# Object Memories Alter the Appearance of Blurry Object Borders

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## Background

Previous studies show that attention affects stimulus appearance: perceived contrast and spatial frequency are higher for attended stimuli [1 2].

Familiarity is another top-down process that influences perception. It is accessed early, and affects border assignment [3]. Might familiarity affect border appearance as well?

**Do familiar objects appear sharper than novel objects?**

## General Method



**Task: Are the two objects same or different in blur?**

180 ms

864 trials
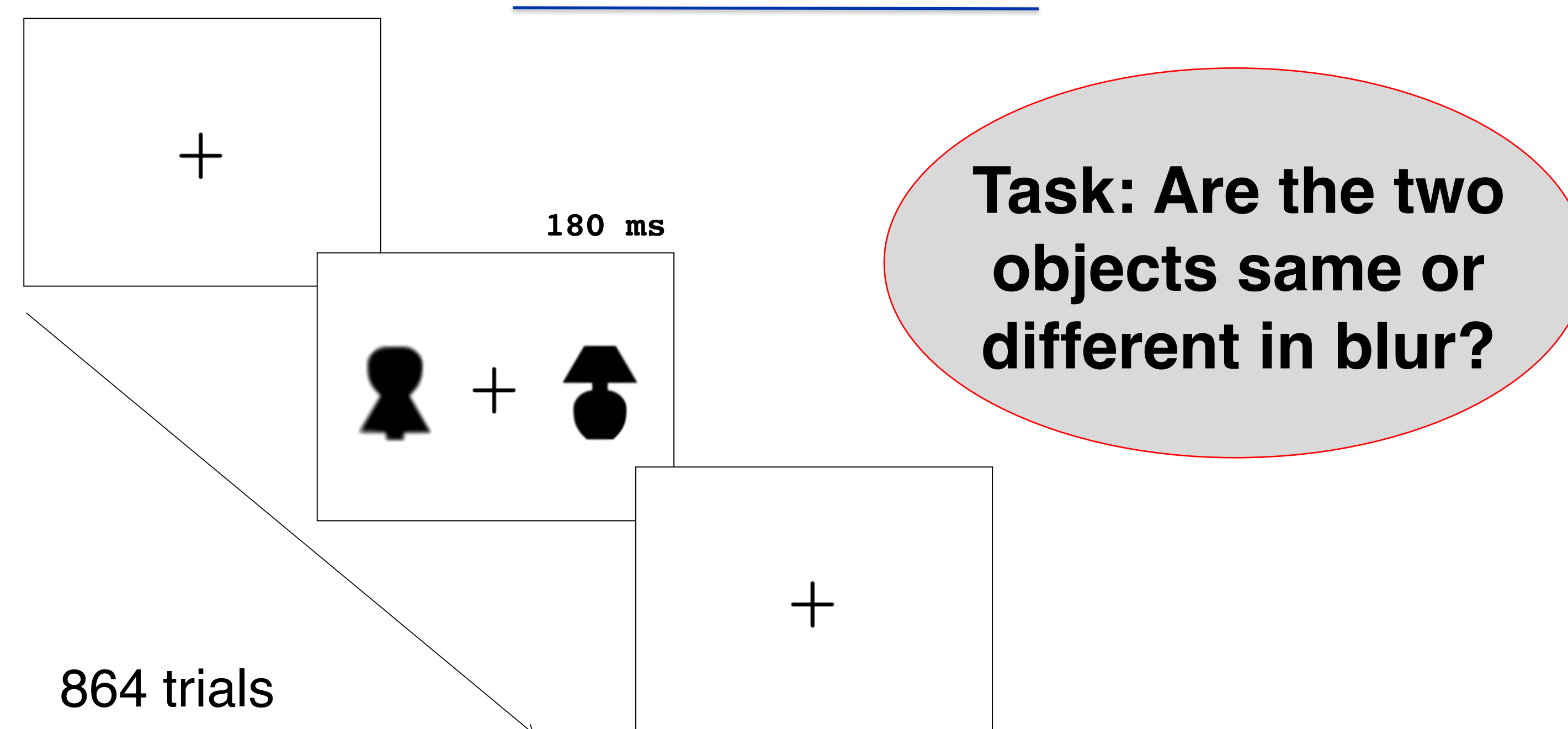
**Two Stimuli Per Trial** matched on low level features
-Lamp and Matched Novel Object
  - Novel object made by rearranging lamp parts
-One is Standard and one is Test
-*Standard* blur level = 7, *Test* blur level range = 3 – 11
  - 8:1 ratio of different trials to same trials
  - Blurred using Gaussian smoothing kernel (imgaussfilt)
-Lamp & Novel = *Test* and *Standard* equally often (intermixed)

## Hypothesis

- Object memories will be integrated with sensory input.
- Memories represent norm of previously seen objects and tend to be sharp.
- No object memories associated with novel object.
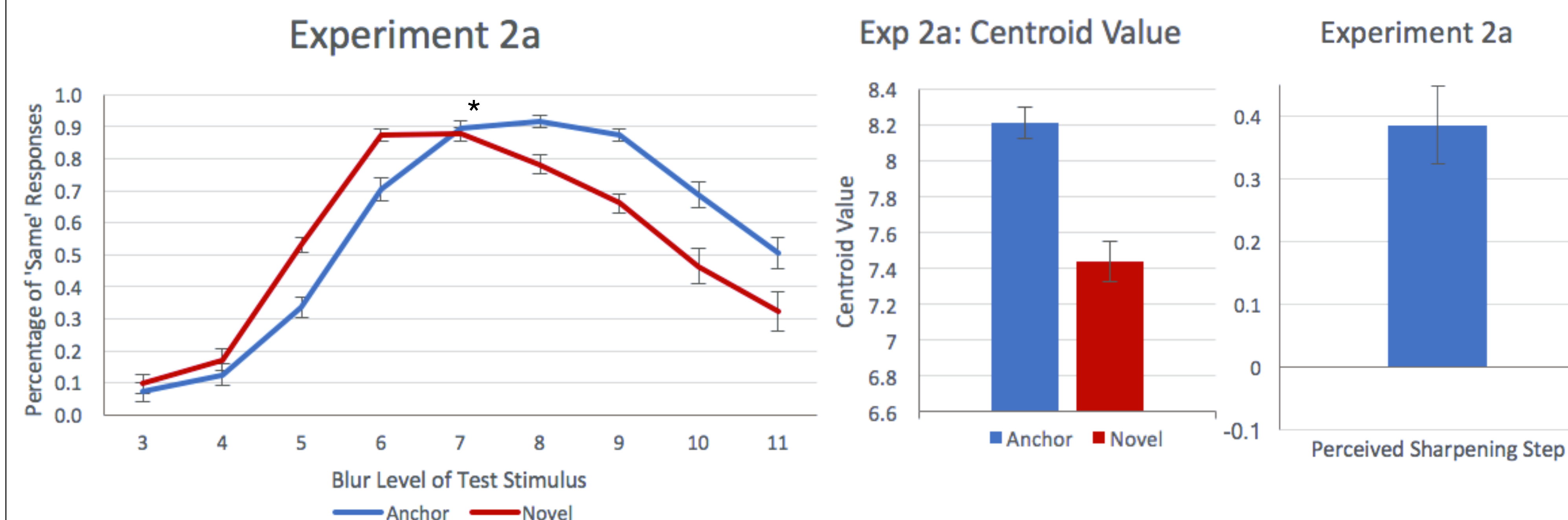- Thus familiar object will look sharper than novel.

## Experiment 1
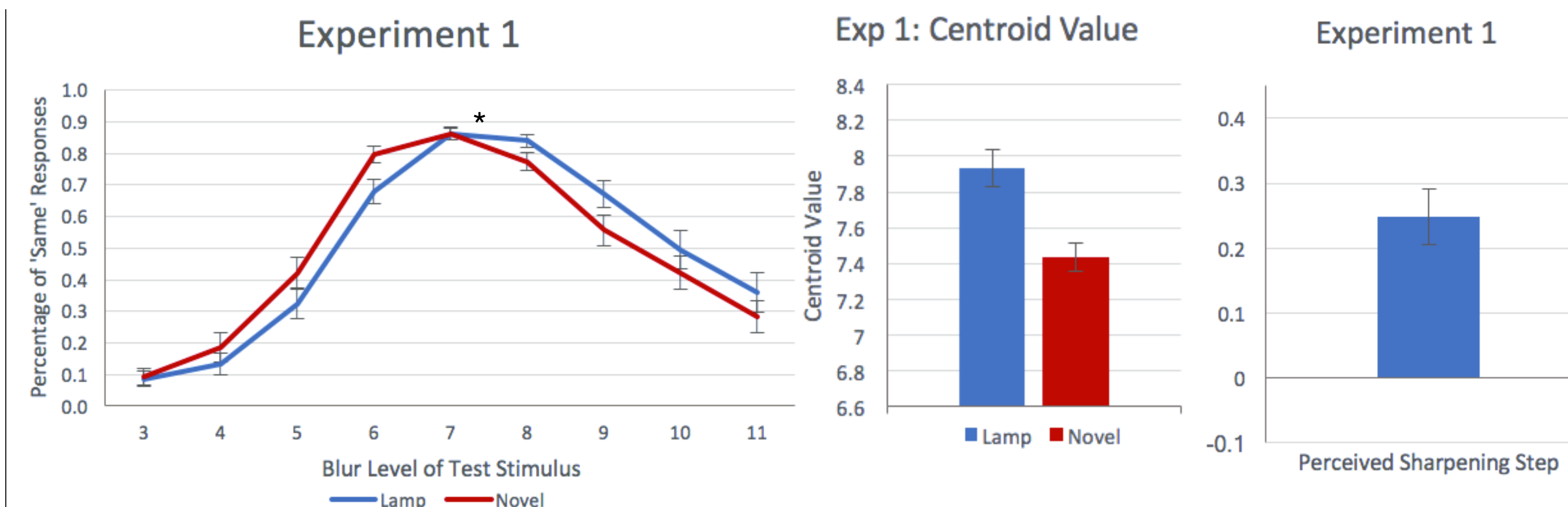


**Lamp perceived sharper than Novel object**, p < .0001, n = 26
Centroid values indicate "Same" response bias. (If not centroid for novel object should be < 7)
After removal of bias, the perceived increase in sharpness for the familiar object was ~ .226

## Experiments 2a and 2b

**Same as Exp 1, with new sets of stimuli to test generalizability**



Exp 2a

Familiar object: Anchor

Exp 2b

Familiar object: Woman



**Results from Exp 1 replicated**
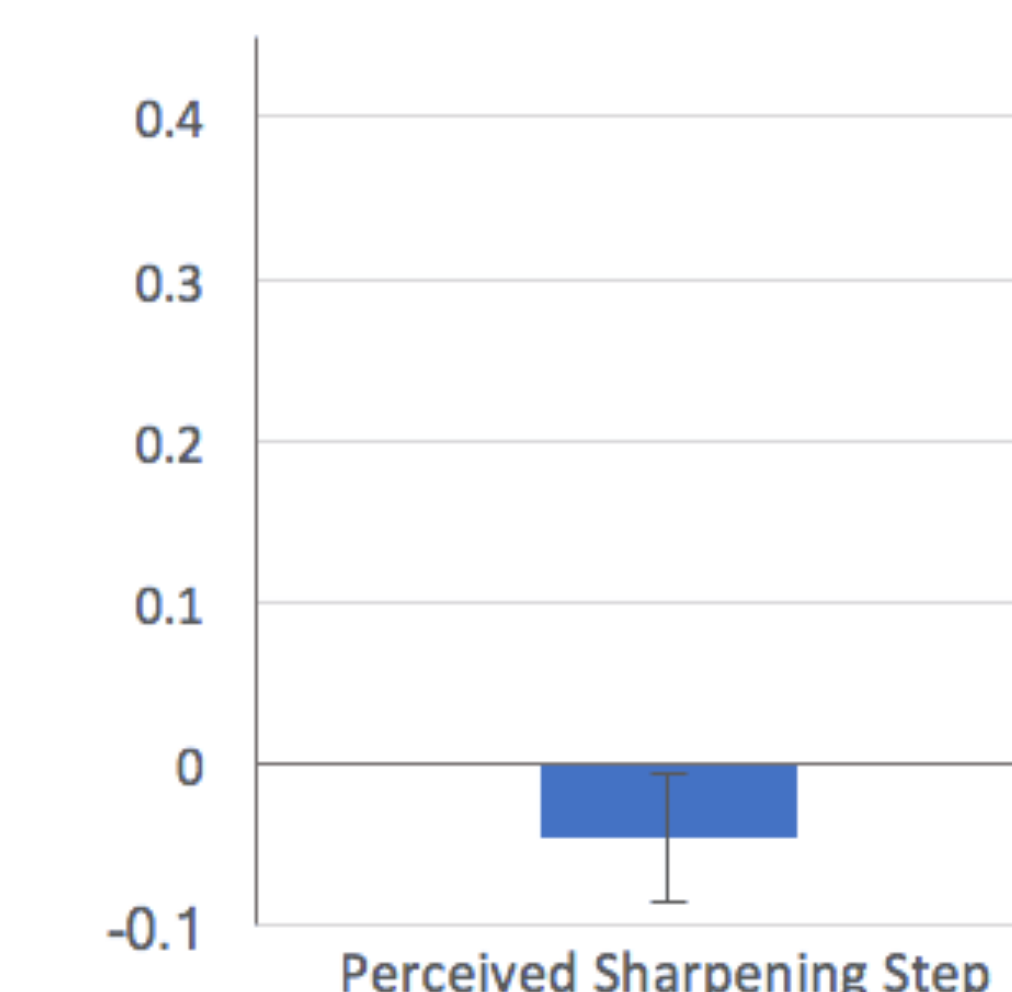**Anchor perceived sharper than Novel object**, p < .0001, n = 15
Bias observed again. After removal of bias, perceived increase in sharpness for familiar object was ~.386

*Bias Exp 1: .71, Exp 2a: .83 (small differences less discriminable at higher blur levels)*

## Experiments 2a and 2b cont'd
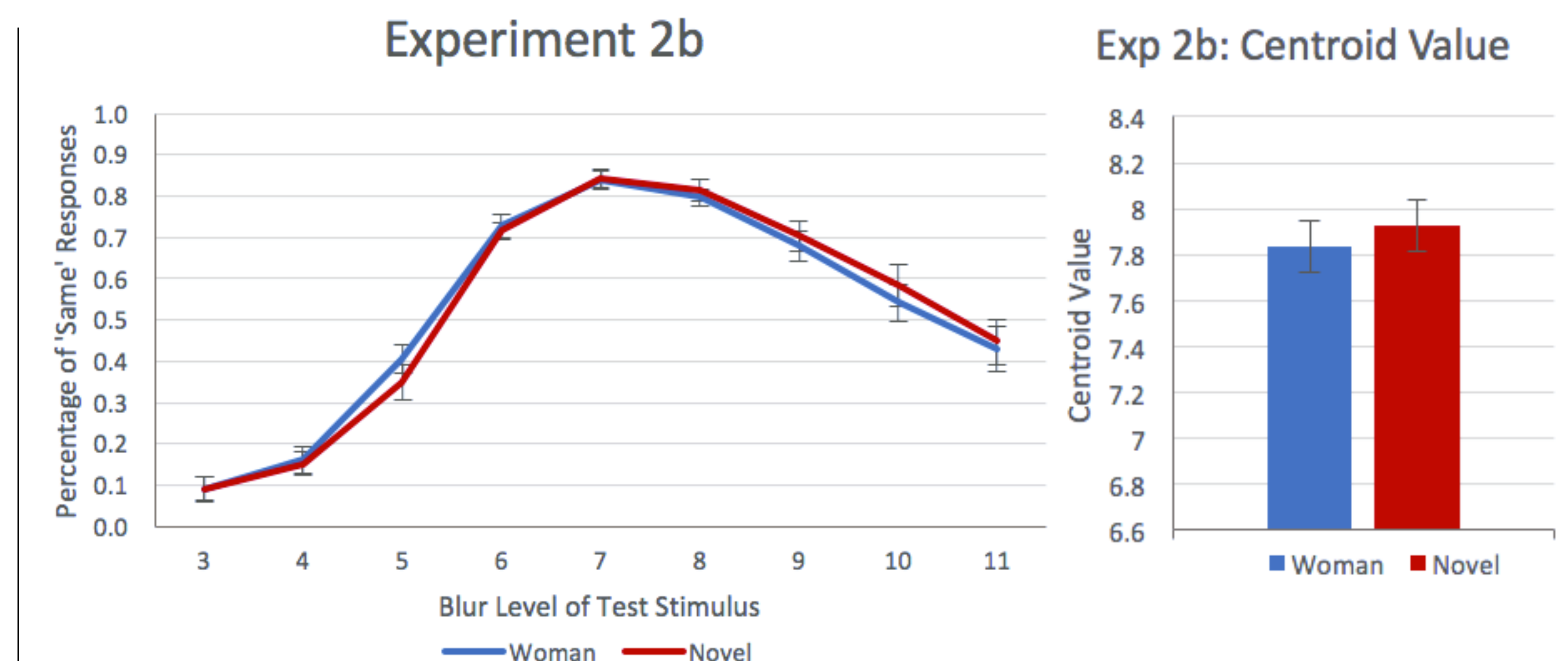


**No effect of familiarity**, p =.14, n = 18

- Post-experiment questionnaire:
  - 65% said novel object was familiar (lamp or male figure)

- Familiarity present for both objects
  → Lack of effect?

- Centroid value close to 8 for both novel and familiar stimuli: *due to response bias.*

## Summary and Conclusions

Borders of familiar objects appear sharper than those of novel objects
- Object memories accessed early by familiar object interact w/ input
- Memories represent norm of previously seen familiar objects
- Norm tends to be sharper than experimental stimuli

Is Familiarity effect mediated by attention?

No evidence that familiar objects automatically attract attention [4]

Perception does not replicate what is out there. Instead, it produces the best interpretation for sensory input based on past experience. We show that past experience effects extend to appearance – to the perceived sharpness of object contour.

**References**
1) Carrasco M, et al. (2004). *Nature Neuroscience,* 7, 308-313.
2) Gobell J., and Carrasco M. (2005). *Psychological Science,* 16, 644-651.
3) Peterson, M. A., & Gibson, B. S., (1994). *Perception & Psychophysics,* 56(5), 551-564.
4) Peterson, M. A., et al (2017). *Attention, Perception, & Psychophysics,* 79(1), 180-199.