



# Mood affects semantic anticipation, but not syntactic parsing, in real-time reading

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## Introduction

Research on attention, memory, decision making, and social judgement has shown that mood can substantially modulate how the brain processes information. For example, in a sad mood people have a narrower focus of attention, and they rely less on heuristics in reasoning and recall [1,2,3]. The exact mechanisms are unknown, but may well be related to the regulation of exploratory behavior. In two studies, we exploit the richness of language comprehension to explore the role of mood in brain function. We assessed how experimentally induced positive or negative mood affects two radically different aspects of reading: ‘algorithmic’ syntactic parsing and heuristic semantic anticipation.

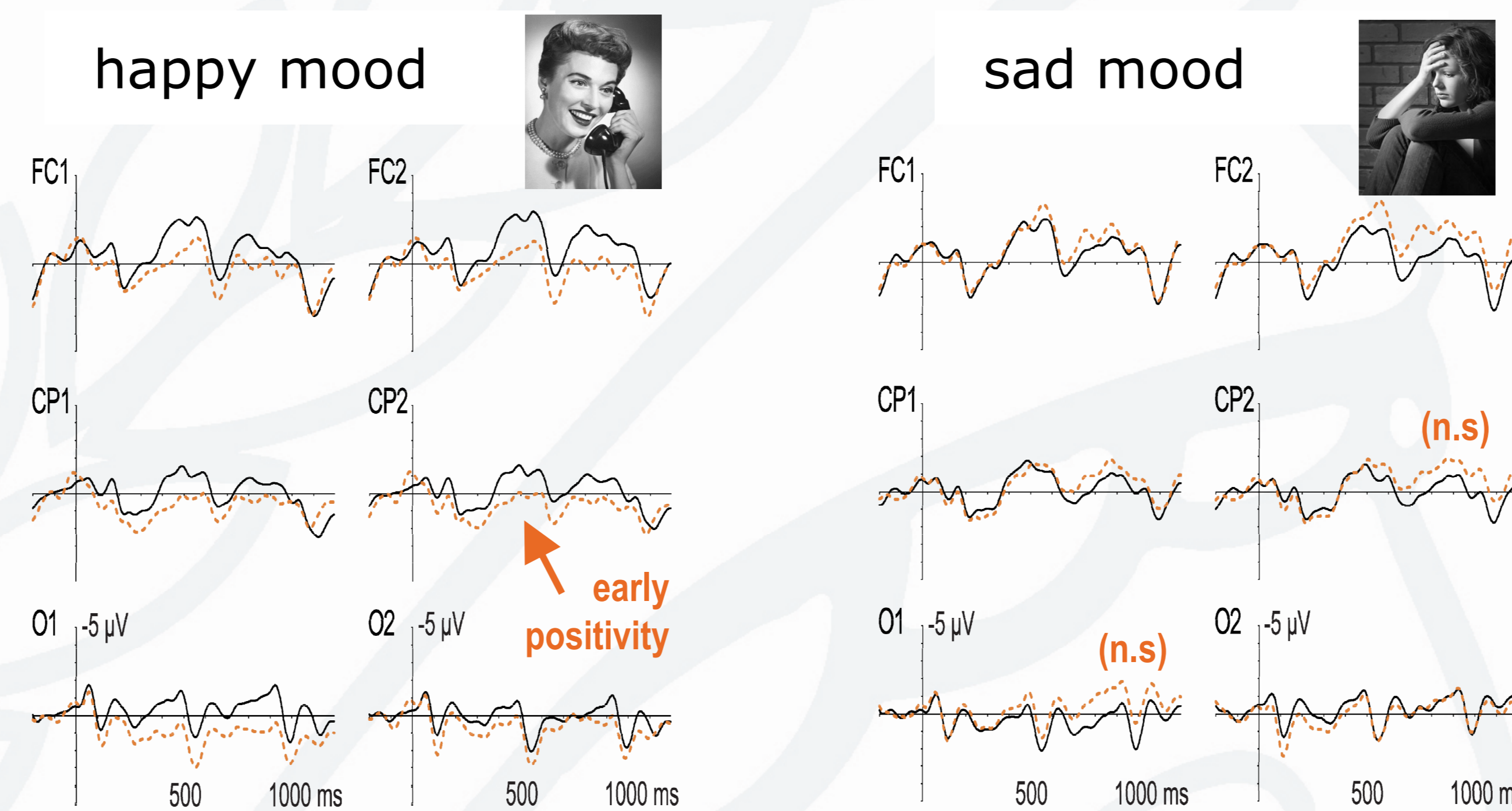
## EEG experiment

In a two-session EEG study, we used film clips to manipulate the mood of 16 female participants just before they read texts that respected or violated a syntactic rule (e.g., "The boys turns..."), and texts that confirmed or disconfirmed a verb-based semantic expectation (e.g., that "X feared Y because..." would continue about Y, not X; see [4]). Texts were presented with ~425 ms/word SVP, and readers were asked to pay attention only. ERPs showed that mood had no effect on syntactic parsing (equal P600 effects when happy or sad). Mood did affect semantic anticipation: whereas readers expected information on a specific person when in a happy mood (as revealed by an early positivity to expectation-disconfirming pronouns), a sad mood completely abolished such anticipation.

## EEG results: semantic anticipation

Joe Biden and Sarah Palin prepared for a very important debate. They were both nervous, as this debate would certainly affect the elections.

Sarah feared Joe because he was fully aware of her ignorance. (expected)  
Joe feared Sarah because he was fully aware of her popularity. (unexpected)

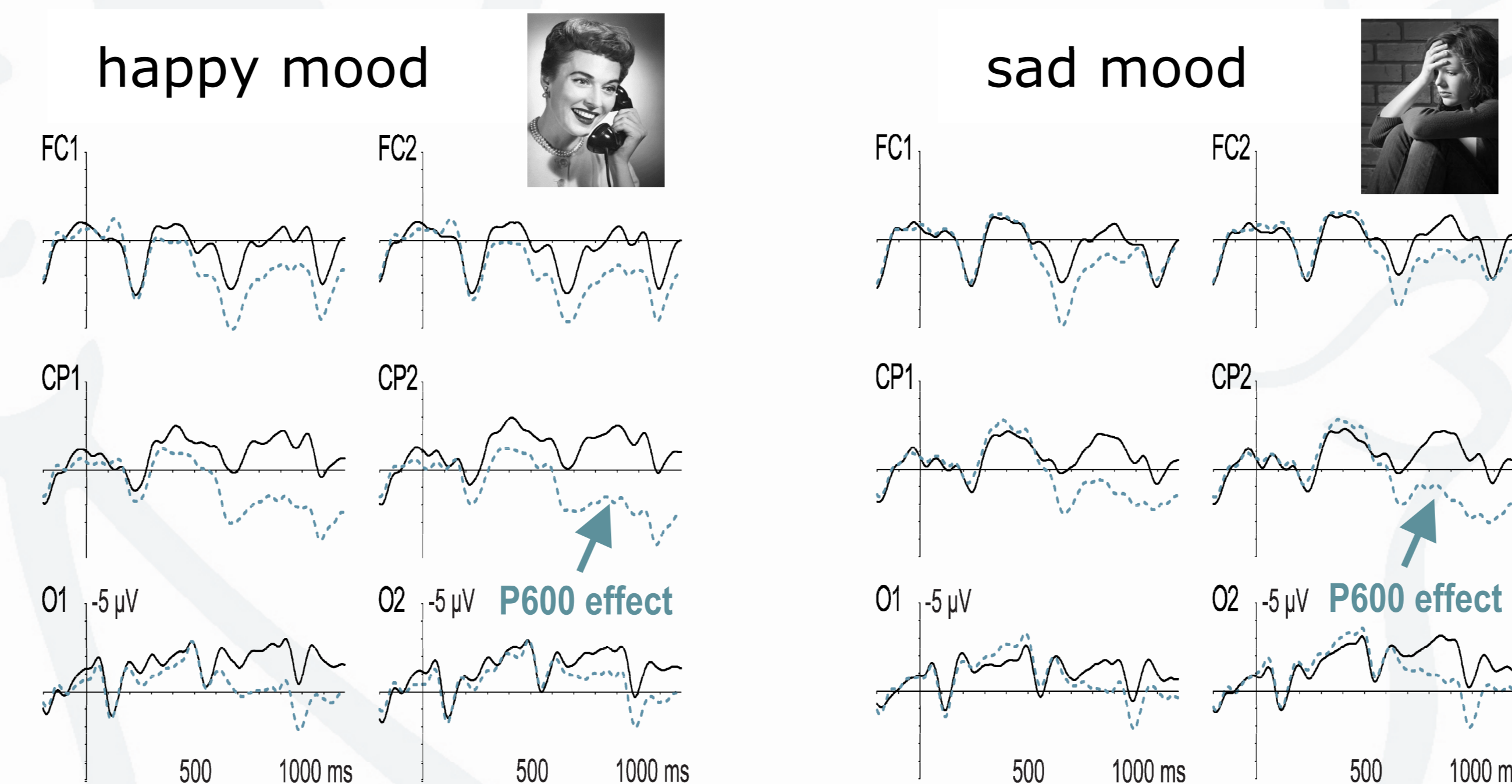


Early positivity at the anticipation-inconsistent pronoun "he" in a happy mood, but no effect at the same pronoun in a sad mood

## EEG results: syntactic parsing

Paul and Jim really like to challenge each other all the time.

The boys turn even the slightest difference of opinion into a bet. (correct)  
The boys turns even the slightest difference of opinion into a bet. (violation)



Equal P600 effects to syntactic violations in happy and sad mood

## Behavioral experiment

We showed the same mood induction clips to 40 new participants and then asked them to complete our semantic anticipation stories, truncated just before the critical pronoun. Responses revealed an equal verb-based semantic bias in the happy and the sad mood (90% and 91% bias). Thus, a sad mood does not prevent access to the relevant semantic information per se: semantic heuristics can still be used in an explicit self-paced behavioral task. This suggests that the sadness-induced absence of semantic anticipation in the ERP study hinges on the specific reading situation in that study (no behavioral task, texts unfolding rapidly).

## Conclusion

Within language comprehension, the processing consequences of mood are interestingly selective: whereas at least some heuristics-based semantic anticipation can be abolished in a sad mood (in real-time reading without a secondary task, EEG study), syntactic parsing mechanisms continue to do their job. This may reflect an impact of mood on the breadth of associative memory retrieval ([1,3]): whereas syntactic features can be easily accessed regardless of whether retrieval is narrow or broad, access to the more remote associations needed for heuristic semantic anticipation suffers – at least in ‘taskless’ real-time reading – from the narrower retrieval focus that comes with a sad mood.

[1] Bar, TICS 2009; [2] Clore & Huntsinger, TICS 2007; [3] Rowe et al., PNAS 2007; [4] Van Berkum et al., BrRes 2007