

## Abstract

The current study was designed to explore the role of working memory in language activation during visual processing. Results show phonological competition occurs during visual search even with concurrent linguistic and spatial demands, but the impact of language is attenuated when working memory is engaged. Working memory may affect visual processing by modulating on-line access to linguistic representations stored in long-term memory.

## Introduction

- Language plays a role in seemingly non-linguistic tasks, but the mechanisms behind the influence of language on visual processing are poorly understood.<sup>1,2,3</sup>
- Working memory (WM) may modulate the on-line access of linguistic representations from long-term memory during visual processing.<sup>4</sup>
- Imposing concurrent linguistic and spatial WM demands during visual scene processing may affect language activation.

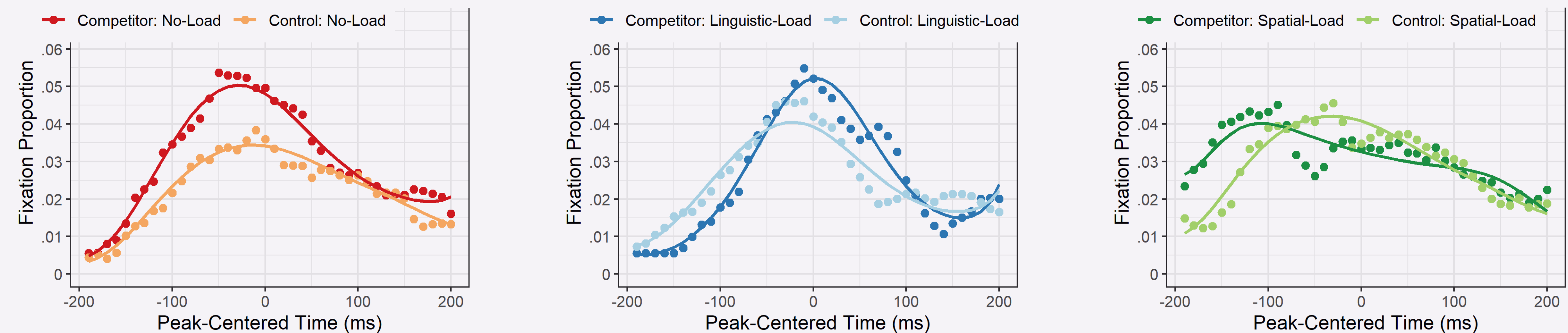
### Research Questions:

- What is the role of working memory during visual scene processing?
- How do dual-task demands impact automatic language activation?

## Results

Pattern of results shows phonological competition occurs regardless of working memory demands, but spatial and linguistic loads impact the magnitude and timing of language activation during visual processing.

Eye-tracking Fixation Shape across Load Conditions



### Within Load Conditions:

- Significant effects of phonological competition on the intercept, linear, cubic, and quartic terms (all  $p < .05$ ), reflecting differences in the shape of fixations to competitors and controls within each load condition.
- More fixation to competitors than controls under **No Load** and **Linguistic Load**; more sustained fixations to competitors than controls under **Spatial Load**.

### Across Load Conditions:

- Reduced competition in **Linguistic** and **Spatial Load** conditions compared to **No Load** ( $Est = -0.28$ ,  $SE = 0.02$ ,  $z = -11.66$ ,  $p < .001$ ).
- Competitor activation in the **Spatial Load** condition was delayed relative to both **Linguistic** ( $t(130) = 3.42$ ,  $p < .001$ ) and **No Load** ( $t(130) = 3.00$ ,  $p = .003$ ).

## Methods

### Participants:

26 native English speakers  
(mean age = 21.27,  $SD = 2.92$ )

### Stimuli:

- 30 sets of 4 items
- Target** object (e.g., *flower*)
- Phonological **competitor** next to the target (e.g., *flag*)
- Control item next to the target (e.g., *knife*)
- Filler item diagonal to the target (e.g., *cat*)

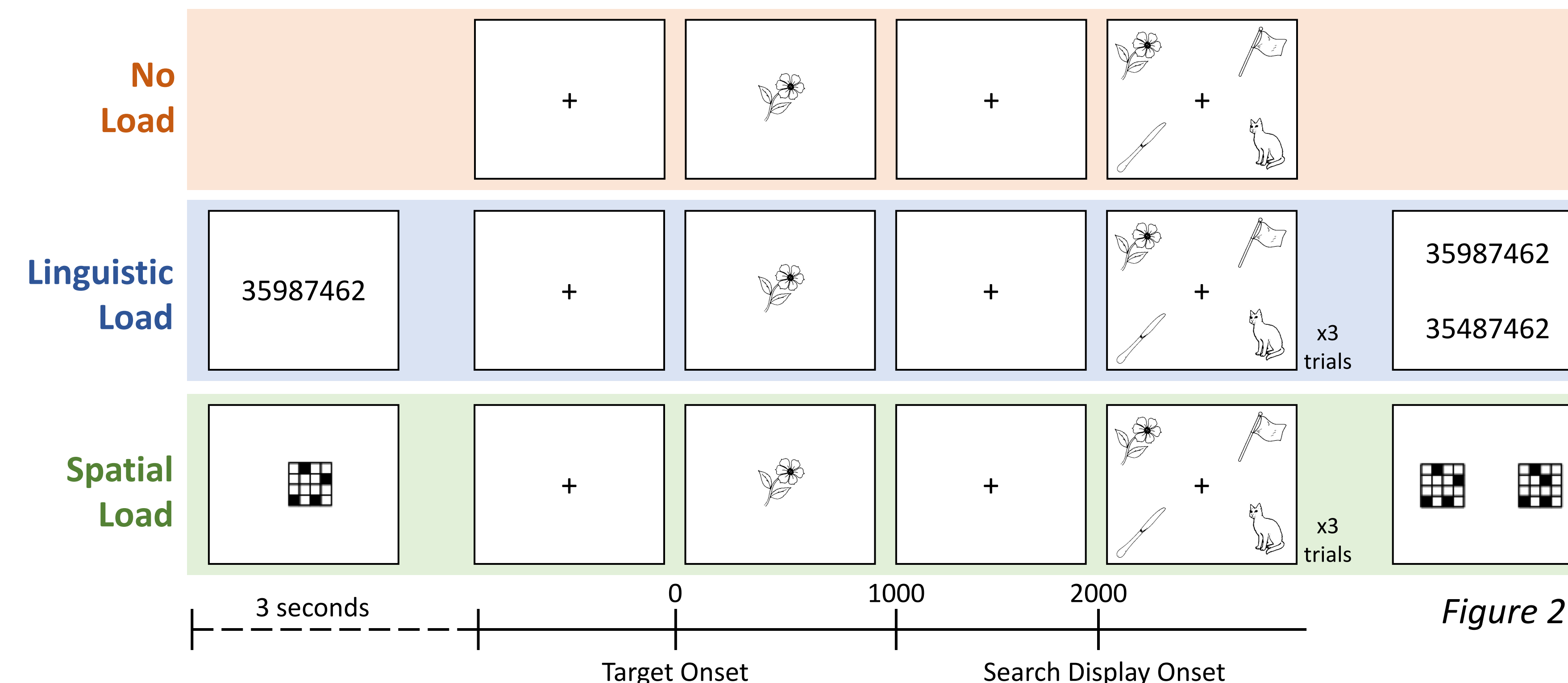
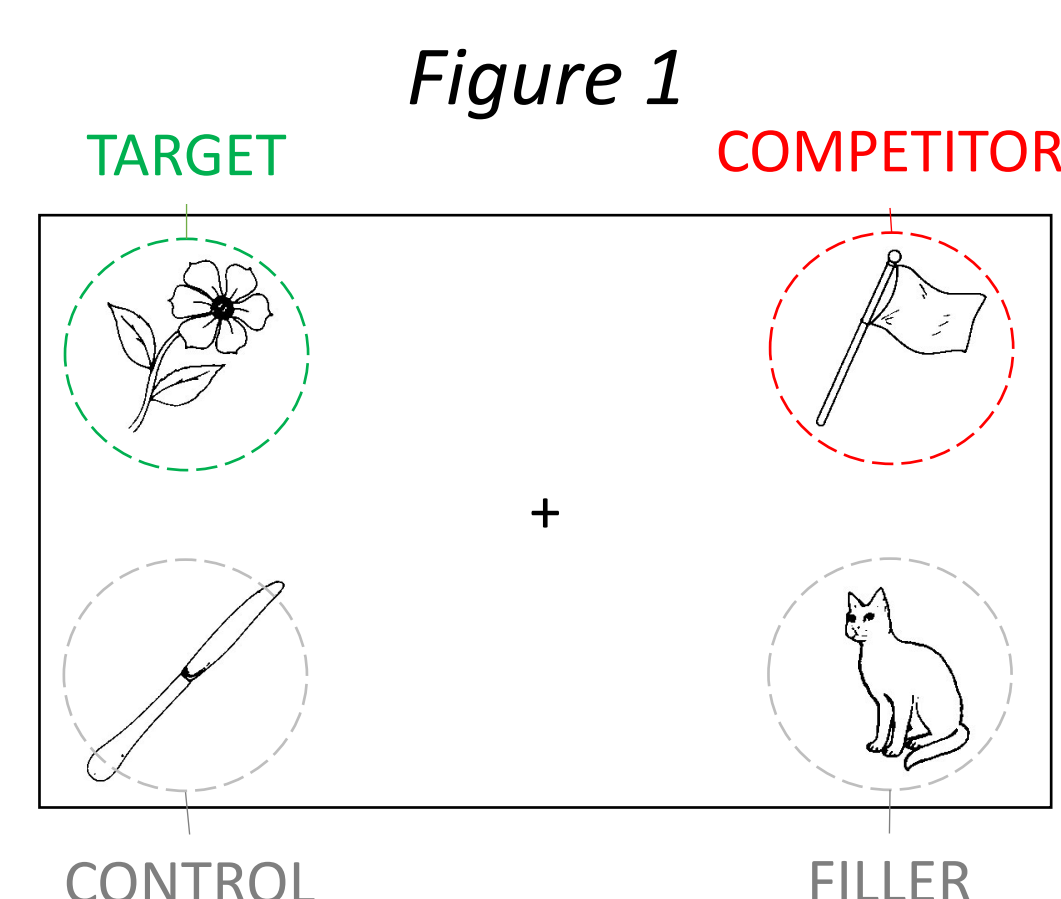


Figure 2

**Task:** Participants identified a visual target from a four-object search display that included a phonological competitor (Fig. 1). Each participant completed three blocks of trials: linguistic load, spatial load, and no load. For the two blocks imposing dual-task demands, participants were instructed to either silently rehearse an eight-digit number (**Linguistic Load**) or create a mental image of a grid pattern (**Spatial Load**) for the duration of three search trials, after which the correct number or grid was identified from one of two options. The **No Load** block of trials featured no dual-task demands. (Fig. 2)

**Data Analysis:** Timecourse of visual fixations was analyzed using growth curve analysis (GCA).

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## Discussion

When people process a visual scene in the absence of dual-task demands, linguistic information about the visually-presented objects becomes automatically activated.<sup>5</sup> Here we show that concurrent cognitive loads (linguistic or spatial) modulate the linguistic activation of non-target objects in a visual search task.

### Conclusions:

- Working memory influences the impact of language activation during visual processing.
- Working memory may play a role in binding linguistic representations stored in long-term memory with visuospatial information during visual scene processing.

### References:

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