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# Peripheral scene context modulates the dynamics of saccadic choice

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## Context

Peripheral vision plays an important role in visual recognition. Previous studies suggest that during a single-eye fixation, the rapid extraction of global features in the periphery would allow a rudimentary representation of the scene, known as the gist<sup>[1]</sup>, associated with prior knowledge about regularities in the environment. Together, they would then be used to rapidly categorize the scene, but also to generate predictions about the objects it contains<sup>[2, 3]</sup>, thus improving their categorization in central vision<sup>[4, 5, 6]</sup>.

However, visual perception is a dynamic phenomenon which alternates between ocular fixations on an object of interest and saccades towards the periphery to fixate new objects of interest. Studies suggest that knowledge about the context influence the ocular movements in top-down mechanisms<sup>[7, 8]</sup> but they did not test how predictive mechanisms allow gaze orientation towards objects in peripheral vision.

➤ **This study aimed to investigate how predictions based on the peripheral scene influence the dynamics of saccadic choice on objects in peripheral vision.**

## Methods

**Saccadic choice task: saccade toward the object belonging to a target category (animal or furniture)**

### Participants:

Experiment 1: N = 16 (21.2 ± 2.8 yo, 13W); Experiment 2: N = 25 (20.9 ± 2.3 yo, 15W)

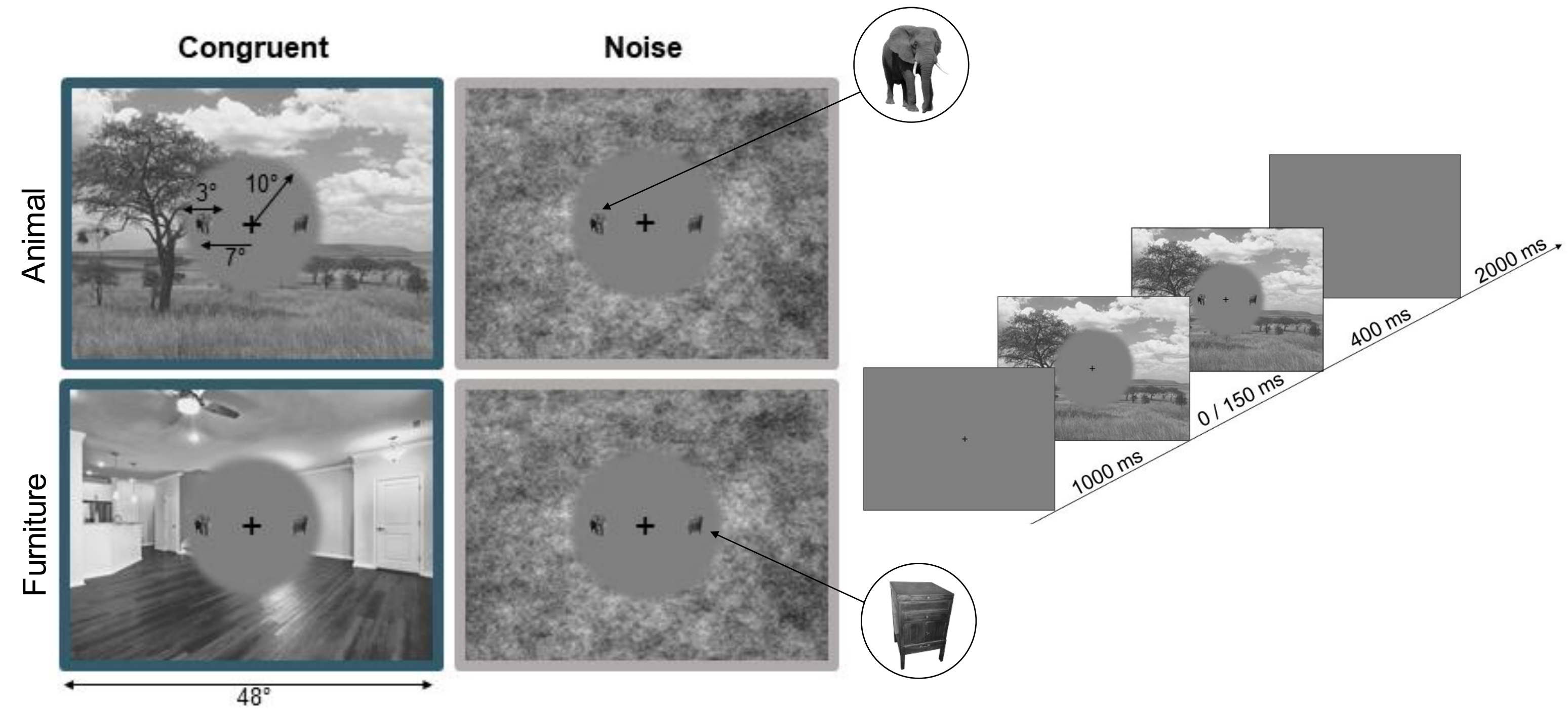
### Stimuli:

- **Two objects** (one animal and one furniture) displayed in peripheral vision, one on the left and one on the right side of a central fixation.
- A **scene background semantically congruent with the target category** (outdoor/animal or indoor/furniture) **or a noise background** (1/f noise).

### Procedure:

- **Experiment 1:** In a stimulus onset asynchrony **SOA = 0 ms** condition, objects and scene displayed simultaneously during 400 ms.
- **Experiment 2:** In a stimulus onset asynchrony **SOA = 150 ms** condition, scene presented alone during 150 ms, then objects displayed in the scene during 400 ms.

**Measures:** Correct and erroneous saccades rates and latencies (ms).



## Hypotheses

### Presence of semantic information

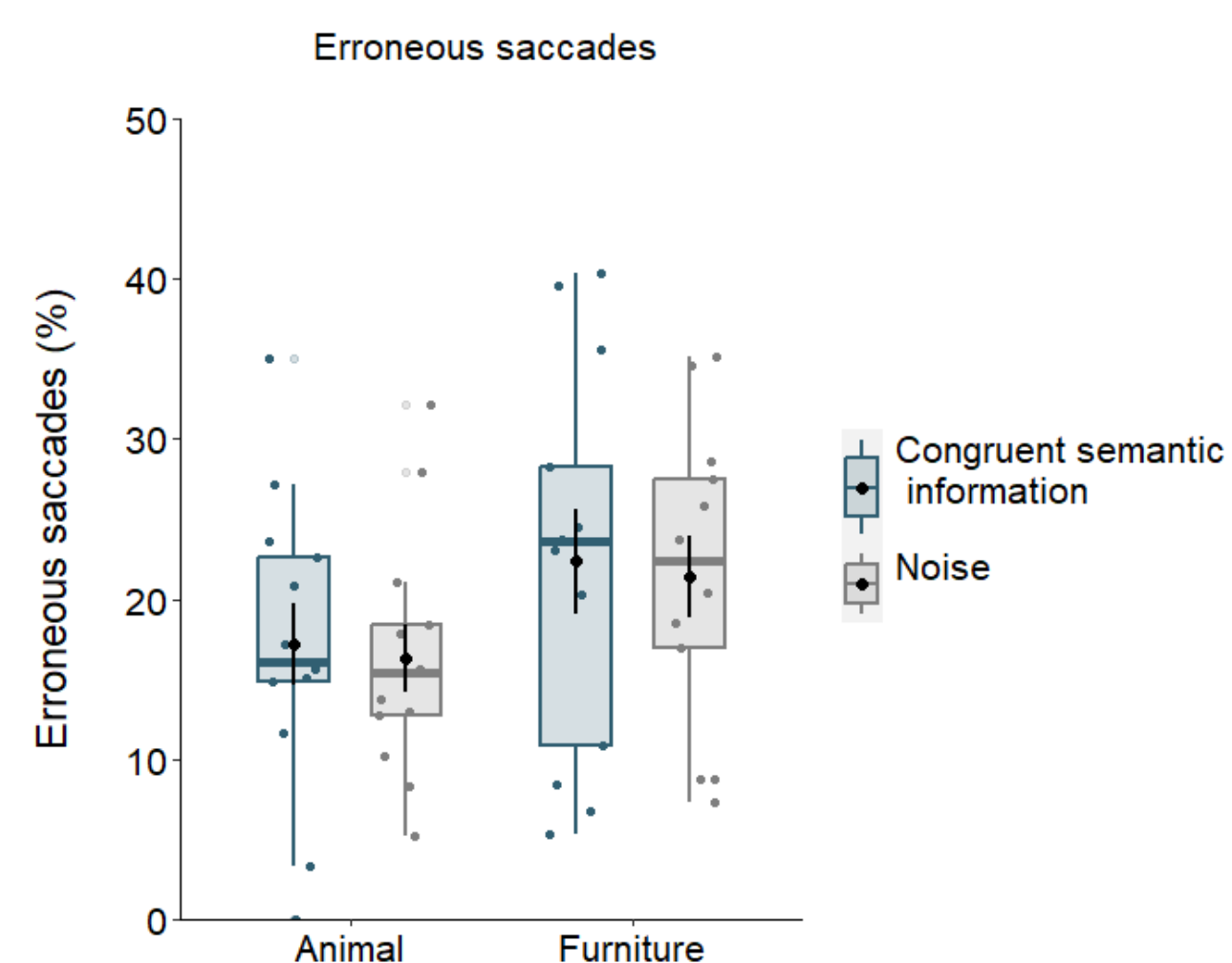
- Fewer erroneous saccades toward the distractor when the objects are displayed in a peripheral background with semantically congruent information (i.e., a scene congruent with the target category) than on a background without semantic information (i.e., a noise background).
- Shorter erroneous and correct saccade latencies when the objects are displayed in a background with semantically congruent information than without semantic information.

## Results

### Experiment 1

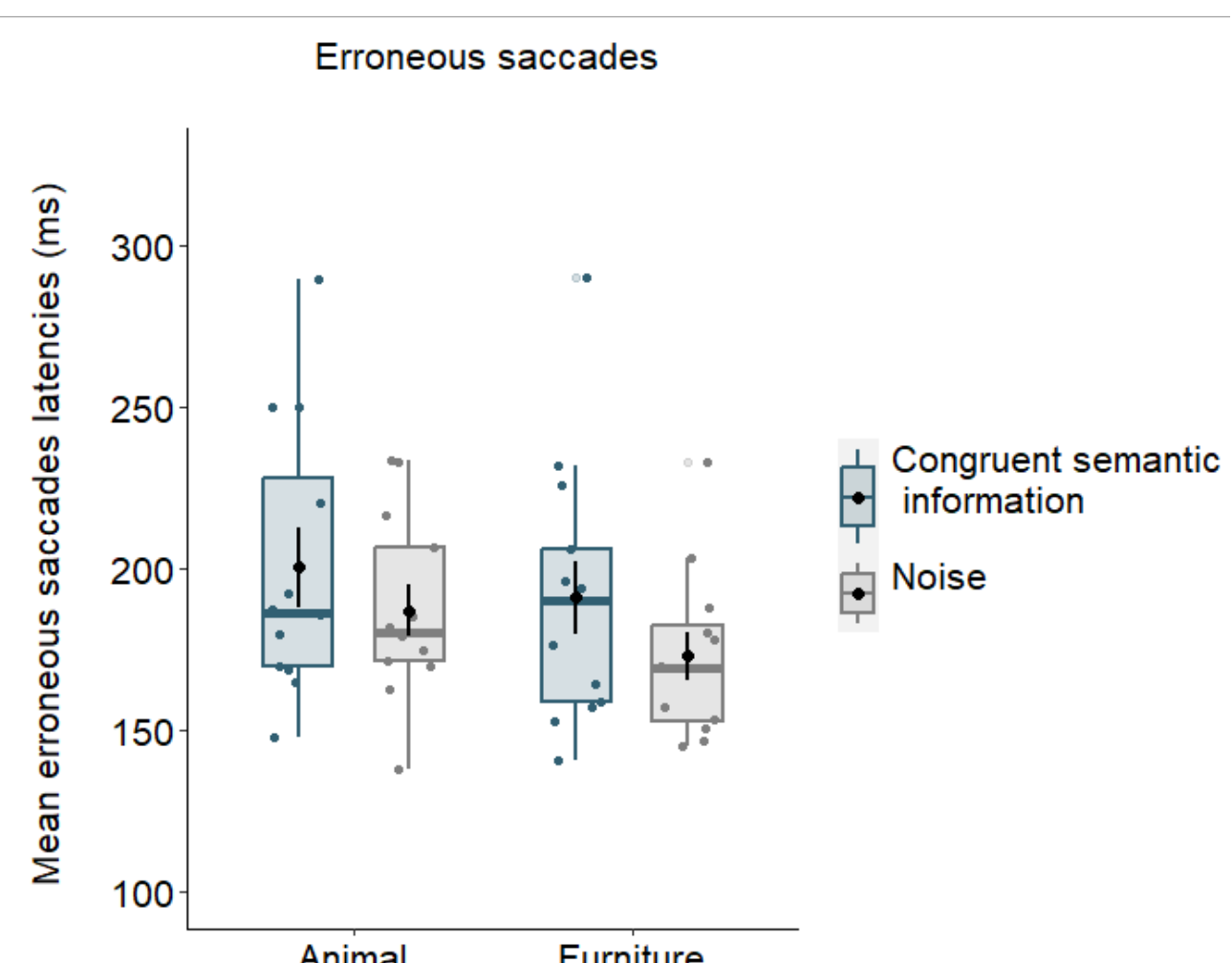
#### Mean erroneous saccades rate:

- Non significant effect of semantically congruent information presence.
- Significant target category effect



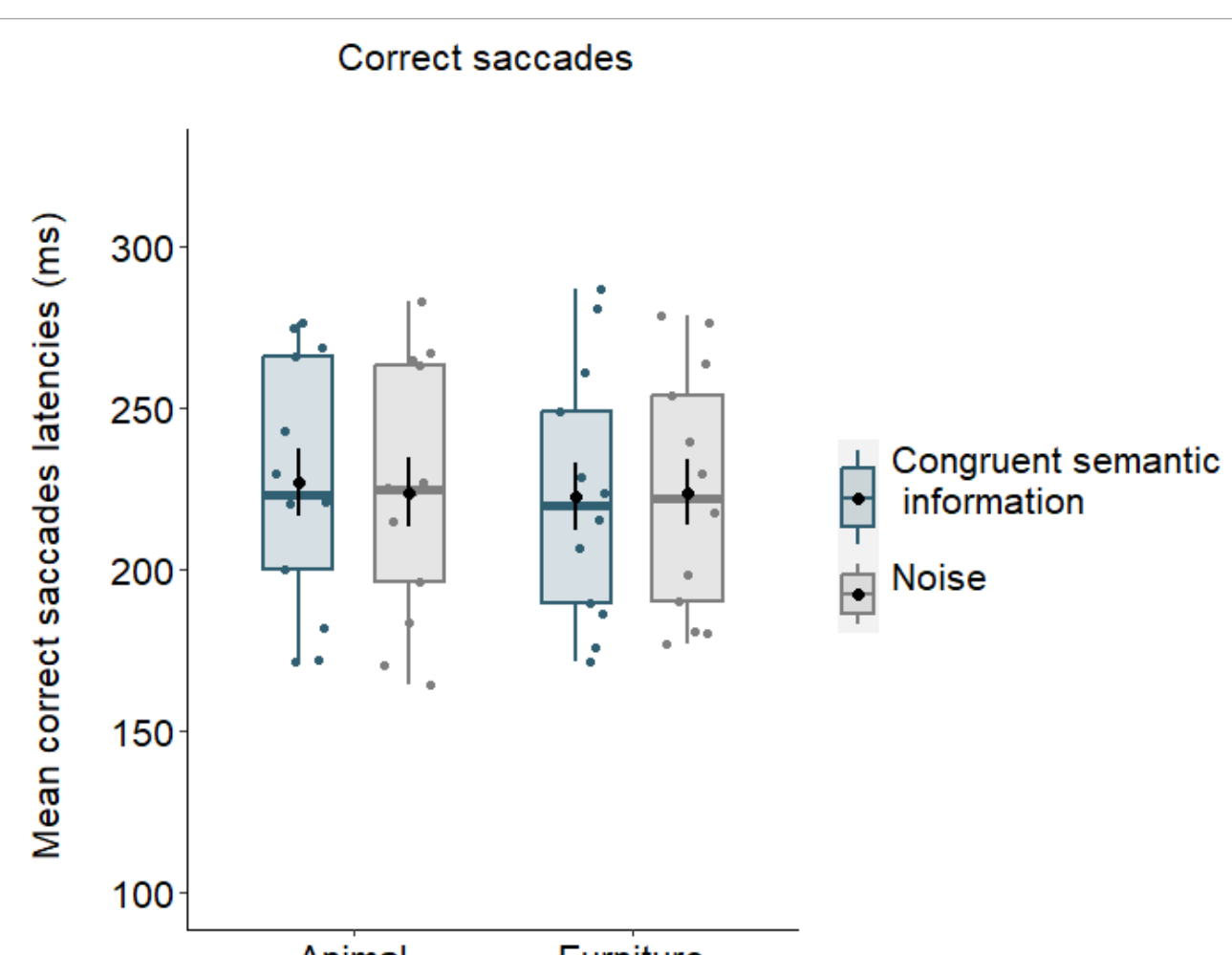
#### Mean erroneous saccades latencies:

- **Significant effect of semantically congruent information presence:** Longer erroneous latencies when objects displayed in a background with semantically congruent information than without semantic information.
- Significant target category effect



#### Mean correct saccades latencies:

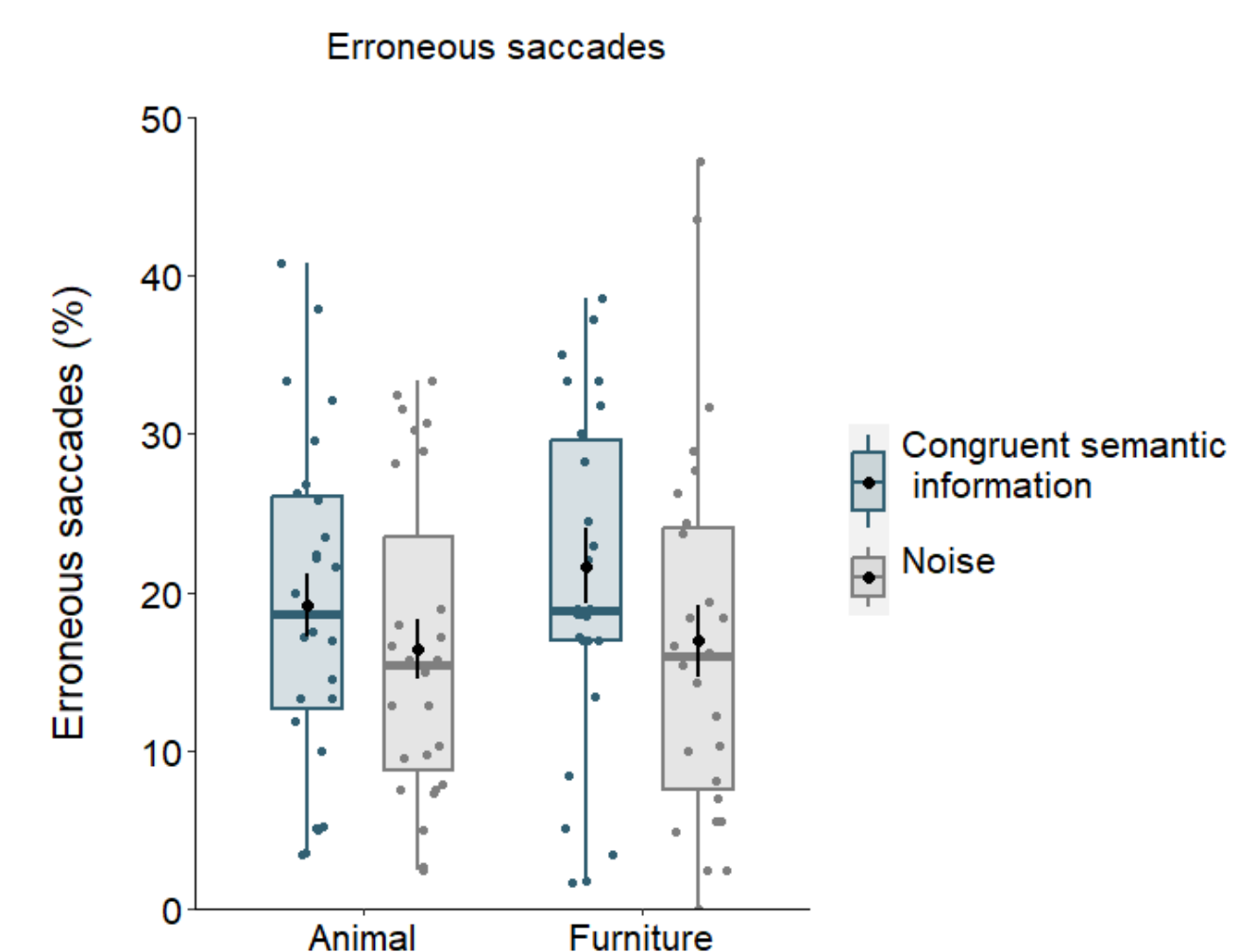
- Non significant effect of semantically congruent information presence.
- Non significant target category effect



### Experiment 2

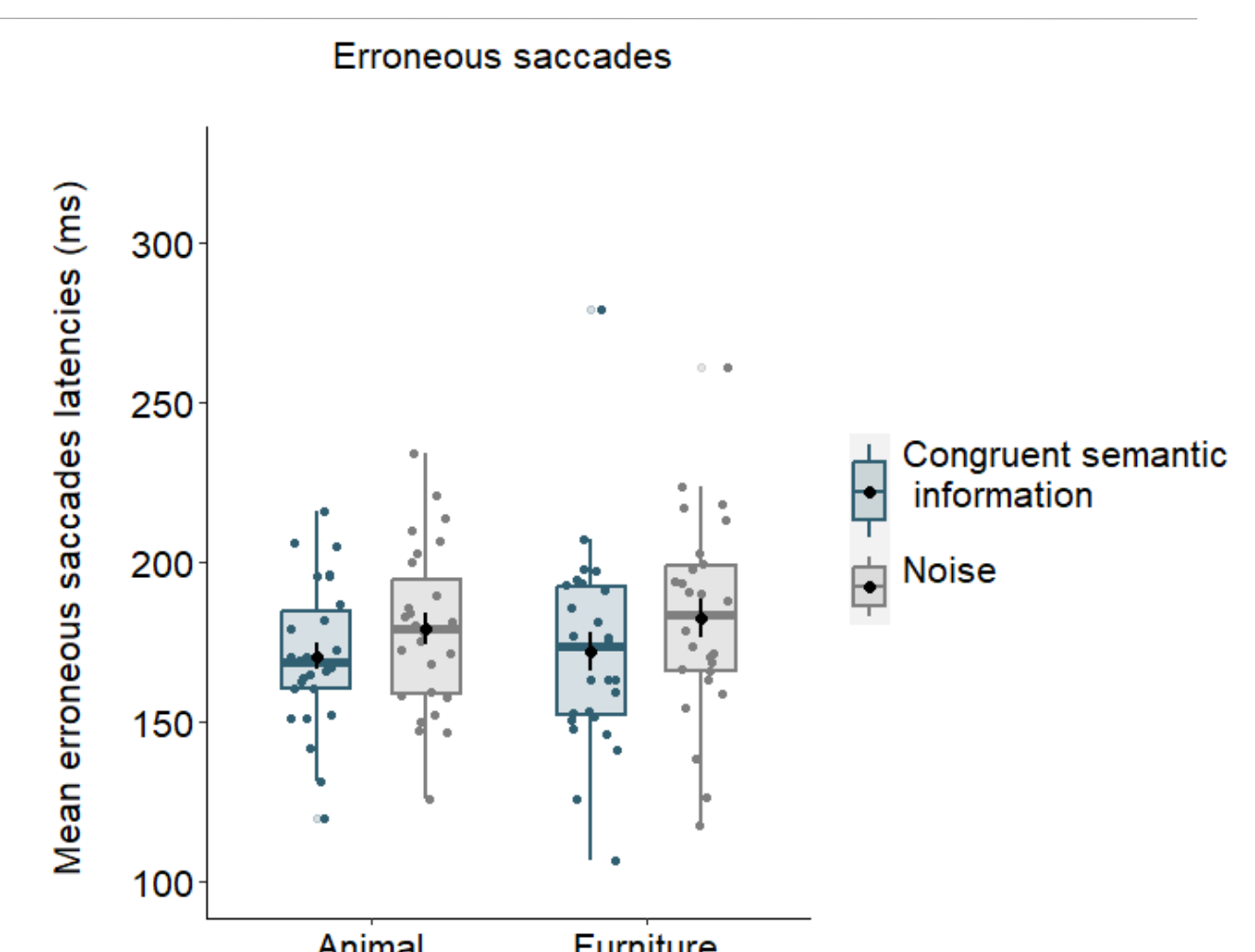
#### Mean erroneous saccades rate:

- **Significant effect of semantically congruent information presence:** More erroneous saccades toward distractor when objects displayed in a background with semantically congruent information than without semantic information.
- Non significant target category effect



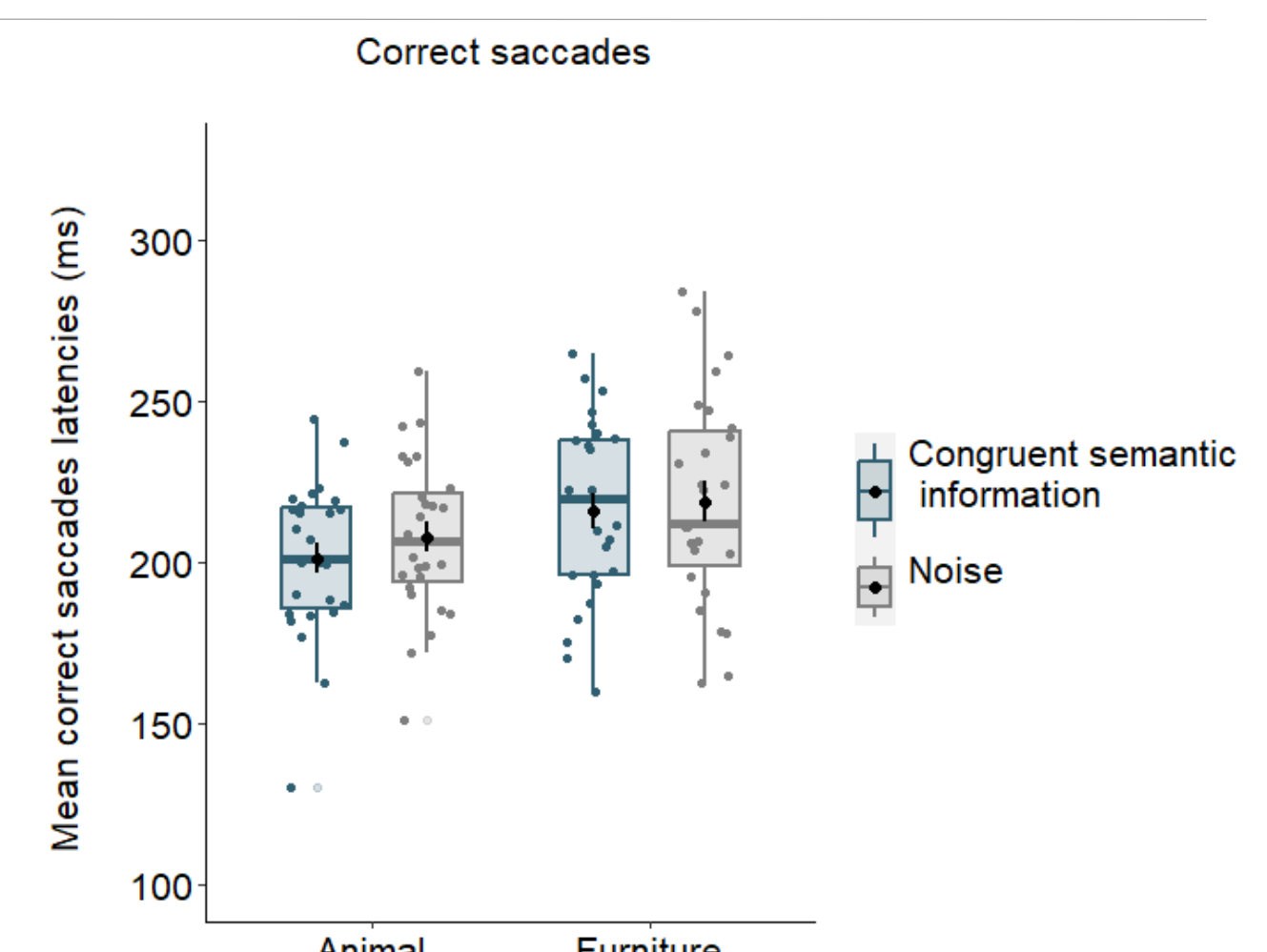
#### Mean erroneous saccades latencies:

- **Significant effect of semantically congruent information presence:** Shorter erroneous latencies when objects displayed in a background with semantically congruent information than without semantic information.
- Non significant target category effect



#### Mean correct saccades latencies:

- **Significant effect of semantically congruent information presence:** Shorter correct latencies when objects displayed in a background with semantically congruent information than without semantic information.
- Significant target category effect



## Conclusion

Experiment 1: When the objects and the scene are displayed simultaneously, the effect of semantic information presence is predominant over predictive mechanisms of the scene, resulting in delaying the initiation of saccades toward the distractor.

Experiment 2: When more time is available to accumulate information from the scene context, the presence of semantically congruent information in peripheral vision allows faster saccades initiation.

- Although contextual information in peripheral vision is not relevant for the task, it influences the dynamics of saccades toward peripheral objects.
- Within an evidence accumulation framework, a congruent scene context modulates the access of the objects to the decision threshold.

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