An Investigation of the Effect of Prediction on Object Perception
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Background
Spatial attention alters appearance: perceived contrast and spatial frequency higher for attended stimuli [1, 2]. Predictive coding theories hold that perception involves testing predictions/expectations [3, 4].

Do expectations or predictions alter appearance?
Does an object appear sharper when expected?
Does a familiar object appear sharper than a novel one?

General Method
Induce expectations for upcoming stimuli via semantic priming

3 types of Primes
- Basic Level ("lamp")
- Unrelated ("hawk")
- No prime ("xxxx")

864 trials

Two Stimuli Per Trial matched on low level features
- Lamp
- Novel Object made by rearranging lamp parts into a novel configuration: Part-Rearranged (PR) Novel

Standard and Test on every trial
- Lamp & PR = Test and Standard equally often
- Standard blur level = 7, Test blur level range = 3 – 11
- Blurred using Gaussian smoothing kernel (imgaussfilt)
- Test is target for primes
- PR primes match Lamp prime in length and frequency

Hypothesized Results
Prime-induced expectations will cause Lamp to appear sharper than it is.
Lamp will appear sharper than PR Novel Object
Blurry objects will violate predictions for appearance, producing error signal.
Modulation of this error signal will result in a sharpening of the final percept.

Experiments 1, 2
No effect of priming

A familiarity effect was observed, however.
Lamp perceived as sharper than PR Novel Object in all conditions
Exp. 1, p < 0.001, n=14; Exp. 2, p < 0.001, n=15

Experiment 3
Same as Exps 1 & 2, except Response Bias Free Task
Judge Whether 2 stimuli are Same or Different Blur Levels

% Same Responses

Lamp perceived sharper than PR stimulus, p < .001, n = 21

*** Results are response bias free
No effect of Prime Condition

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 [5]

Strategy effect?

Conclusion
Object memory-based predictions affect appearance
Object memories accessed by input, not a priori
No evidence of effect of word prime-based prediction

References

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