

NOVITAS: A stimulus database with new tasks and metrics for assessing absolute and associative novelty detection in objects and scenes

Introduction

There exist different types of novelty processed by different brain regions¹.

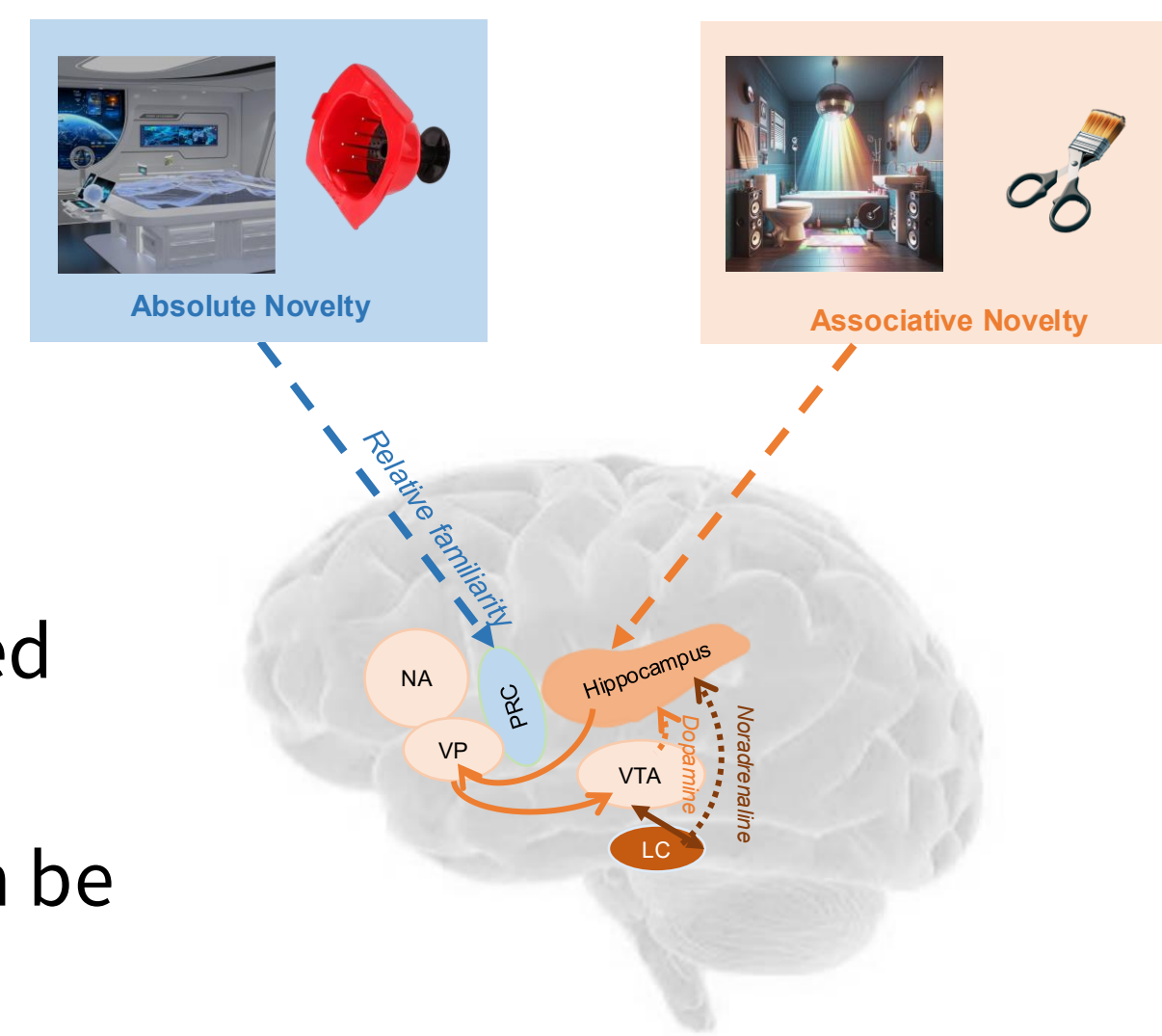
- **Absolute novelty**: unseen before
- **Associative novelty**: new association between otherwise familiar things

In the lab, novelty is most often assessed compared to lab prior exposure, which induces often absolute novelty and can be confounded with implicit memory².

Moreover, the distinction between novelty at the object or scene level has been overlooked despite the fact that scene processing relies on the hippocampus³ while object processing relies on the perirhinal cortex⁴, i.e., the two key brain regions involved in different novelty types.

To overcome these issues and answer outstanding questions:

1. We created [a database of stimuli](#) composed of object and scene images for both absolute and associative novelty conditions.
2. We provide [normative novelty ratings](#) for the stimuli of the database for younger and older adults.
3. We adapted two commonly used novelty detection tasks (Oddball-like and Visual Paired Comparison-like paradigms) to [validate that our stimuli elicit behavioural markers of novelty](#) in young adults, while assessing novelty relative to prior knowledge.

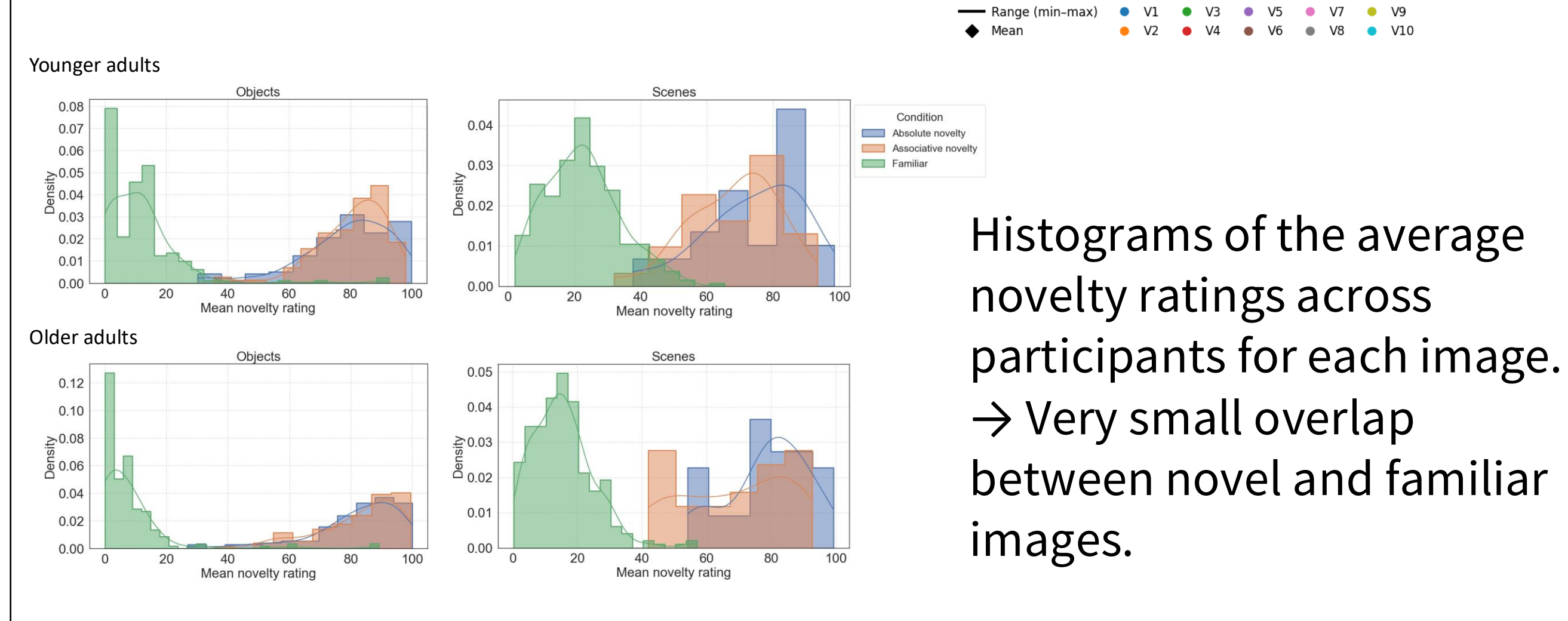


2. Normative novelty ratings

Online study with subjective ratings of novelty (scale 0-100).

N = 104 younger and 184 older adults (min 10 ratings/image)

High inter-rater reliability (ICC).



Histograms of the average novelty ratings across participants for each image.
→ Very small overlap between novel and familiar images.

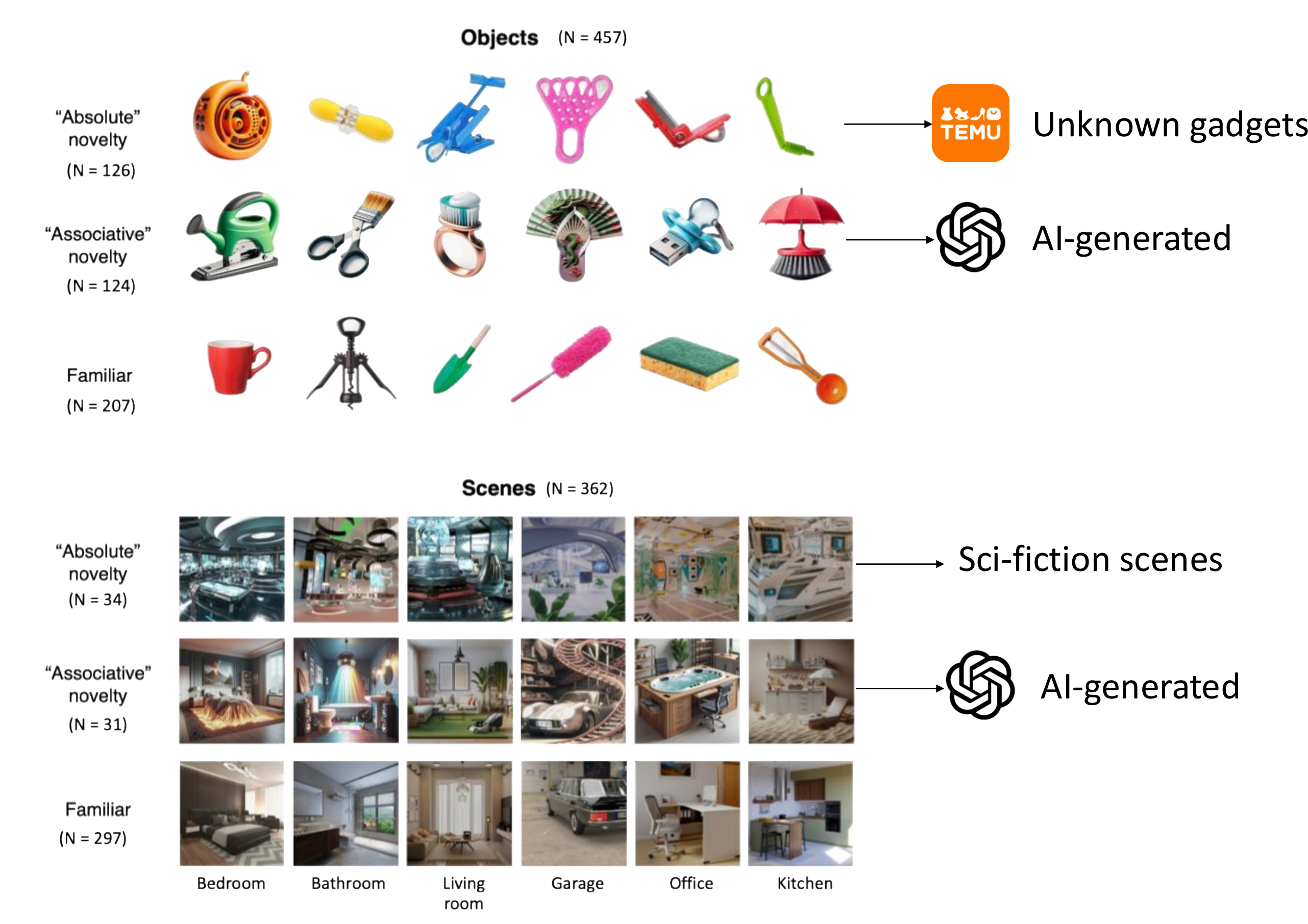
New tools to investigate processing of distinct novelty types and at different levels of representations.

📢 Open database and more normative data coming soon 📢



Follow for updates!

1. NOVITAS stimuli database



3.1. Oddball-like task

Hypotheses: Longer viewing times for novel images (associative or absolute) than for familiar ones.

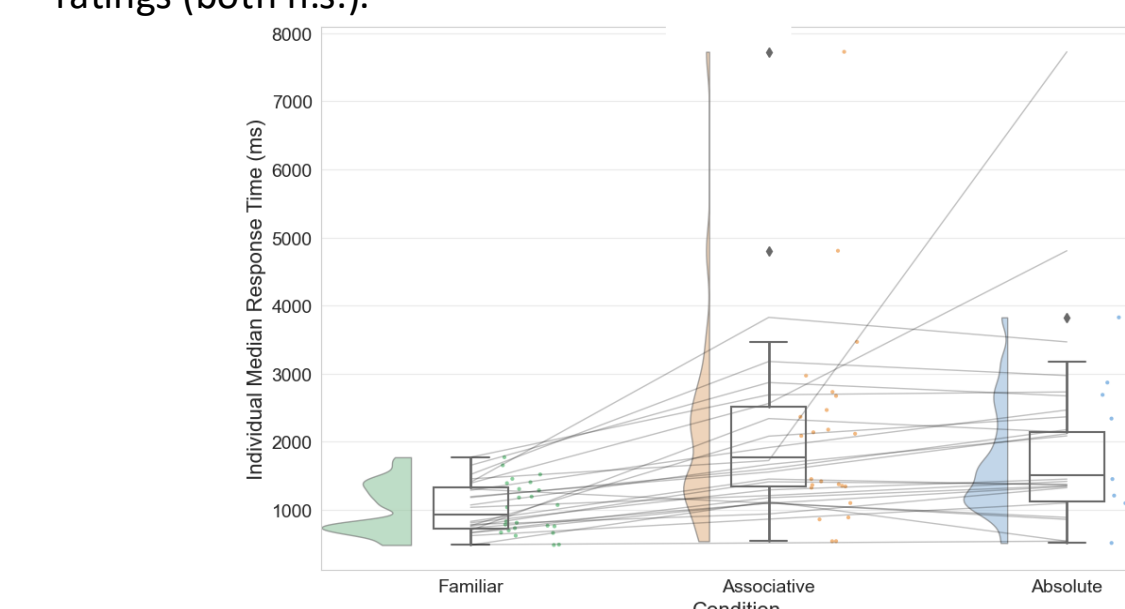
Methods: Oddball-like task with 25 absolute, 25 associative, and 125 familiar images randomly presented. N = 24 young adults

Instruction: "Watch each image and press a key when you want to move to the next image. Respond naturally."

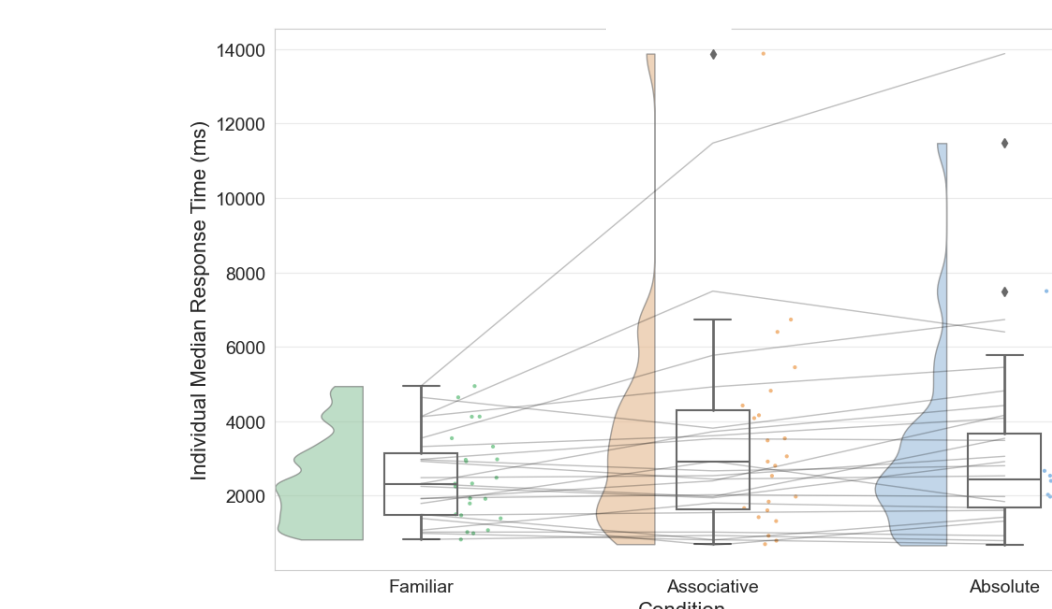
Measured variable: Viewing time (RT)

Results

Linear mixed-effects models showed significantly slower responses for:
• **Associative vs Familiar** ($\beta = 0.53$, $z = 7.12$, $p < .001$; ~70% slower)
• **Absolute vs Familiar** ($\beta = 0.41$, $z = 6.91$, $p < .001$; ~51% slower)
Effects remained significant when controlling for entropy and aesthetic ratings (both n.s.).



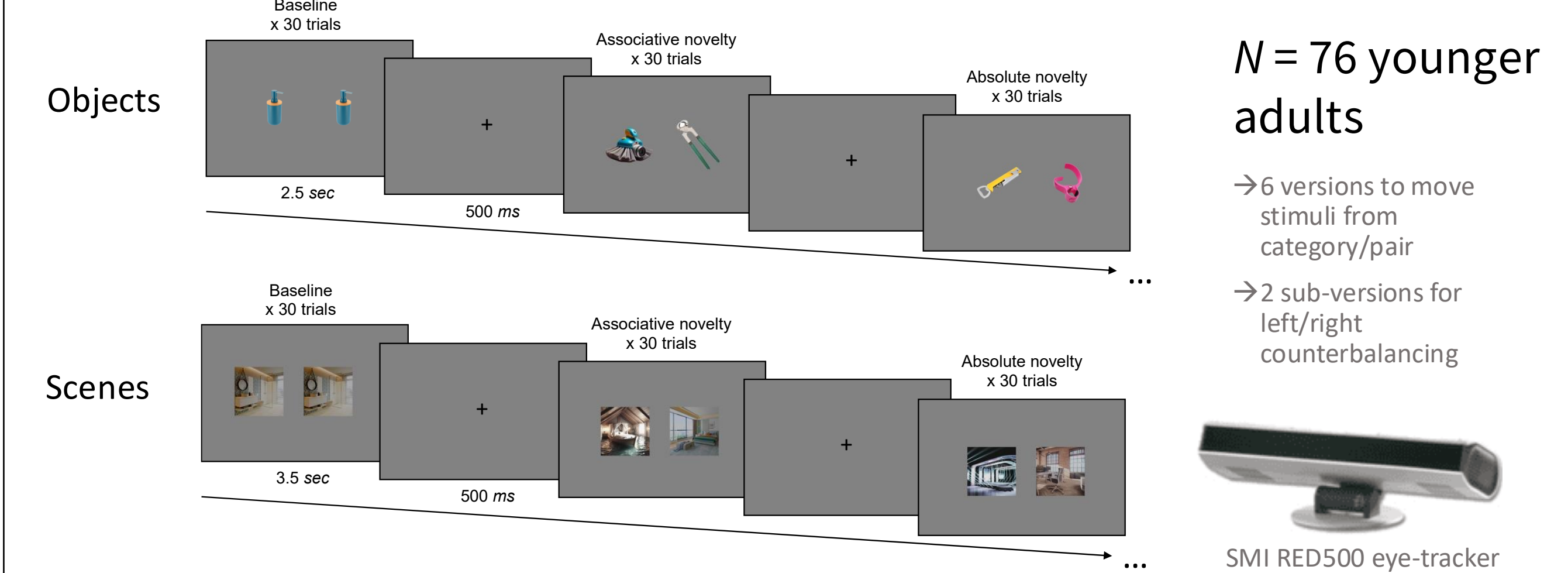
Linear mixed-effects models showed:
• **Associative vs Familiar** ($\beta = 0.22$, $z = 3.09$, $p = .002$; ~25% slower)
• **Absolute vs Familiar** (n.s.)
Controlling for entropy and aesthetics did not alter condition effects.



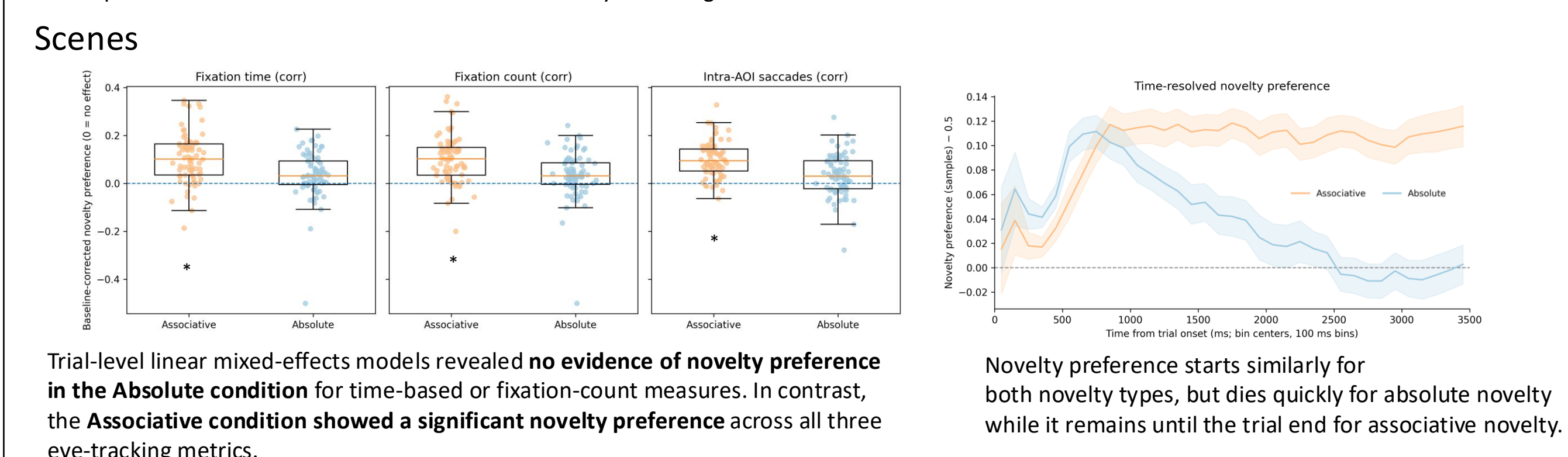
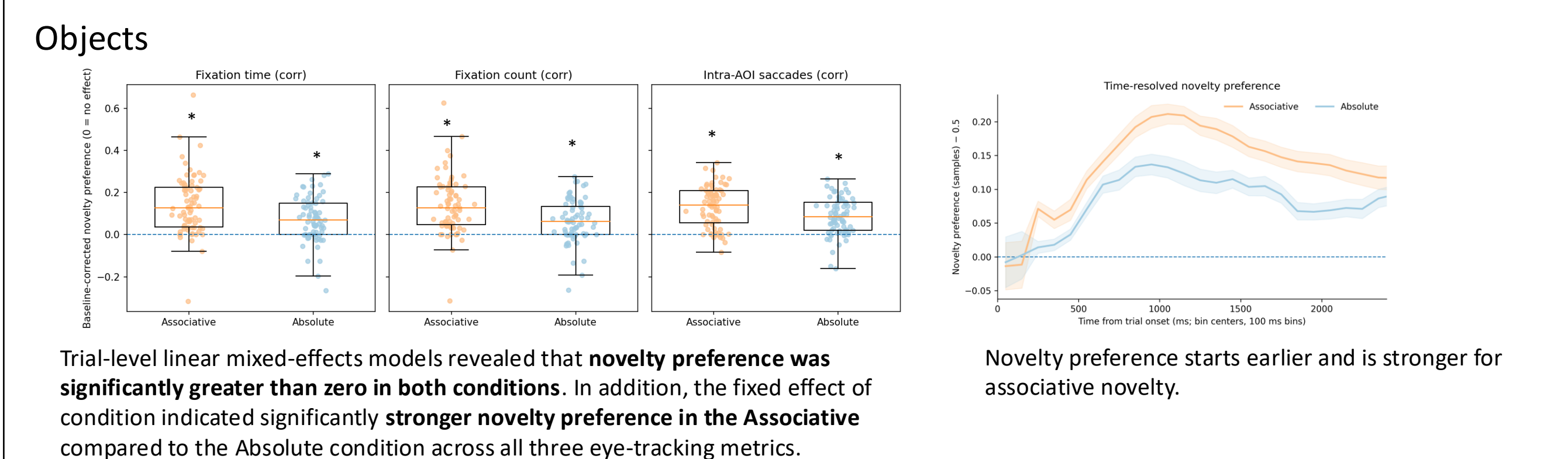
3.2. Visual Paired Comparison-like task

Hypotheses: Novel images → ↑ fixations counts, ↑ fixation duration, ↑ saccades counts on novel stimuli.

Methods: "Watch the images naturally, there will be no memory test."



Results



Discussion

- Our stimuli and tasks elicit the typical markers of novelty preference across novelty types and representations, except from the scene of the Absolutely novel conditions.
- Effects are robust after controlling for aesthetics and visual complexity.
- We provide stimuli to investigate neural substrates and cognitive mechanisms of distinct novelty types within the same paradigms.
- The database includes larger normative data for novelty, surprise, bizarreness, familiarity, visual complexity, and aesthetics.

References

1. Kafkas & Montaldi (2018) *Neurosciences Letter*.
2. Barto et al. (2013) *Frontiers in Psychology*.
3. Dalton et al. (2018) *The Journal of Neuroscience*.
4. Bastin & Delhay (2023) *Cognitive, Affective & Behavioral Neuroscience*.