

# Does deciding whether a primed picture is natural or manufactured really activate semantic memory? Comparing the temporal dynamics of taxonomic and thematic priming using ERP

Sonia Sistiaga<sup>1</sup>, Erika Wauthia<sup>2</sup>, Aurélie Miceli<sup>1</sup>, Laurent Lefebvre<sup>1</sup>, Laurence Ris<sup>3</sup>, Isabelle Simoes Loureiro<sup>1</sup>

<sup>1</sup> Cognitive Psychology and Neuropsychology Department, Institute of Health Sciences and Technologies, University of Mons, Belgium

<sup>2</sup> Education and Learning Sciences Department, Teacher Training School, University of Mons, Belgium

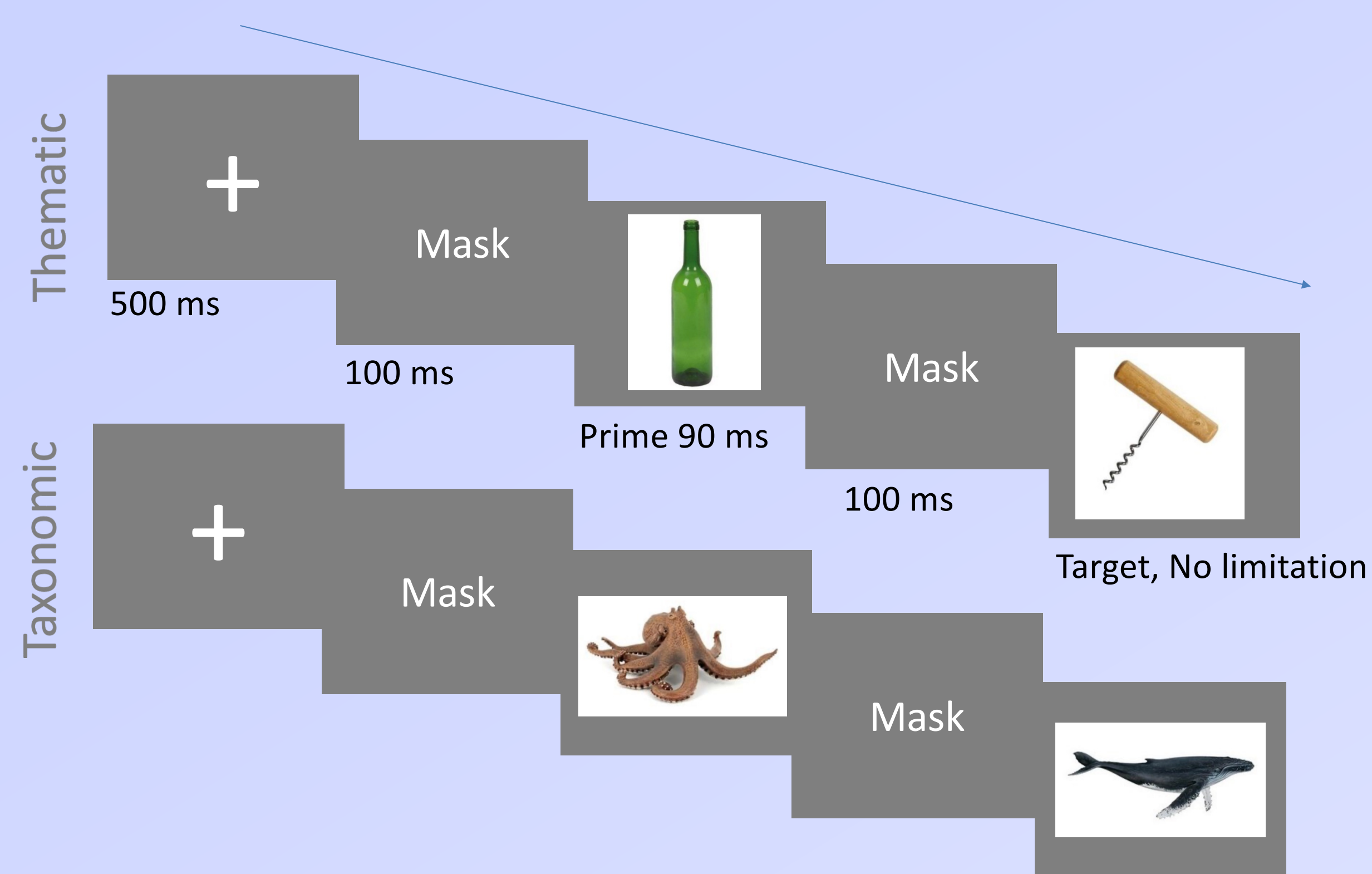
<sup>3</sup> Neurosciences Department, Faculty of Medicine and Pharmacy, University of Mons, Belgium

## Introduction

- The knowledge stored in semantic memory includes information about categories and features, as well as semantic relationship between concepts. In the semantic network, **taxonomic** (i.e., relations between objects of the same category) and **thematic** (i.e., contiguity relations based on co-occurrence in events or scenari) links are both salient.
- Prior studies using semantic priming demonstrated **an increased priming effect (e.g., faster reactions times)** to process thematic links than taxonomic ones<sup>a,b</sup>.

→ **AIM** : understanding whether visual or semantic processing is activated during visual taxonomic or thematic priming processing using **event-related potentials (ERP)**

→ **HYPOTHESIS** : easier processing of thematic than taxonomic links, resulting in faster reaction times and smaller amplitudes on the EEG signal



## Method

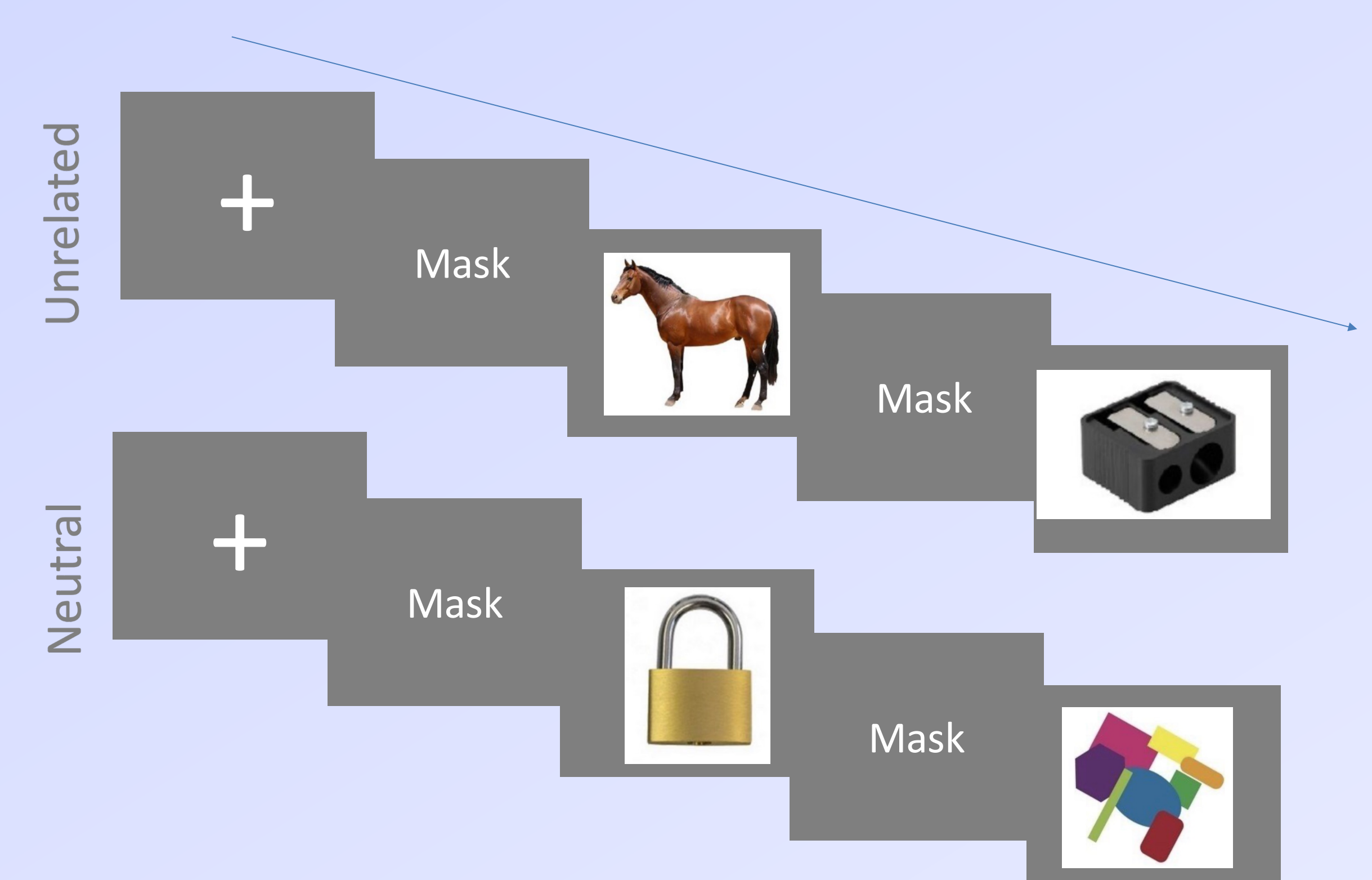
### Participants

- 26 healthy adults ( $M_{age} = 26.57$  ;  $SD = 7.21$ )
- Socio-cultural level (number of years) :  $M = 3.75$  ;  $SD = 1.04$
- Inclusion criteria : right-handed, French native speaker, corrected-to-normal vision

### Task : Semantic Masked Priming

- 38 targets (19 natural, 19 artifacts) will be preceded by *thematically*, *taxonomically*, or *neutrally* related or unrelated primers. Participants had to **classify targets as natural or artificial entities**.
- Stimuli have been controlled and all primes were similar for lexical frequency, familiarity, age of acquisition and visual complexity.

**EEG recording** : Biosemi Active-Two system with 64 active electrodes and 4 exogenous electrodes (3 electro-oculogram and 1 reference mastoid)

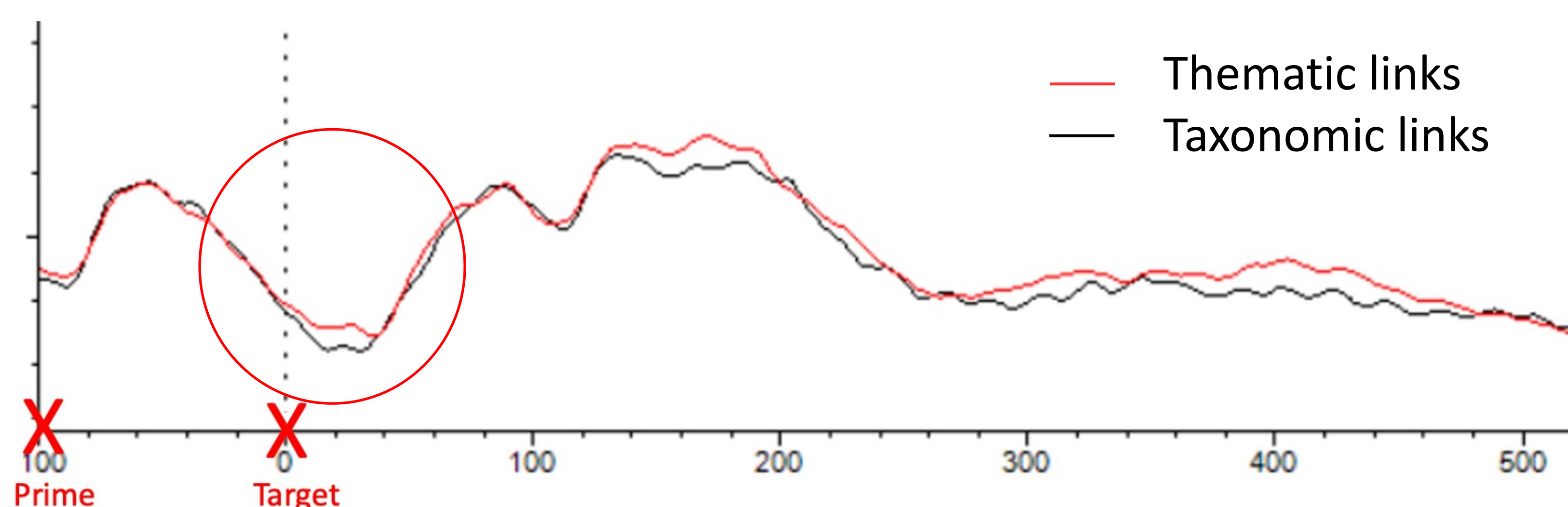


## Results

### Behavioral data

- Faster process for **taxonomic links** than thematic links ( $p < .001$ )
- Greater priming effect ( $RT_{unrelated} - RT_{related}$ ) for **taxonomic links** ( $M = 31.67$  ;  $SD = 19.88$ ) than thematic links ( $M = 9.75$  ;  $SD = 18.87$ ) ( $p < .001$ )

### Electrophysiological data



- Peak signaling **target visual detection** between 0 – 100 ms, but
- **No significant difference** appeared between thematic and taxonomic conditions on the ERP signals

## Discussion and conclusion

- In contrast with our hypothesis** and data found in the literature, **taxonomic links were processed faster** than thematic links.
- As the stimuli in the paradigm were pictures, target categorization involves **early visual processing**. From a visual processing point of view, **priming helps to retrieve target features**, which are **more important at the taxonomic level** (e.g., apple – pear) than at thematic level (e.g., apple – pie). This suggests easier retrieval of taxonomic links, specifically for **this type of task**.
- Future direction: extend primer timing to give a more precise overview of target processing

<sup>a</sup> Chen, Ye, C., Liang, X., Cao, B., Lei, Y., & Li, H. (2014). Automatic processing of taxonomic and thematic relations in semantic priming—Differentiation by early N400 and late frontal negativity

<sup>b</sup> Sass, K., Krach, S., Sachs, O., & Kircher, T. (2009). Lion–tiger–stripes: Neural correlates of indirect semantic priming across processing modalities. *NeuroImage*, 45(1), 224–236.