

The neural signature of retrograde memory enhancement by contrastive focus accent

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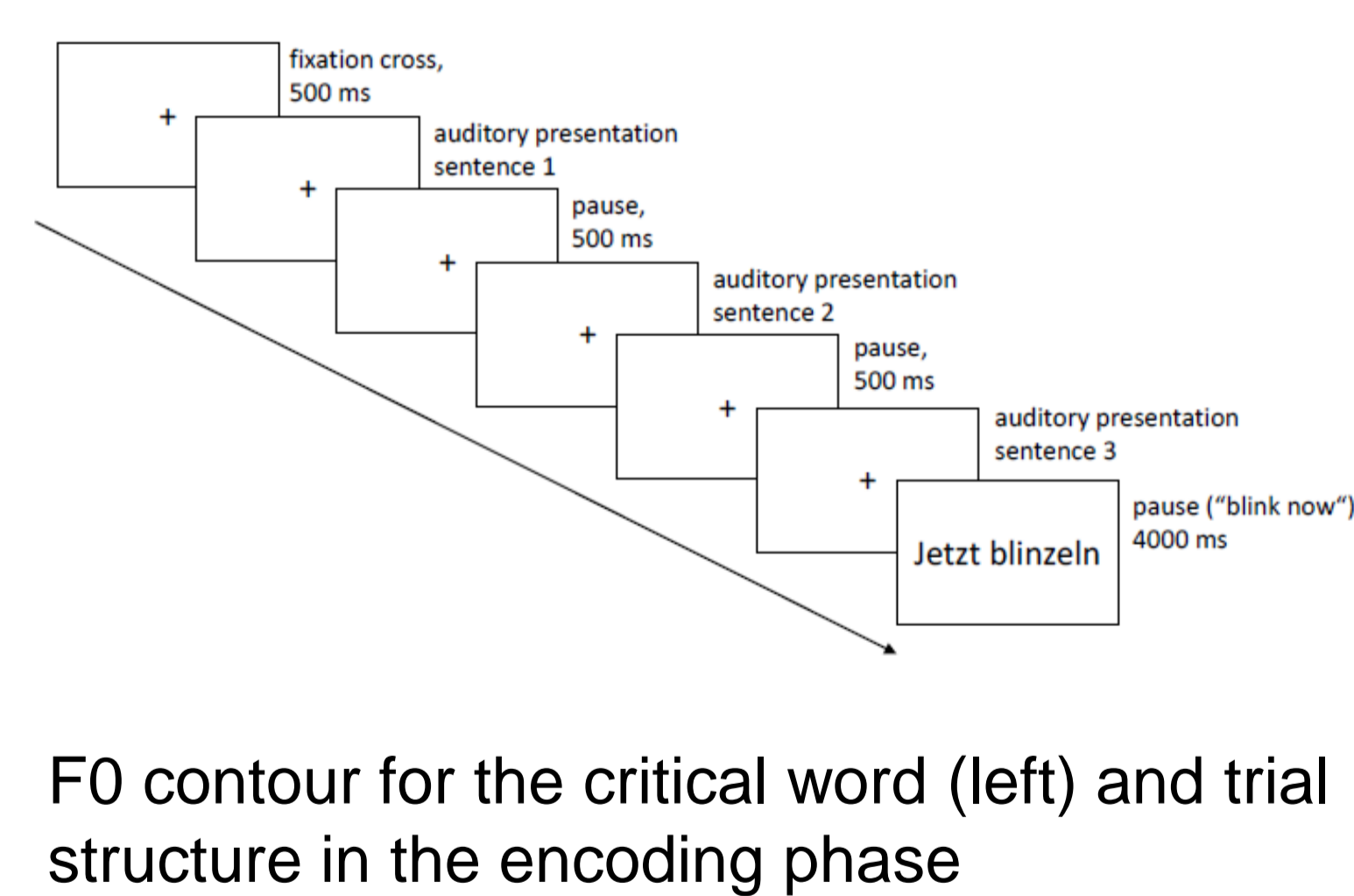
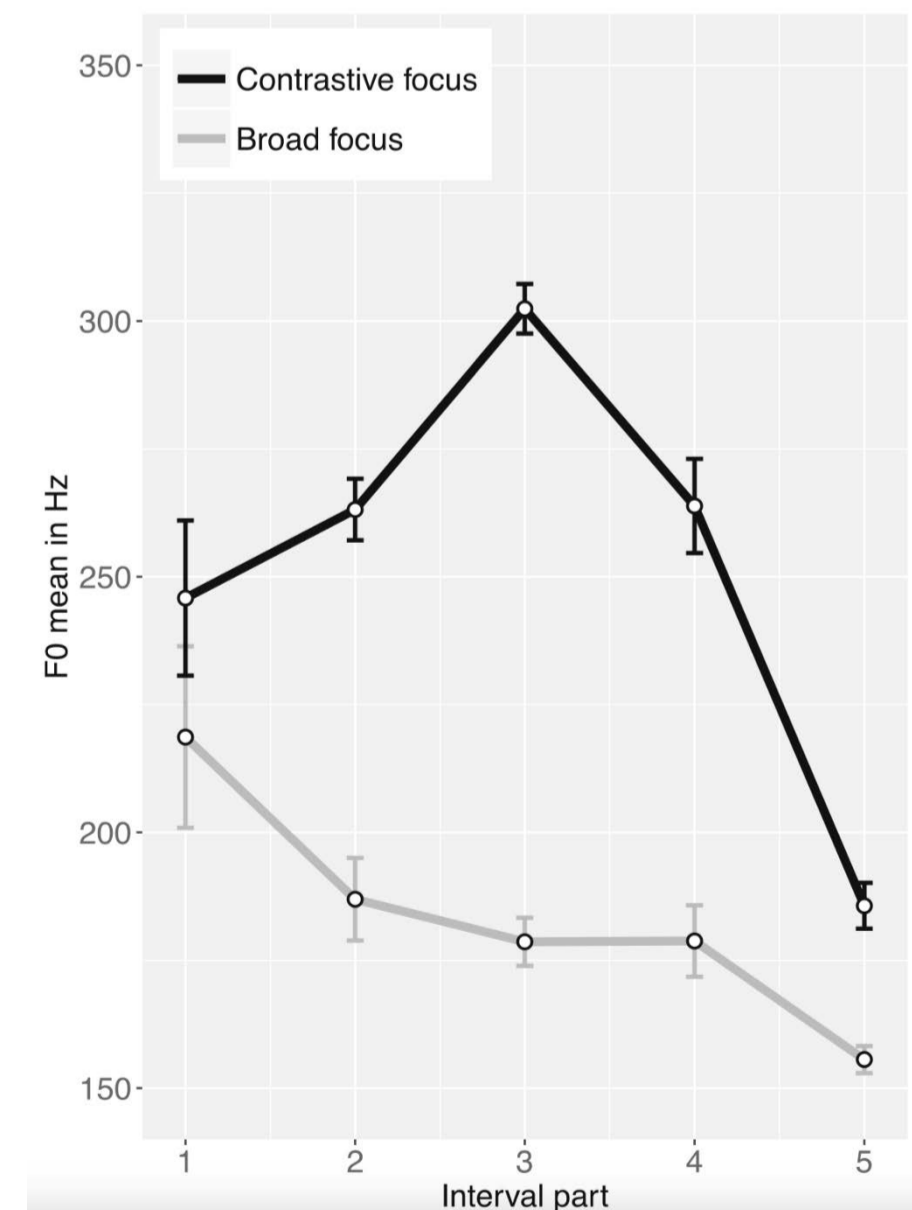
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1 Introduction

- Motivationally salient events are preferentially stored in memory even when the relevance of an event becomes evident only sometime after encoding. (1, 2). Such an **retroactive memory enhancement (RME)** is generally highly adaptive, but it is still unclear by which mechanisms initially weak memories are strengthened.
- We used the **ERP subsequent memory effect (SME)** (3, 4) together with **contrastive prosodic focus marking** to explore the mechanisms underlying RME. Contrastive prosodic focus marking has been shown to boost memory for the marked words and also for words which were mentioned in a prior discourse (5, 6).
- We expected an SME on the focused marked element, which is more pronounced the more elements from the prior discourse are remembered (retrograde SME).

2 Methods

- 31 participants (from labs in Berlin and Saarbrücken)
- Materials (80 short stories) (<https://osf.io/txg5r/>) each with neutral focus (H+IH*) or contrastive focus (L+H*) (see Box 4)
- Encoding Phase:** Eight blocks with 10 stories each. (8 critical and 2 filler stories. (50% contrastive focus)
- Recall Phase:** 10 questions, one per story
 - For critical stories: Remember the three elements from the first sentence
 - For filler stories: Remember details of the stories. (Synonyms were counted as correct responses)



F0 contour for the critical word (left) and trial structure in the encoding phase

- EEG:**
 - 25 scalp electrodes, bandpass filter (0.116-250 Hz)
 - ERP averaging to the focus element when either one or two elements (alternatives) were remembered in both focus conditions.
 - ERP trial numbers (mean=12; range 5-19)

3 Methods and ERP results

Encoding Phase

Context sentence 1:
Tamara lagerte in ihrem Tresor Perlen, Rubine und Saphire.
(*Tamara stored pearls, rubies and sapphires in her safe.*)

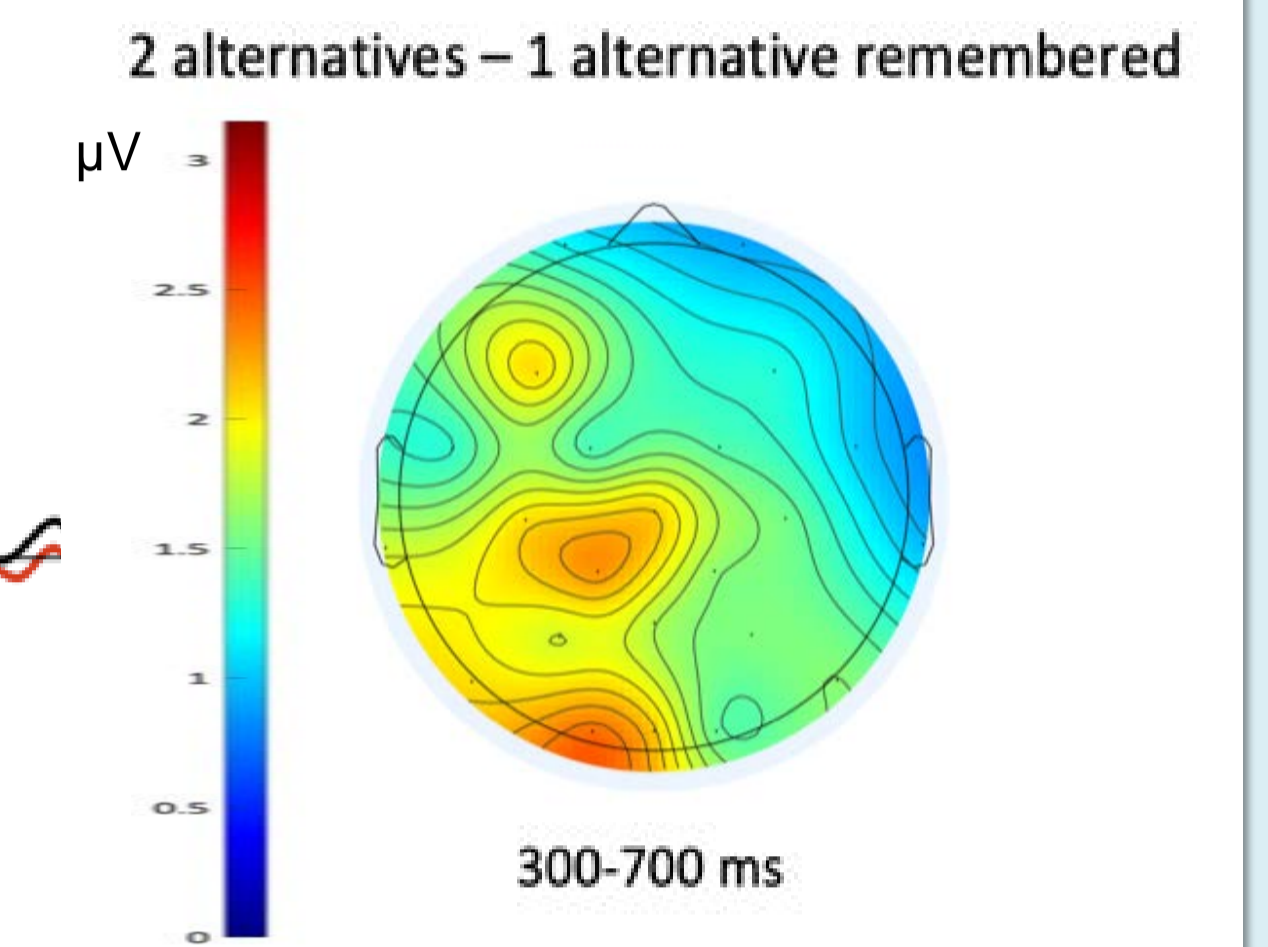
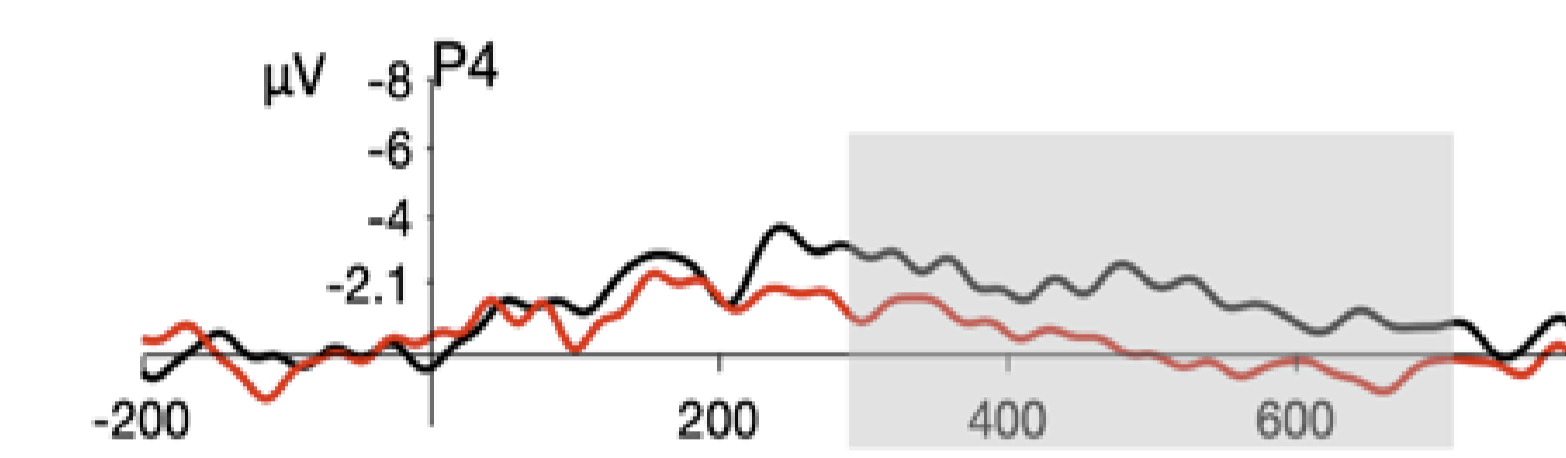
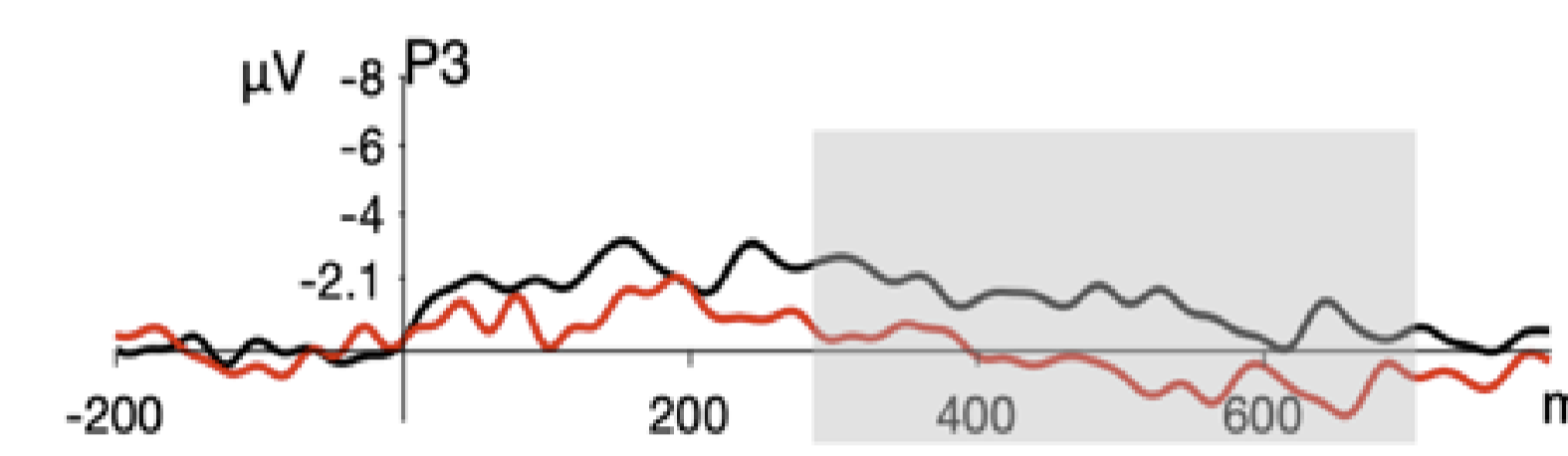
Context sentence 2:
Sie benötigte Geld.
(*She needed some money.*)

Critical sentence:
Sie hat die Perlen/ die PERLEN verkauft.
(*She sold the pearls/ the PEARLS.*)

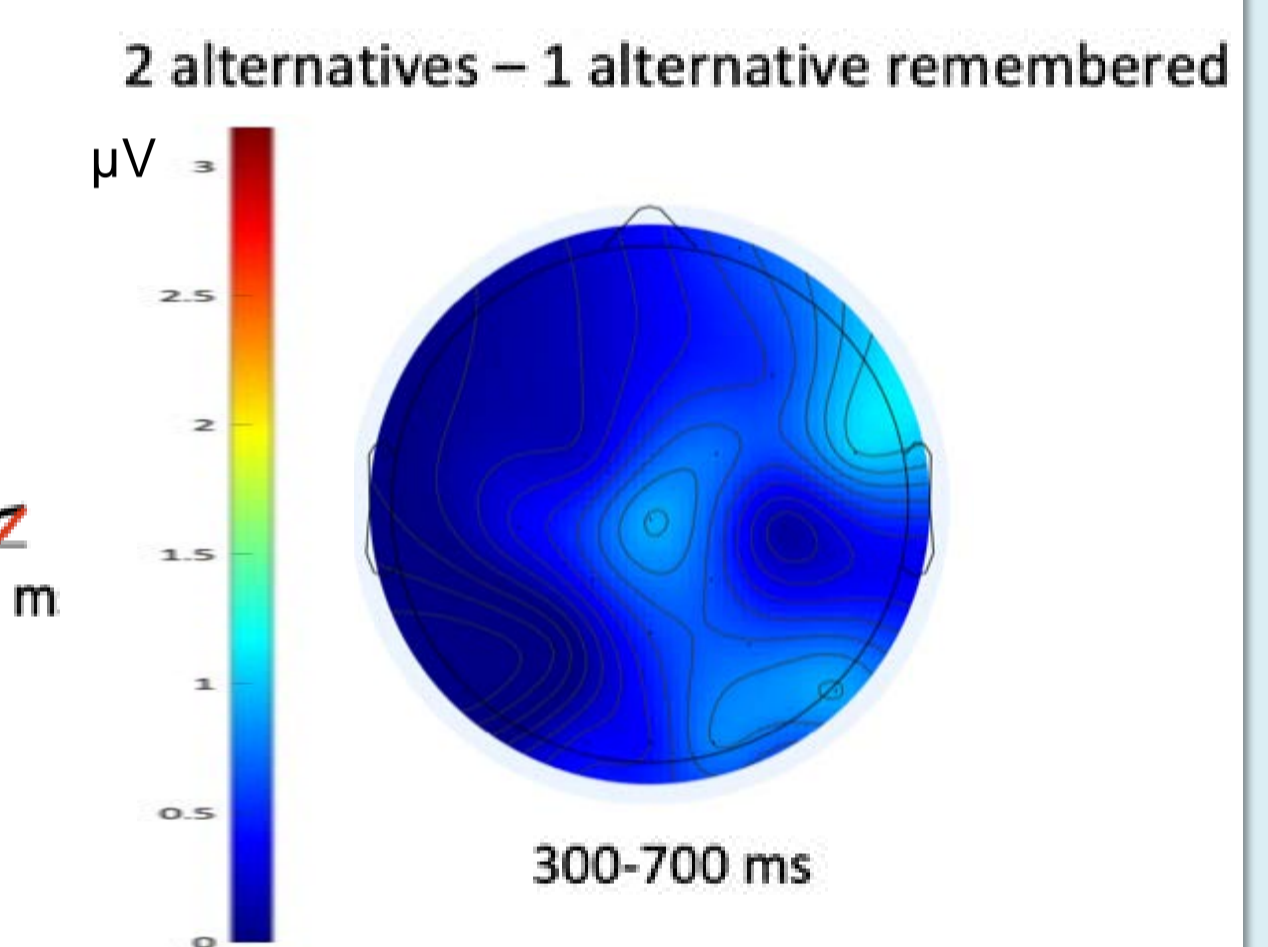
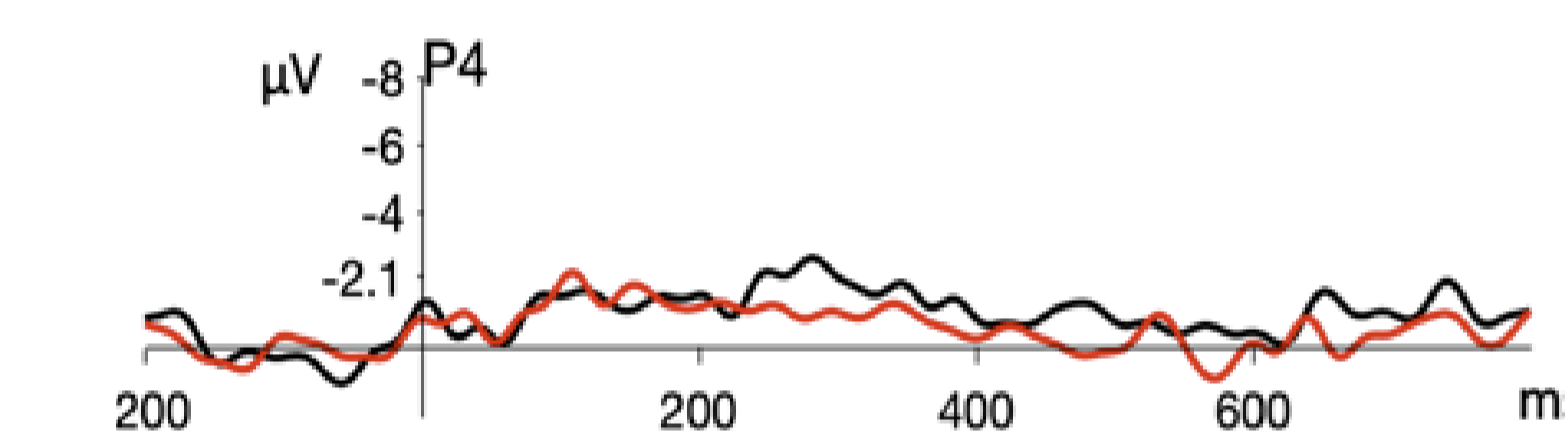
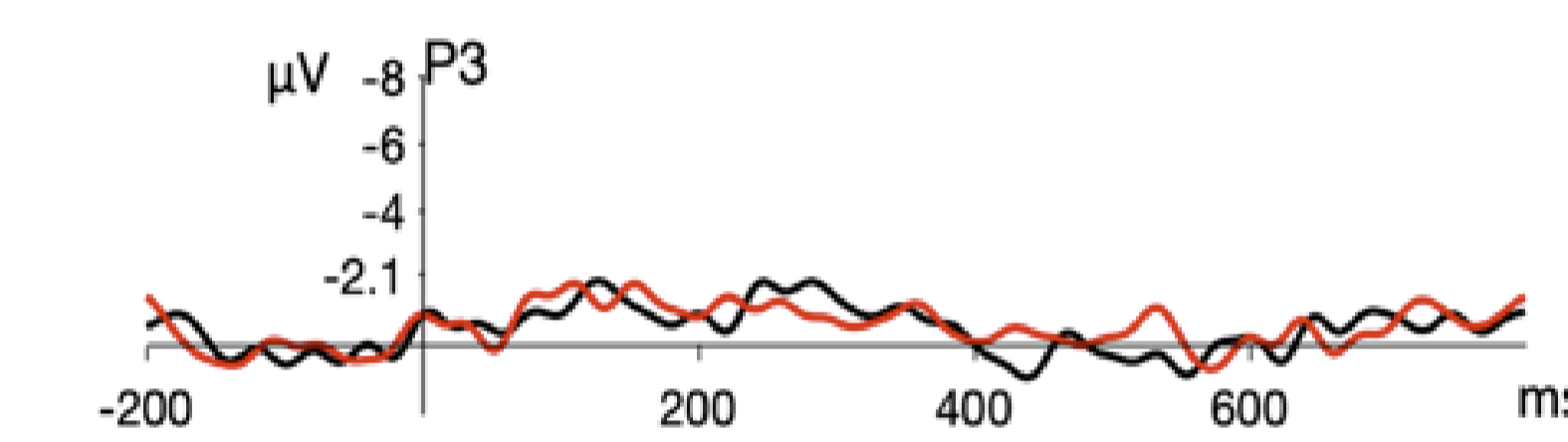
Recall Phase

“Welche Kostbarkeiten befanden sich zunächst im Tresor?”
(*Which treasures were there in the safe at first?*)

Contrastive focus

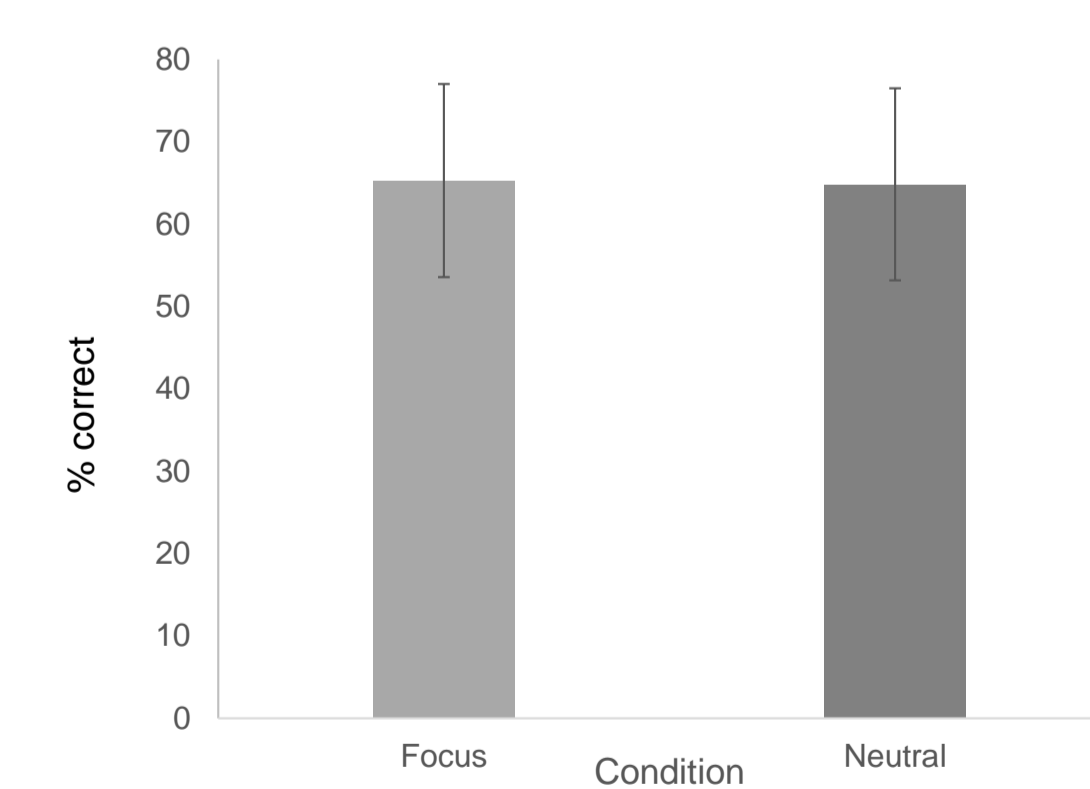


Neutral focus



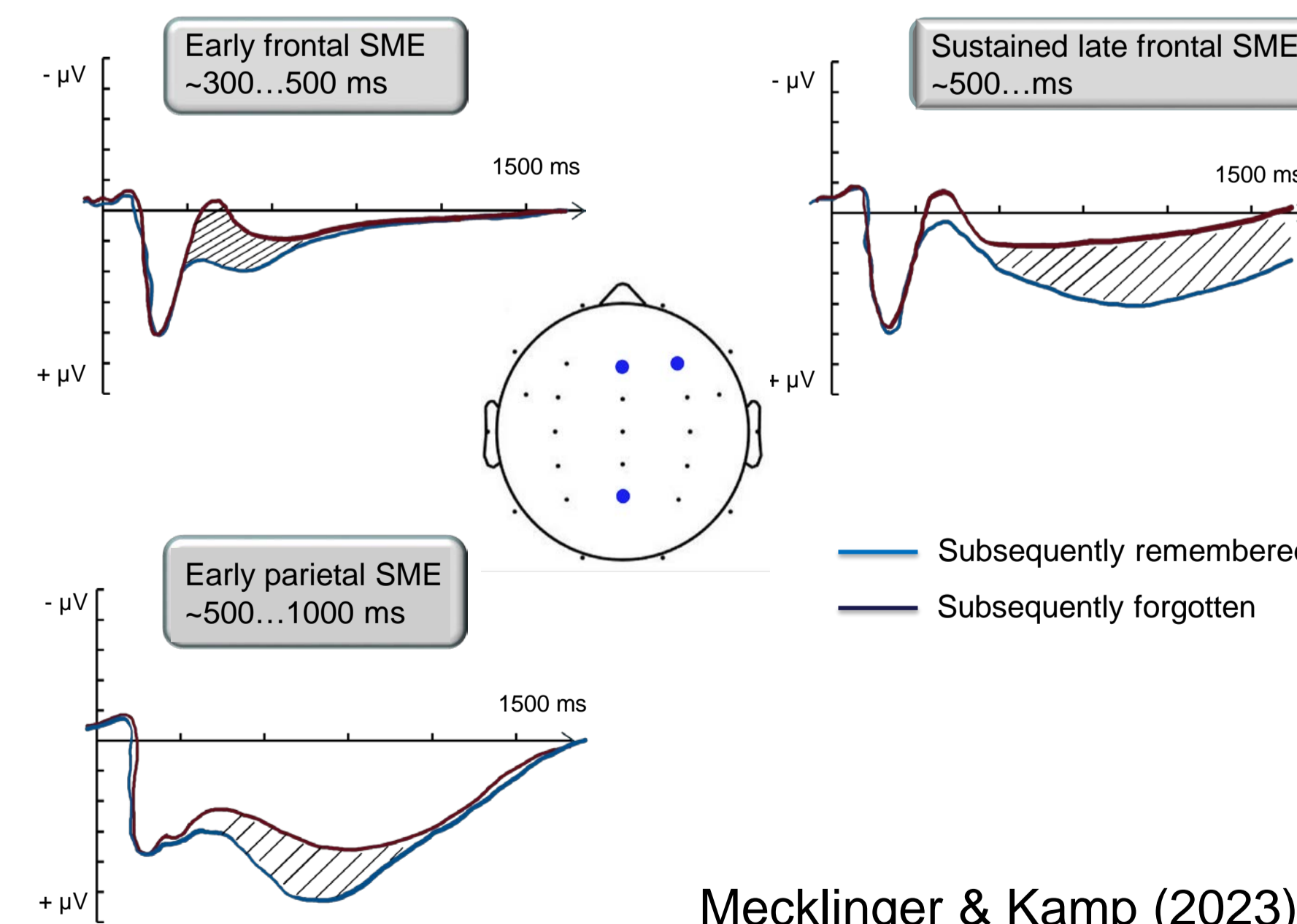
The ERP elicited by the focused element (pearls vs PEARLS) was more positive going between 300 and 700 ms at parietal electrodes when two elements (rubies AND sapphires) were remembered than if only one element (rubies OR sapphires) was remembered. This retrograde SME was only present in the contrastive focus condition.

4 Behavioral Results and SME logic



Memory performance was not affected by the focus manipulation

The three subcomponents of the ERP SME



Mecklinger & Kamp (2023)

5 Discussion

- Unexpectedly, we did not find a memory benefit for the alternatives in the contrastive focus condition. Maybe the sample size was too small. Others have reported retrograde memory effects only for items remembered with high confidence (1).
- Encountering the focus-marked target word may initiate the reinstatement of previous parts of the story, a process called **retrieval practice** (7). This in turn could have strengthened the representations of the alternatives and could have made them more readily accessible in the subsequent memory test.
- Interestingly, in prior studies retrieval practice gave rise to an early parietal SME (8, 9), highly similar to the present retrograde SME. Supporting the retrieval practice account of the RME and its electrophysiological correlate, the effect resembles in its spatio-temporal characteristics the late parietal old/new effect, the ERP correlate of recollection.
- Taken together, the data suggest that contrastive focus marking initiated a reinstatement of the preceding sentence context (retrieval practice) by which these elements are prioritized in memory and therefore more likely remembered.

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