

# Frequency attenuation effects in masked repetition priming: A large-scale online study

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## In a nutshell

- Masked repetition priming is reportedly insensitive to word frequency (unlike non-masked repetition priming), though the evidence is actually inconclusive.
- Past disparate findings are likely due to the use of unreliable word databases and lack of statistical power.
- We ran two large masked priming experiments online based on more reliable word databases.
  - Experiment 1** assessed the feasibility of online masked priming experiments.
  - Experiment 2** was pre-registered to have high power for detecting at least a 10-ms interaction.
- We found a significant 15-ms interaction effect, which suggests word frequency may be accessed at earlier stages of lexical access.

## Introduction

- Masked priming has been the primary tool for investigations on lexical access and word processing while mitigating strategic effects [1]
- Unlike the non-masked counterpart [2], masked repetition priming reportedly does not interact with word frequency (**frequency attenuation effects, FAE**) [3–10]

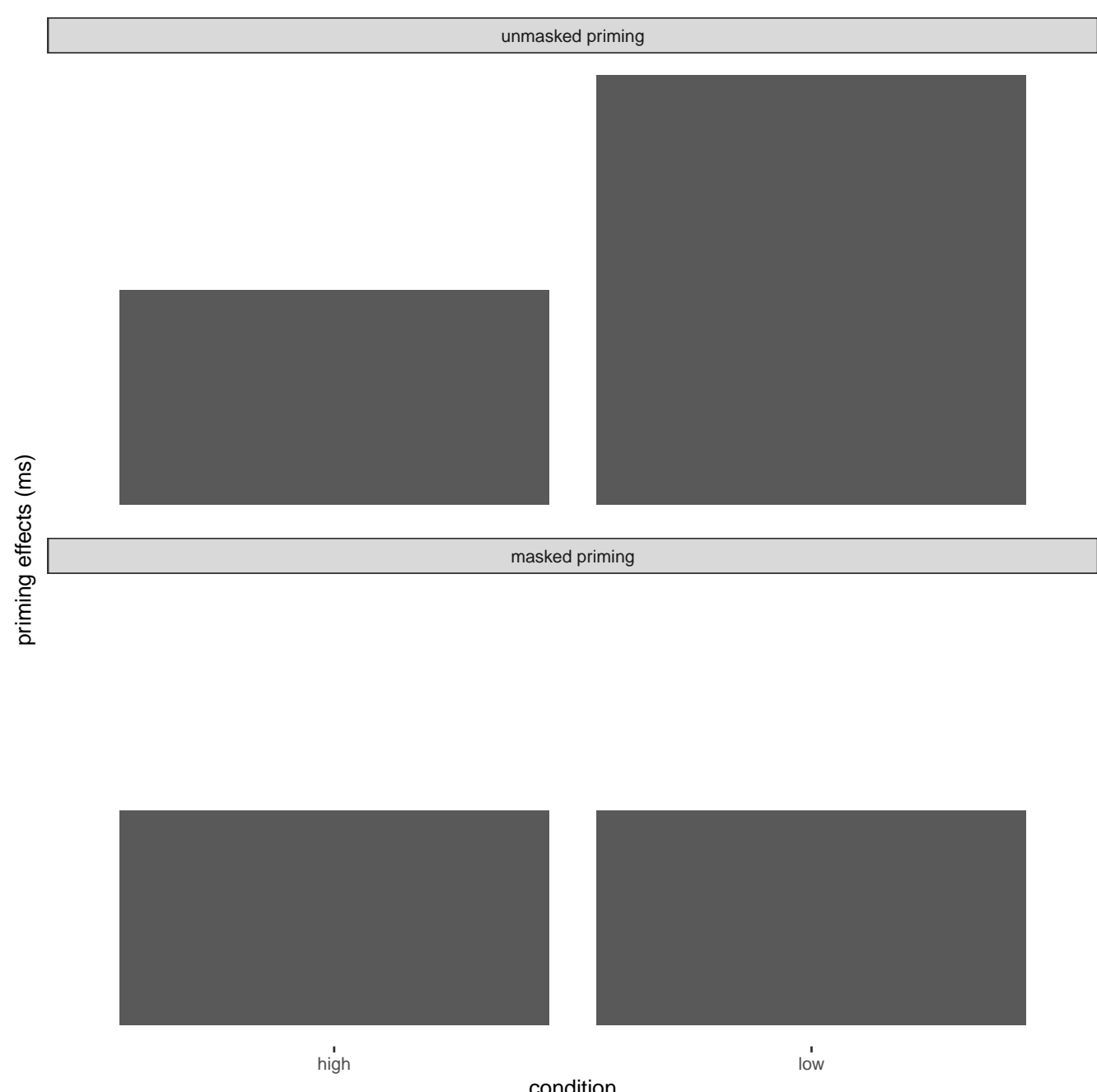


Figure 1. Frequency effects in priming.

- These seemingly robust results support the **entry-opening model** of lexical access [1, 3, 11]
- Priming is a post-access saving effect that
  - 1. is triggered by the prior opening of the prime word entry; but
  - 2. arises only after the target word entry is located

## However

- 4/17 experiments report a significant 30 ms FAE [12–15]
- no study** reports a numerically null (= 0ms) effect
- $FAE_{mean} = 13ms$

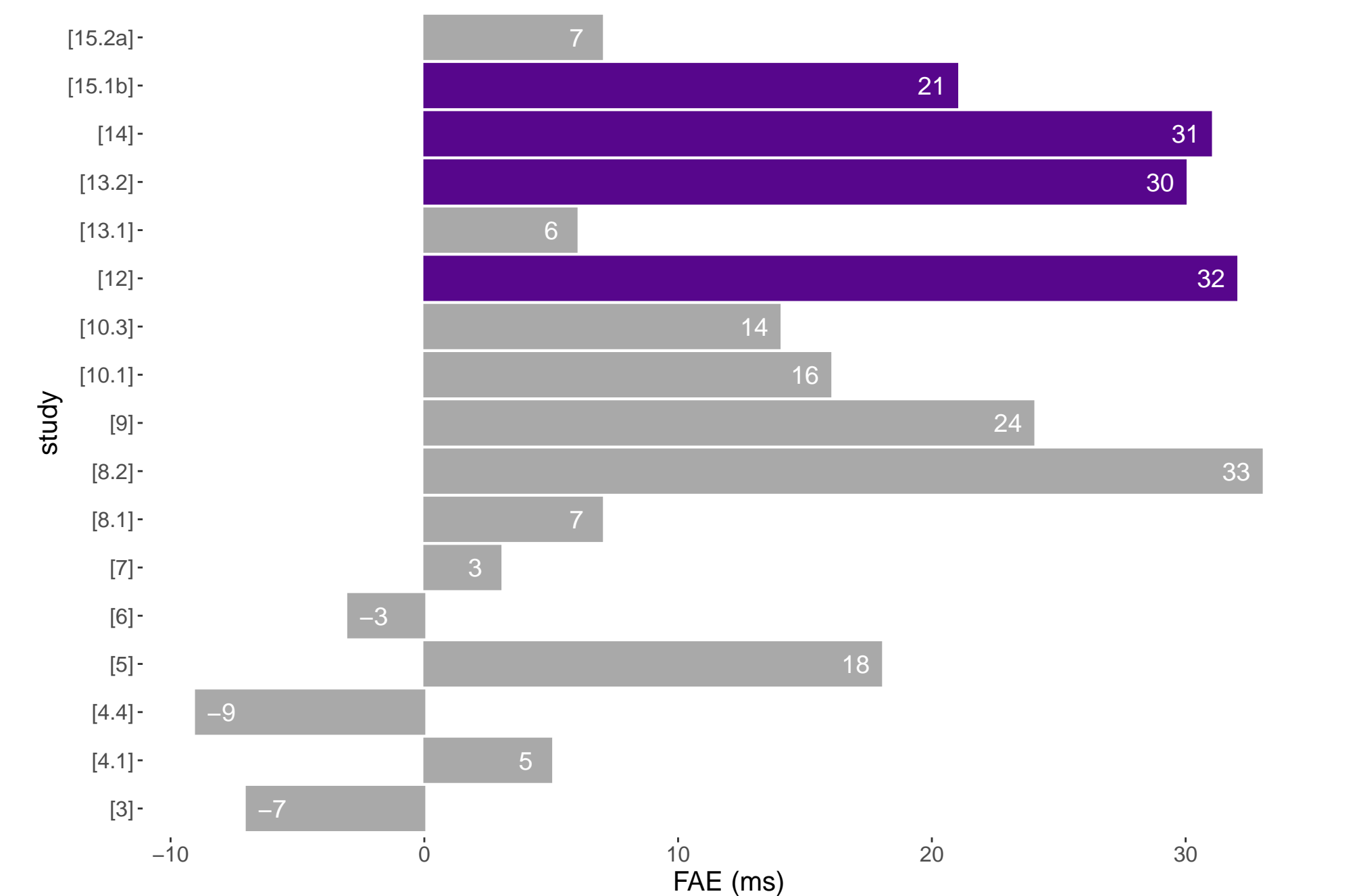


Figure 2. Structure of a masked priming trial.

## Data analysis

- prime duration cut-off: [25ms 60ms]
- subject and item error rate cut-off: 30%
- RT outlier removal cut-off: [200ms 1800ms]

## Results

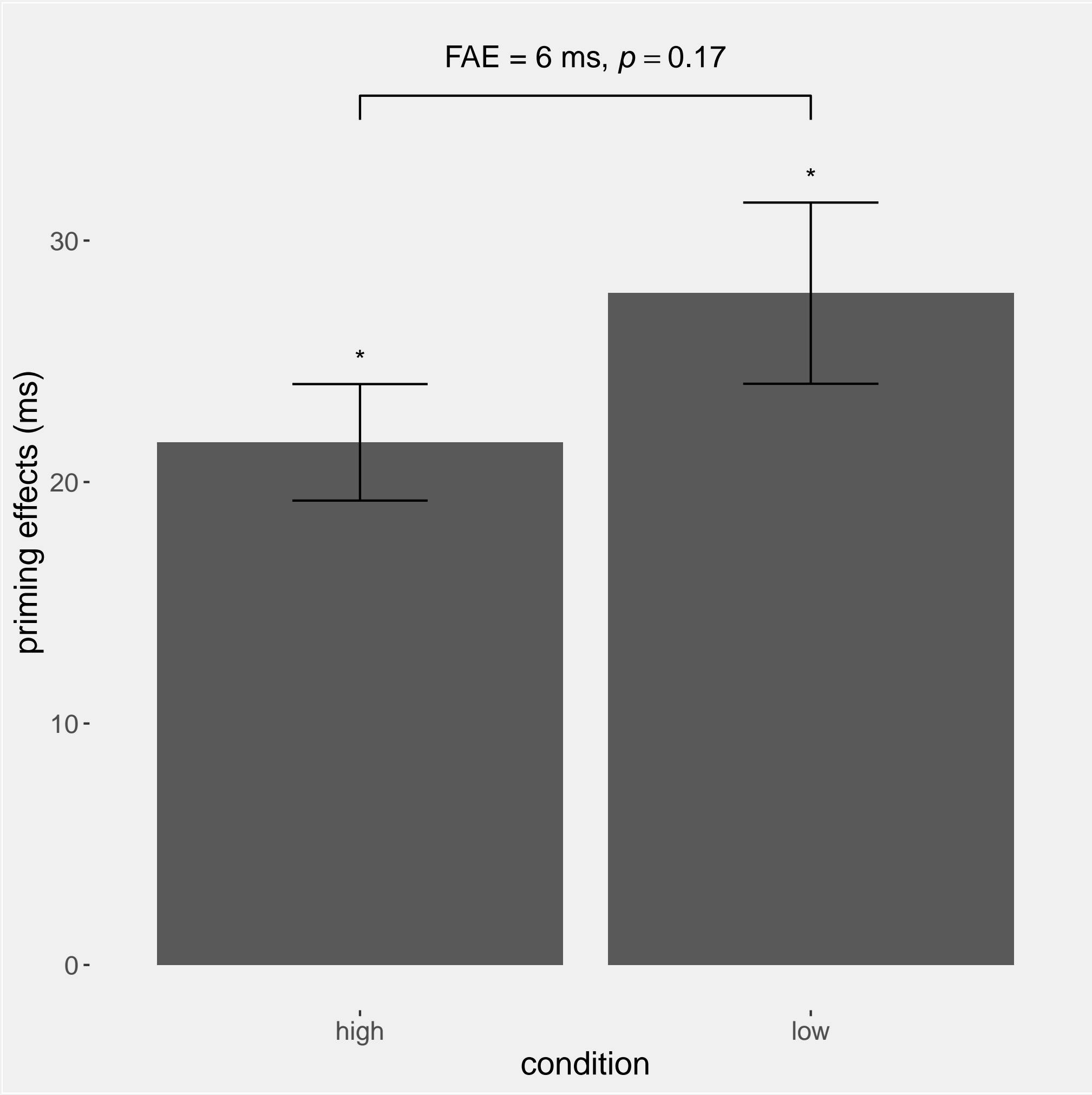


Figure 3. Experiment 1. Results

## Conclusions

- Word frequency seems to impinge on the masked priming response, similarly to the non-masked environment.
- The entry-opening model is therefore challenged, in favors of alternative models encoding word frequency within the priming mechanism (e.g., spreading activation [20]; memory recruitment [21]).
- These results call for:
  - a revision of the mechanism of prime masking.
  - a reconsideration of masked priming as a tool for investigations on early stages of lexical access.

## This study

### Experiment 1

#### Materials

frequency	N	length	log HAL			
			min	max	mean	SD
high	100	5	10.01	11.97	10.87	0.60
low	100	5	6.01	7.99	6.96	0.55

Table 1. Experiment 1. Lexical properties

#### Procedure

- $N = 300$  native English speakers recruited on Prolific
- $SOA = 33ms$
- delivered on Labvanced [19]

### Experiment 2

#### Materials

frequency	N	length	$SUBTLEX_{US}$			
			min	max	mean	SD
high	100	4	10.01	11.97	10.87	0.60
low	100	4	6.01	7.99	6.96	0.55

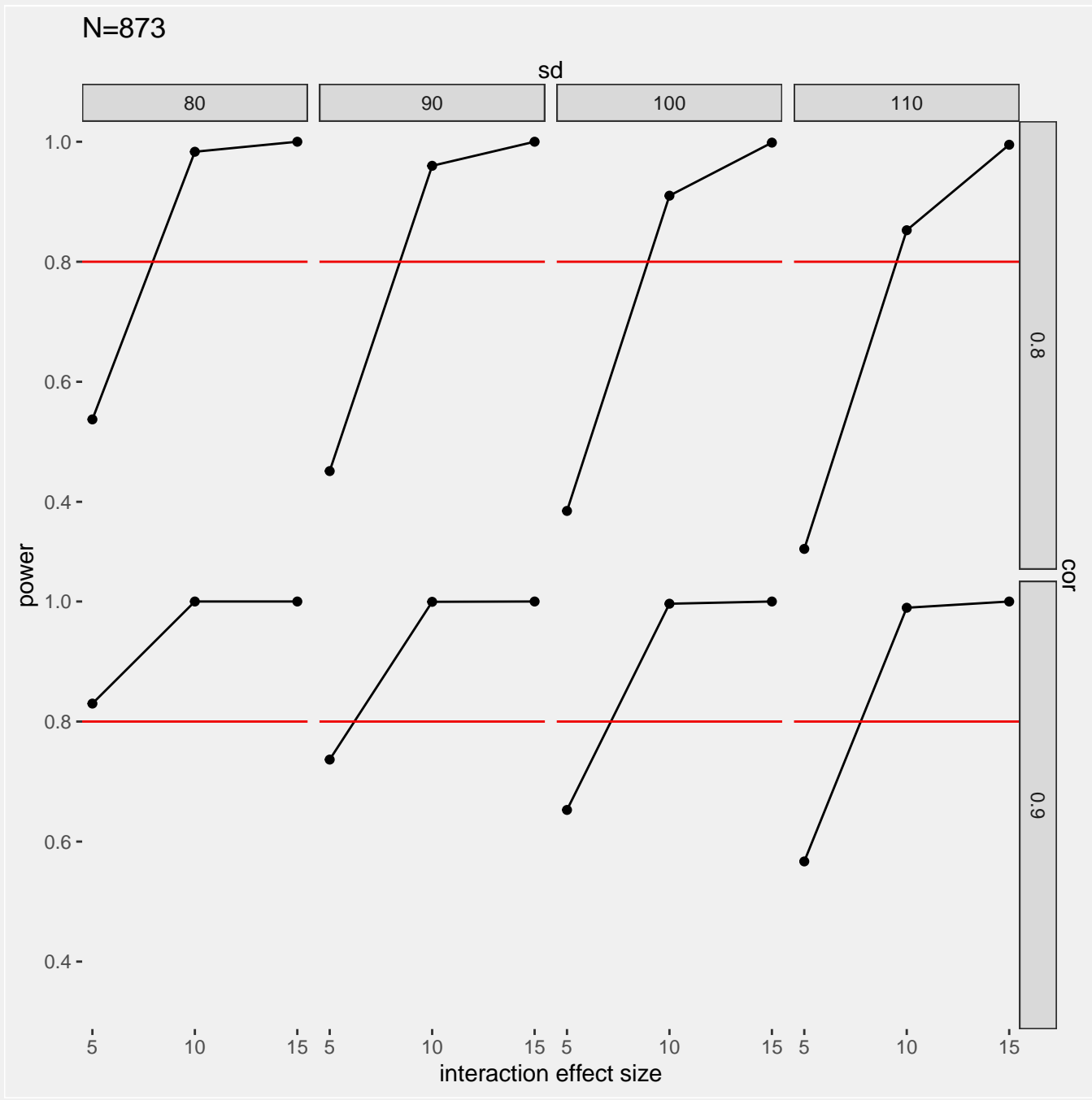
Table 2. Experiment 2. Lexical properties

#### Procedure

- power simulations** based on the following parameters:
  - $SD = [80 \sim 120, step = 10]$
  - $r = \{0.8, 0.9\}$
  - $FAE = \{5ms, 10ms, 15ms\}$
  - $\hat{N} = [200 \sim 3000, step = 150]$
- $N = 2,600$  native English speakers
- same procedure as Experiment 1

#### Data analysis

- same as Experiment 1
- 66% of the sample was removed → **power evaluation**



## Results

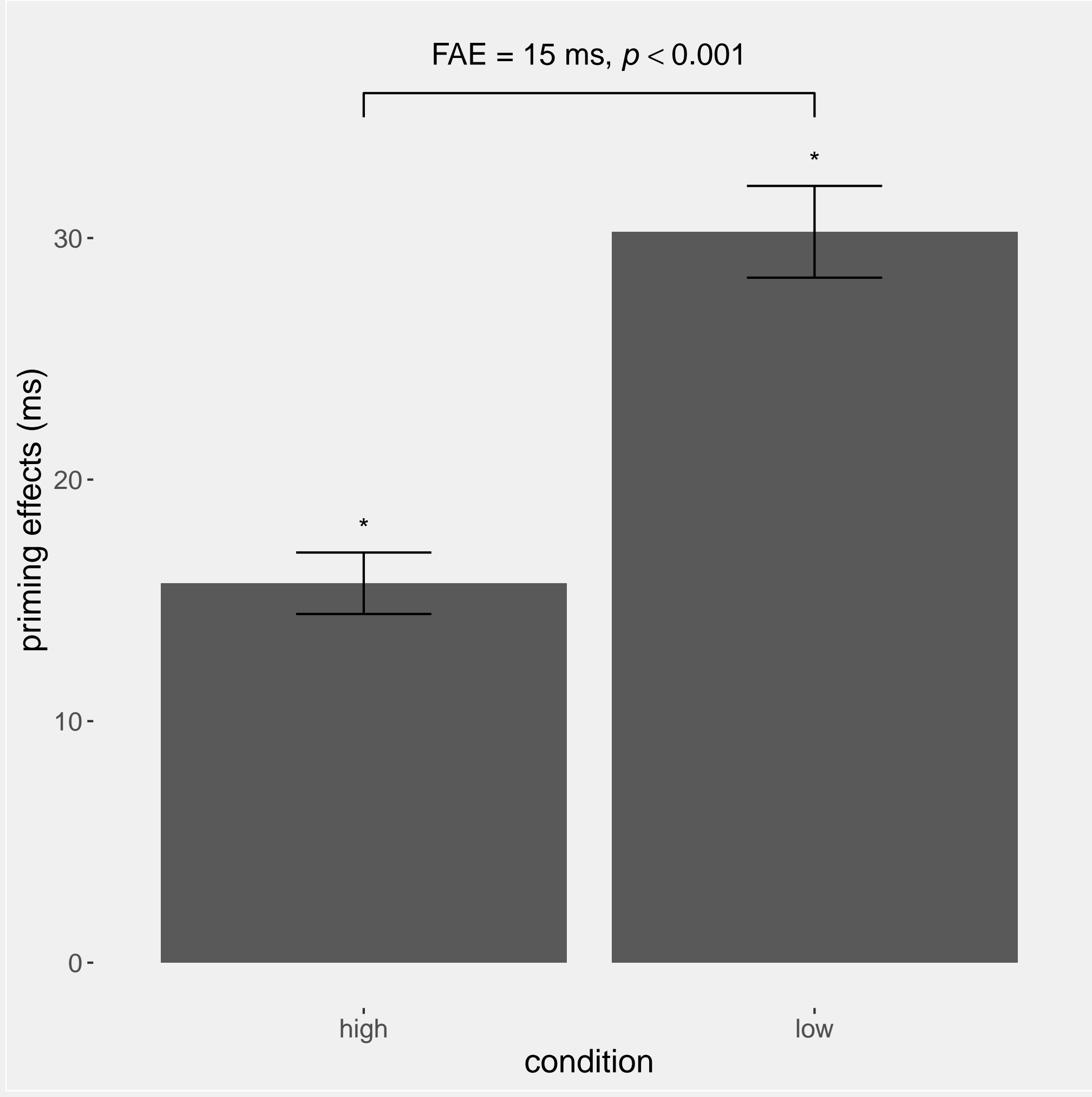


Figure 5. Experiment 2. Results

## Draft available!



## Two potential confounds

- use of outdated word database [16]
- substantial lack of power [17, 18]

This study was designed to eliminate both confounds, and reliably provide evidence (or lack thereof) for FAEs in repetition masked priming