Does familiarity increase the perceived sharpness of an object?

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Background

Previous studies show that perceived contrast and spatial frequency are higher for attended stimuli [1 2].

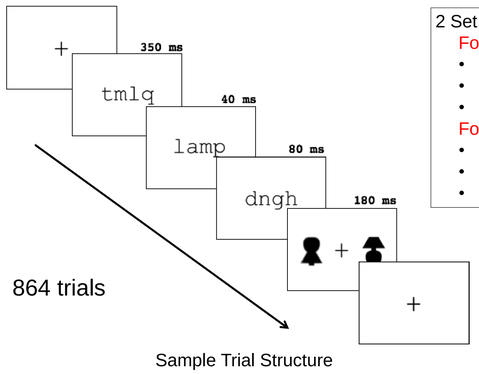
- Do objects appear sharper when they are expected?

Familiarity is accessed early in perception, even before figure-ground assignment occurs [3].

- Do familiar objects appear sharper than novel objects?

General Method

Induce expectations via semantic priming



864 trials

Sample Trial Structure

2 Sets of Primes
For familiar test object
- Name of object (“lamp”)
- Unrelated (“hawk”)
- No prime (“xxxx”)

For novel test object*
- Name of unrelated object (“pole”)
- Unrelated (“chin”)
- No prime (“xxxx”)

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

Two Stimuli Per Trial matched on low-level features
-Lamp and Novel** Object
-One is Standard and one is Test
-*Standard* blur level= 7, *Test* blur level*** range = 3–11
-Lamp & Novel = *Test* and *Standard* equally often

-Effect of expectations:
- When the familiar object is the Test object, does it appear sharper when primed with its name?
- Can’t be assessed for the novel object because the prime

*Novel and familiar primes matched in length and frequency
**Novel object made by rearranging lamp parts
***Blurred using Gaussian smoothing kernel (imgaussfilt)

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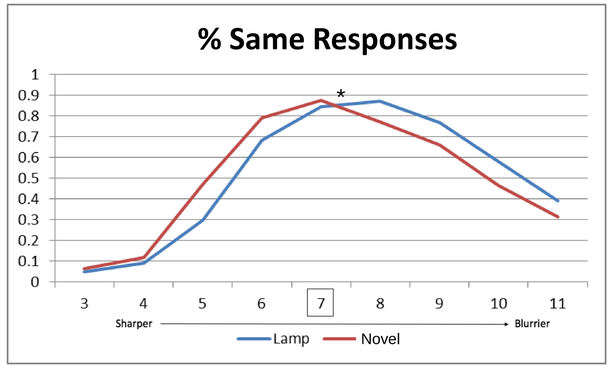
Hypothesized Results

Blurry objects will violate predictions for appearance, producing an error signal. Modulating this error signal by priming or familiarity will result in a sharpened percept.
- Priming: Expectation will cause Test Lamp to appear sharper than Standard.
- Familiarity: In both standard & test conditions, Lamp will appear sharper than Novel

Experiment 1

Effect of familiarity; No effect of priming

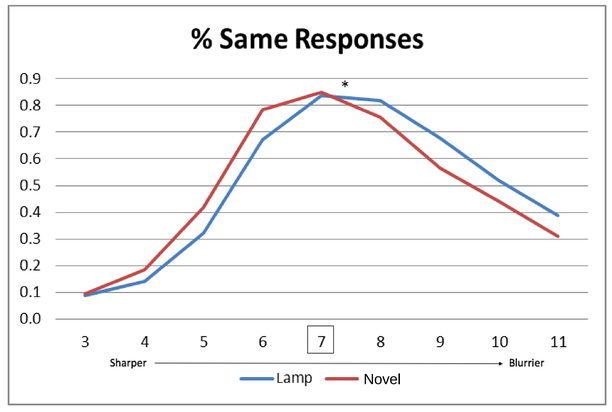
Data for when Lamp and PR were test objects (hence, varied in blur)
Averaged over priming conditions



Lamp perceived sharper than Novel object, $p < .001$, $n = 21$
*** Results are response bias free

Experiment 2

Same as Exp 1, except without priming to assure effect was not influenced by word primes



Lamp again perceived sharper than Novel object, $p < .0001$, $n = 30$

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Experiments 1 and 2 Summary

No effect of prime-mediated expectations
- Perhaps stimulus wasn’t good match to memory activated by primes
- Perhaps primes weren’t sufficiently predictive (16.6% match)

Familiarity effect
- Predictions from object memories activated by lamp interact w/ input
- Memories represent norm of previously seen lamps
- Norm tends to be sharper than experimental stimuli

Is Familiarity effect mediated by attention?

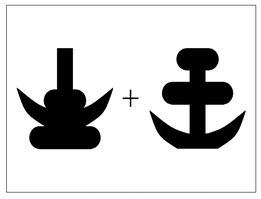
No evidence that familiar objects automatically attract attention [4]
Strategy effect?

Object memory-based predictions affect appearance:
- Object memories accessed by input, not a priori
- Recurrent processes result in sharpening

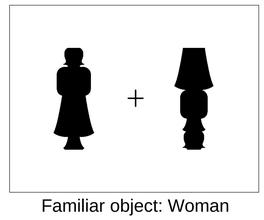
Our perception is not always an exact representation of the external world. How we perceive objects can be influenced by priors.

Experiment 3 (in progress)

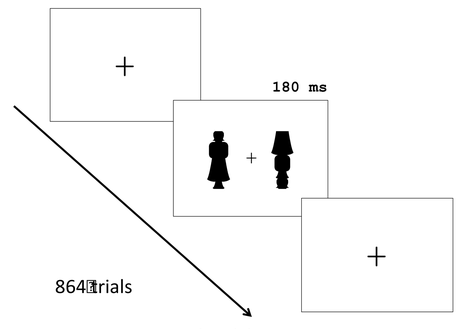
To test if results generalize, we used two new sets of stimuli.



Familiar object: Anchor



Familiar object: Woman



Sample Trial Structure

Procedure same as Exp 2

Scan for PDF of the poster

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.