



# Priming and Antipriming of Memory and Judgments of Learning

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## Introduction

### Purpose:

To investigate the effects of implicit memory on metamemory in healthy young adults.

### Implicit Memory:

Implicit memory refers to changes in the speed or accuracy of processing a stimulus due to prior processing of that (or a similar) stimulus, irrespective of awareness of such changes (Schacter, Chiu, & Ochsner, 1993).

### Priming:

Viewing an image or reading a word improves the accuracy and response time for subsequently processing the same or similar stimulus for some period of time thereafter.

### Antipriming:

Viewing an image or reading a word worsens the accuracy and response time for subsequently processing an item that is *different* from the previously processed item (Marsolek et al., 2010).

### Metamemory:

Self-monitoring and self-regulation of one's own memory processes.

### Judgment of Learning (JOL):

A type of metamemory measure: an estimate on how well an individual believes he/she learned something, often represented on a Likert scale.

Example:

"How confident are you that in ten minutes you will be able to remember the second word that went with the first word, when you see it appear on the computer screen?"

0% 20% 40% 60% 80% 100%"

## Experiment

### Background:

Ramanathan, Kennedy, and Marsolek (2014) investigated whether priming and antipriming could affect JOLs in 18 individuals with Traumatic Brain Injury and 18 matched controls. In that study, in each trial a masked prime or antiprime stimulus word was presented immediately prior to presentation of each word-pair for study. Participants studied the word-pair and made an immediate or delayed JOL. (See figure in the next panel). A recall test was completed afterwards.

The results of that study showed that antipriming significantly lowered participants' JOLs and overconfidence. Thus, presenting masked stimuli immediately prior to word-pair study seemed to affect JOLs.

Here we replicate and extend these findings by presenting the masked stimuli:

- 1) Immediately before word-pair study, to replicate the prior findings, and
- 2) Immediately before making the JOL to reduce the likelihood that the masked stimuli are priming or antipriming encoding rather than JOL

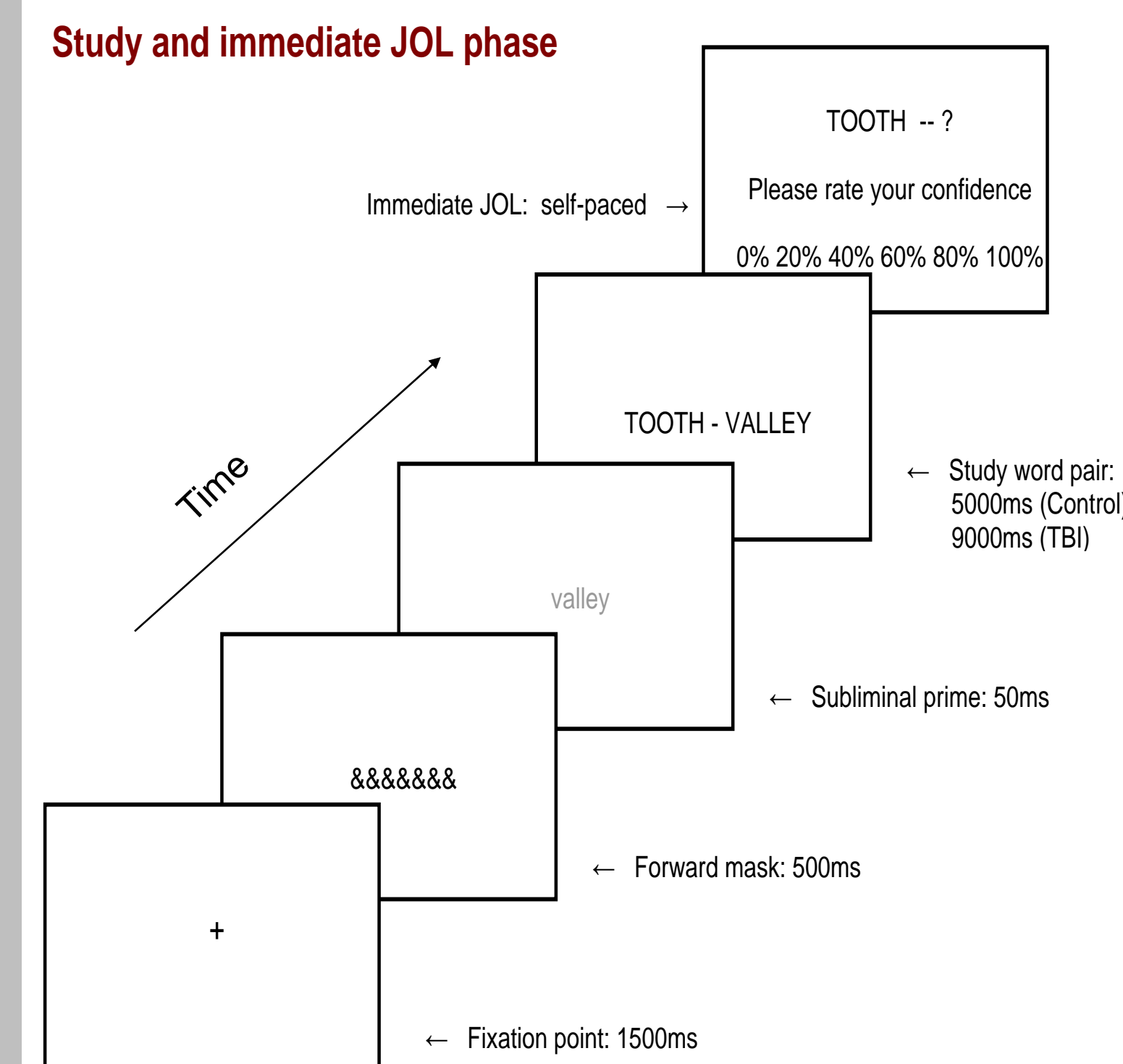
We also use a larger sample size, with college students with no neurological impairments.

### Primary Research Questions:

- 1) Will masked priming or antipriming affect measures related to JOLs
- 2) Will manipulating the point at which we present implicit memory stimuli influence any such effects on measures related to the JOLs?

## Procedure

### Experiment 1:



Participants stared at a fixation point for 1500 ms, followed by a 500 ms forward masking row of ampersands. Then, a lower case item was presented for 50 ms. This item could be either a row of x's (baseline), the ensuing target word of the cue-target word-pair (prime), or a word unrelated to the ensuing cue or target (antiprime). This stimulus item was immediately followed by the cue-target word-pair, in capital letters, for five seconds. After the initial training block, there was one trial block of 60 word-pairs, presented in the above manner. For a randomized half of the trials, a JOL rating was made immediately after studying the word-pair. For the remaining half of the items, the JOL was delayed for approximately two minutes. Finally, a recall test was completed

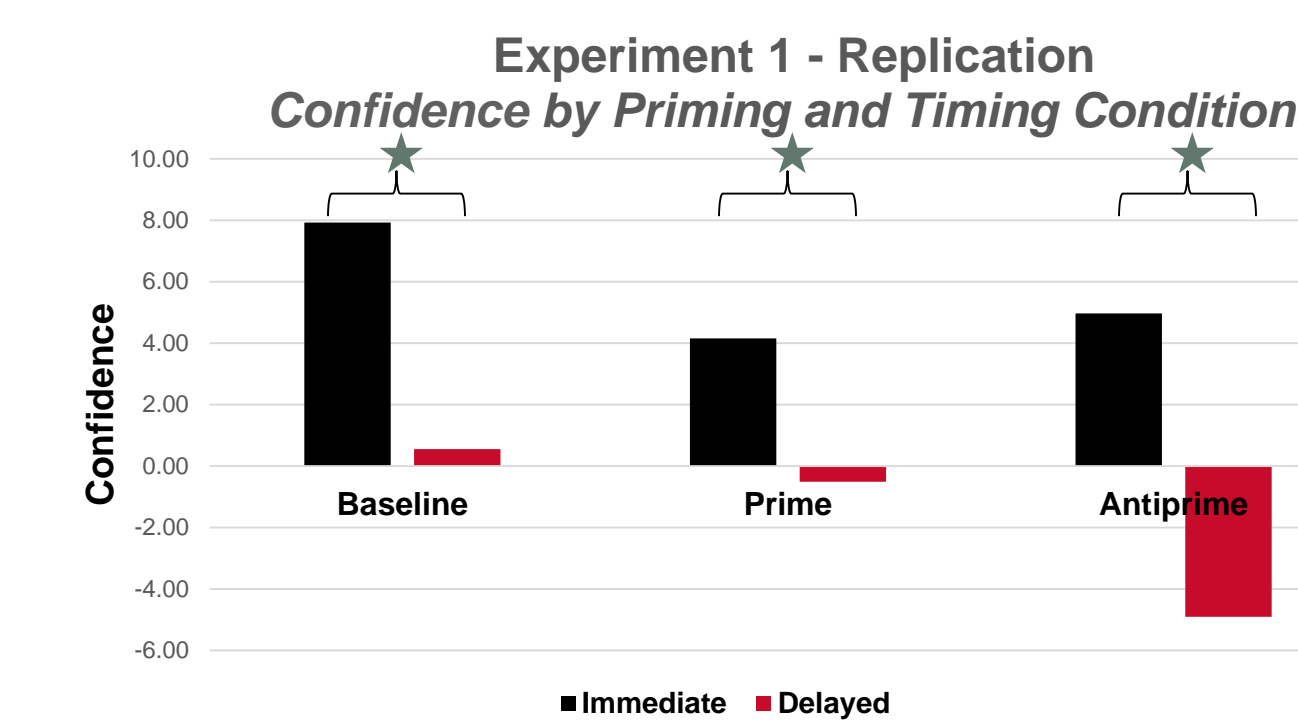
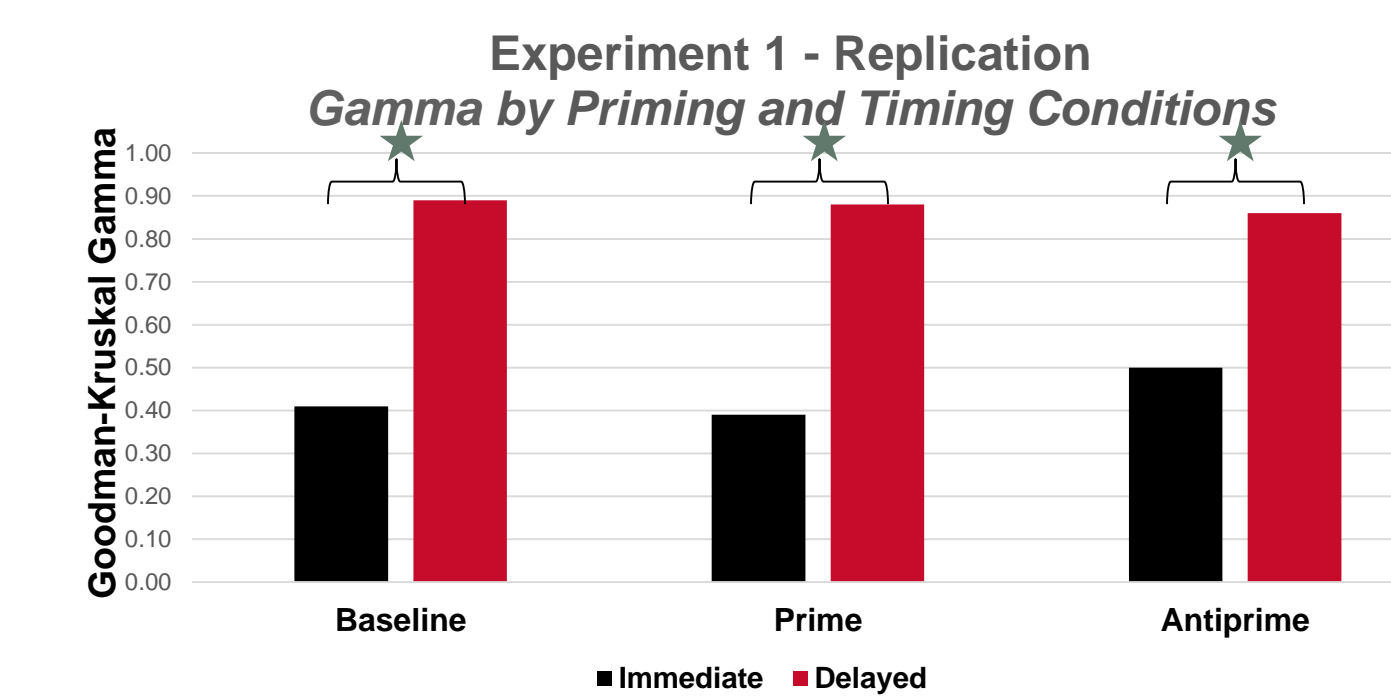
### Experiment 2:

Followed the same procedure as above, but with the masked stimuli presented immediately prior to the JOL request, rather than immediately prior to word-pair study.

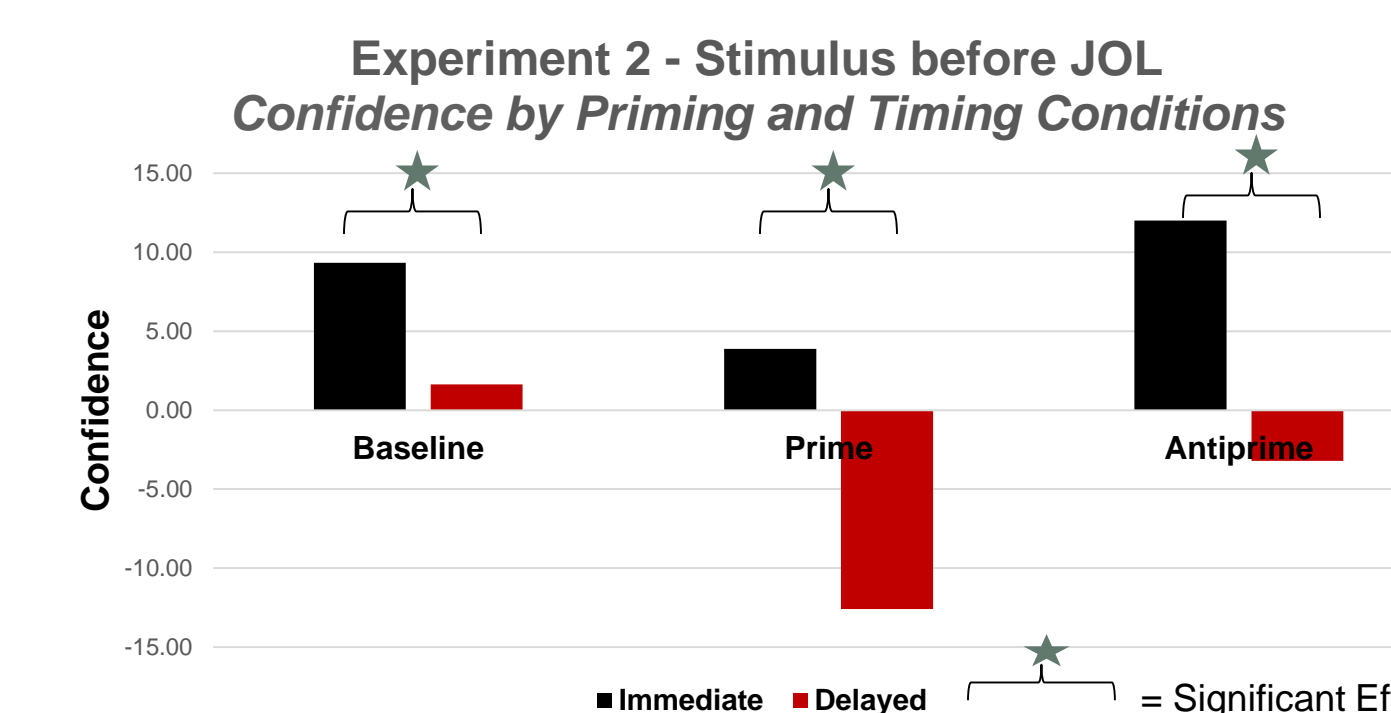
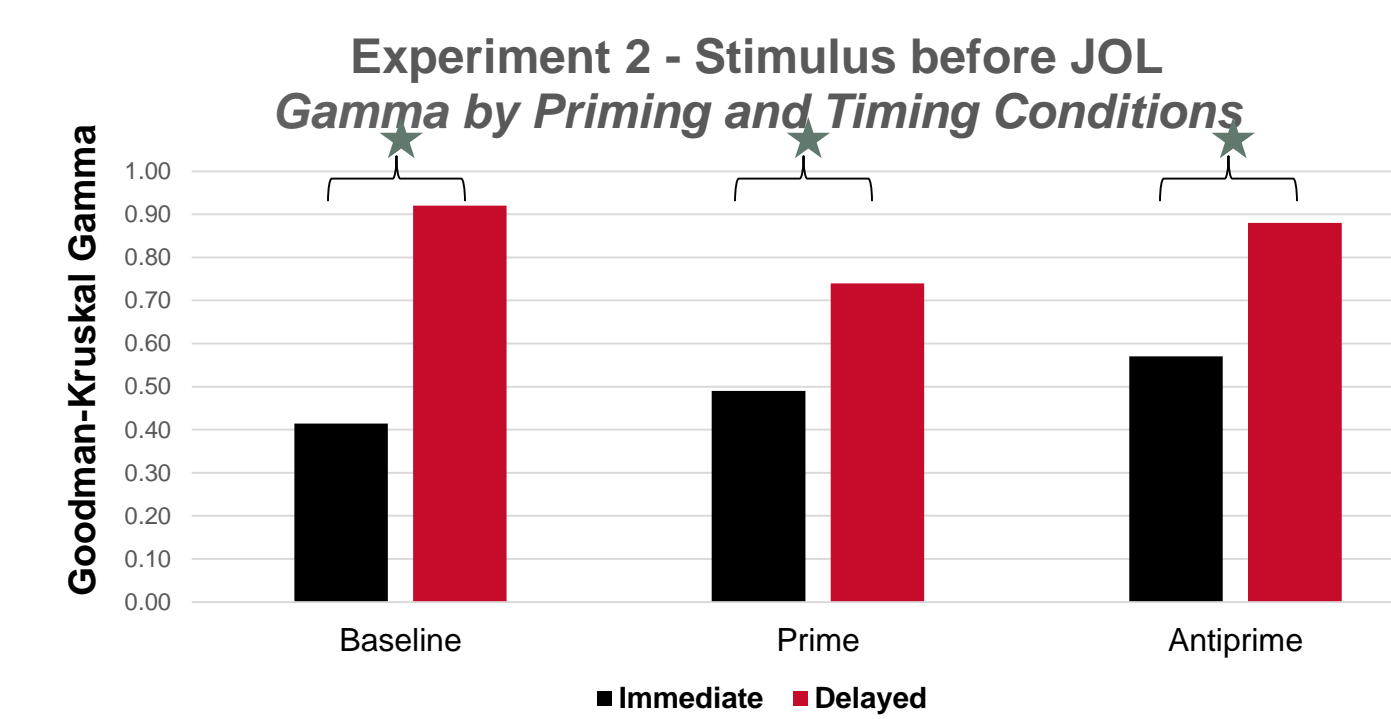
## Results

### Current Status:

- 96 participants completed study (48 in each experiment – 24 male, 24 female in each)
- Missing cases were not replaced, reducing the number of subjects in both experimental analyses to 28 (15 males, 13 females).
- **Black Bars** = trials for which **immediate JOLs** were solicited
- **Red Bars** = trials for which **delayed JOLs** were solicited



In Experiment 1:  
• Timing condition had a significant effect on both gamma and confidence scores (Gamma:  $p < .001$ ; Confidence:  $p < .025$ ). This is the "Delayed JOL Effect"  
• Priming condition was not significant (Gamma:  $p < .814$ ; Confidence:  $p < .349$ )



In Experiment 2:  
• Timing condition had a significant main effect on both gamma and confidence scores (Gamma:  $p < .001$ ; Confidence:  $p < .025$ )  
• Priming condition was not significant for Gamma ( $p < .490$ ), but was significant for Confidence ( $p < .014$ )  
• Collapsed across timing condition, the positive priming condition was significantly lower than baseline (PR = -4.4% while BL = 5.5% for a difference/confidence score drop of approximately 10% in the prime condition as compared to baseline)  
• Further exploration of this indicates that there was both an increase in Recall for primed items over baseline (approximately 5%), and a decrease in JOL (approximately 5%) for primed items vs. baseline.

## Conclusion

### Preliminary Findings:

- The widely reported finding in the literature of the so-called "Delayed JOL effect" was replicated, lending credence to the integrity of the task protocol.
- For experiment 1 (PreStudy) the finding of a possible antipriming effect in the previous paper was not replicated in this larger sample study.
- For experiment 2 (PreJOL), preliminary results suggest a possible effect of priming on confidence.
  - The positive prime condition had significantly lower confidence scores than either baseline or antiprime, and this is equally due to increased recall accuracy and decreased JOLs for that condition.

### Further analyses:

- Some 42% of participant data were not included due to empty cells. The final analysis will replace missing cases.
- Analysis did not include participant sex as a covariate, as between group t-tests found no difference. If after replacing missing cases a sex difference is found in t-tests, this will be included as a covariate

### Future directions:

- If these results remain after the above adjustments, then the next step will be to investigate the causes for increased recall and decreased JOL in the positive prime condition

### References

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