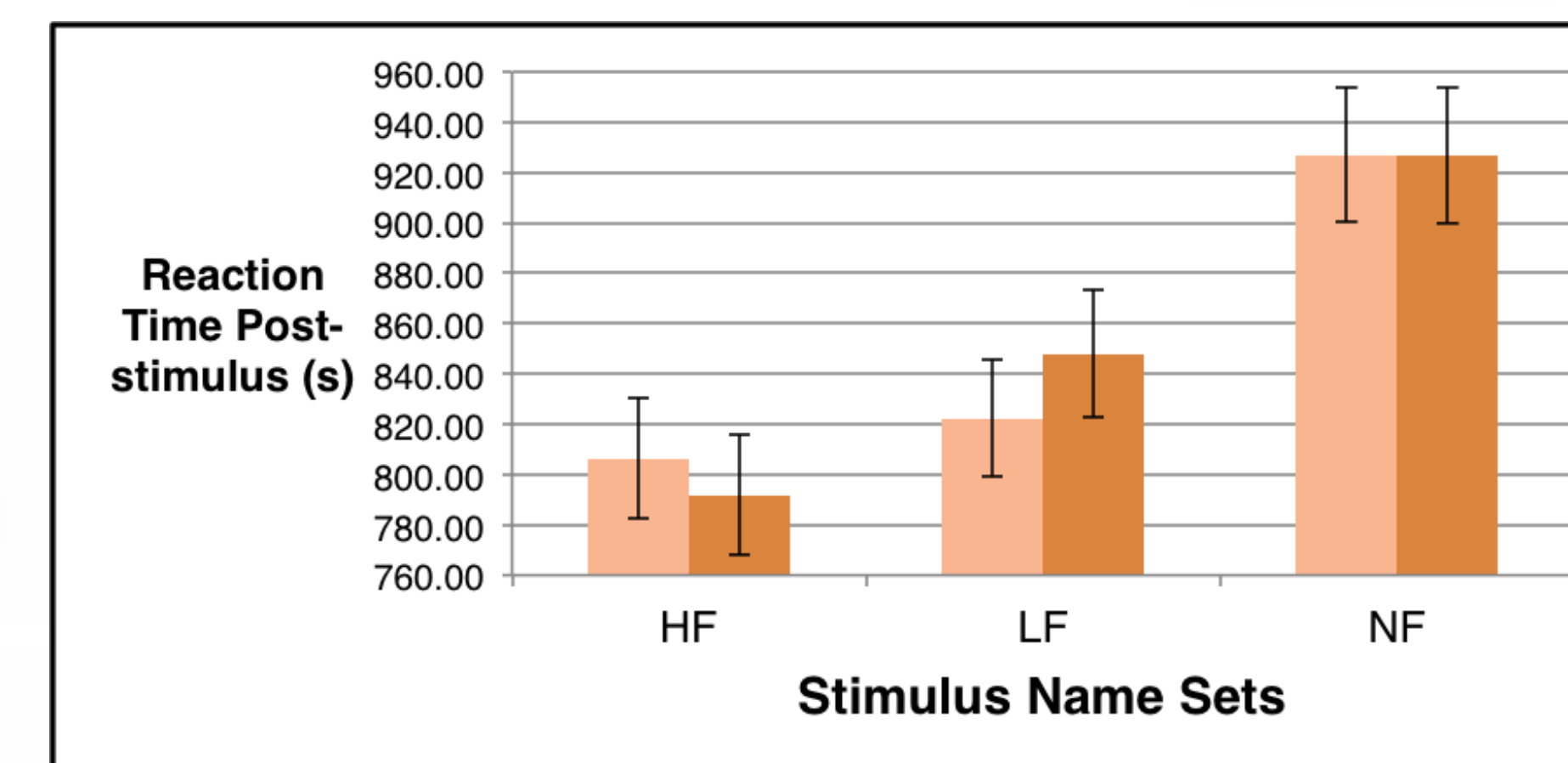


Fig. 1- Reaction times (ms) and standard error recorded of participants correct responses to High Famous (HF), Low Famous (LF) and Non-Famous (NF) names in the Fame-Judgment Task.

The lighter shade indicates the grand average of reaction times (ms) according to the norms, the darker shade indicates the grand average of participants reaction times (s.), according to individual ratings.

ERP results show increased negative neural activity of the N400 wave in left-frontal electrodes.

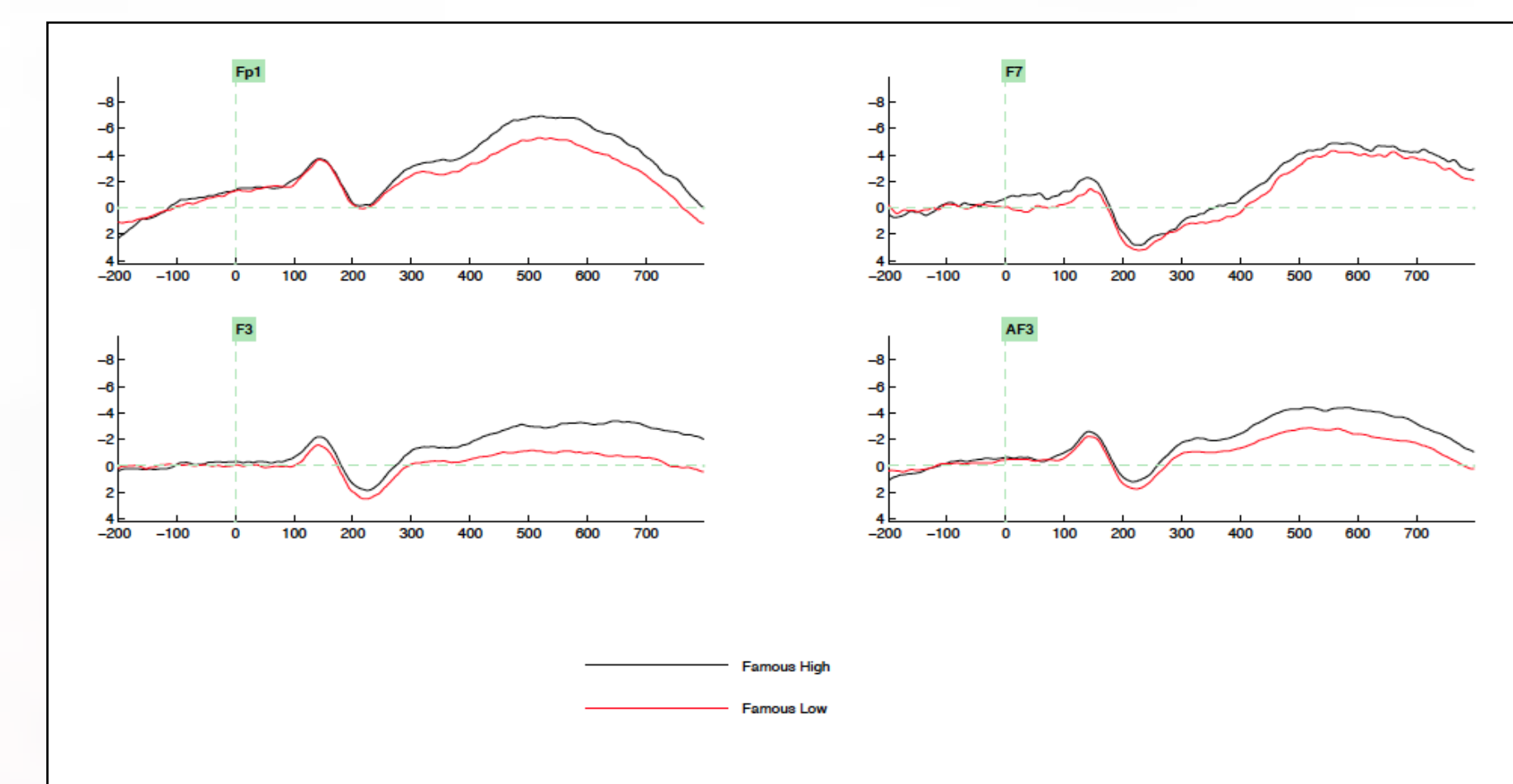


Fig. 2- Screen capture image of four left frontal electrode's (Fp1, F7, F3, Af3) grand averages for 19 participants.

Increased negativity of the N400 wave following the presentation of Famous High (black) names, and thus personally significant, is statistically and significantly greater than the negativity observed of the N400 wave for Famous Low (red) names.

Conclusion

Personal memories, a case in which semantic memory and episodic memory overlap, has been the main focus of our study.

In sum, the localization of electrodes, where the effect of personal memories on the N400 wave is greatest, demonstrates the significant impact that personal memories have on this ERP component. We also state that personal memories are associated with faster reaction times.

Results may contribute to our greater understanding in the organization of semantic memory.

Prospective Applications

A recognition computer-based test was run in sequence to the fame judgment task.

Through presentation of famous and non-famous names, a proportion of which were retrieved from the fame-judgment task, participants are asked to use the touch key pad to indicate whether or not they recognize the names from the first study, as well as how certain they are of their response.

Data has yet to be processed and analyzed. The database from the Fame Judgment Task may also be analyzed to uncover neural trends and correlates due to repetition.

References

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