An investigation on the influence of prior experience on working memory representations

Diana C. Perez, Mary A. Peterson
University of Arizona

23.416

Peterson Lab

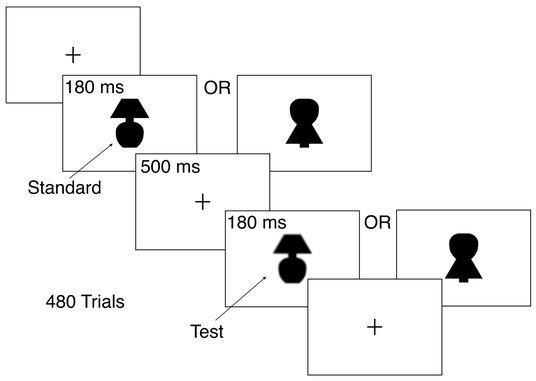
Background

Attention and LTM (prior experience) affect stimulus appearance
- -Attention affects perceived contrast[1]
- -Real-world ("familiar") words/objects appear sharper than novel ones[2,3]
  - -LTM combines with briefly exposed blurry input → sharper percept[2]

LTM can replace active maintenance in WM[4]

Are familiar objects in WM remembered as sharper?

Experiment 1

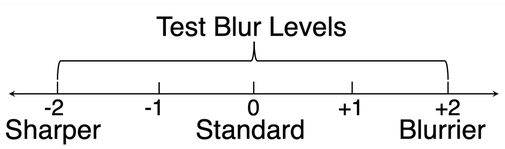


Task:
Is *Test* the same or different level of blur as *Standard*?

-Compare Familiar and Novel Objects
- Novel objects made by rearranging familiar parts
- Blurred using Gaussian smoothing kernel (imgaussfilt)

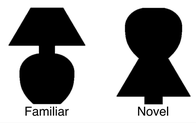
-One object per trial, seen two times:
- First = *Standard*, blur levels = 5, 7, or 9
- Second = *Test;* 1 of 5 blur levels equal to or 1 to 2 blur levels above or below *Standard*

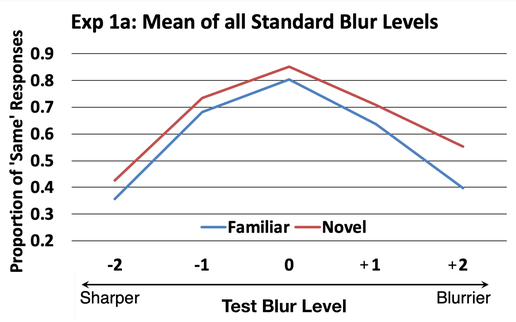
-*Test* was sharper, same, or blurrier equally often



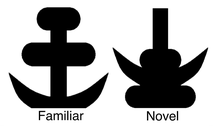
Experiment 1 Results

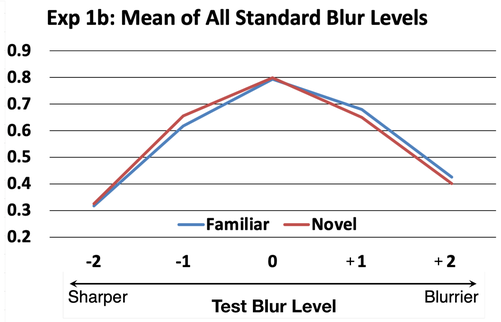
Exp 1a: familiar object = lamp (N = 18)





Exp 1b: familiar object = anchor (N = 23)

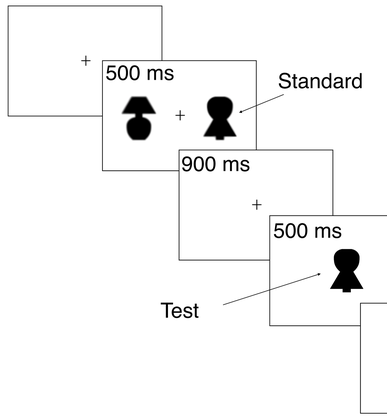




No difference between familiar and novel objects:
- -Not enough WM load?
- -*Standard* & *Test* in same location → local edge comparison?

Experiment 2

Increased WM memory load
- -2 objects in first frame (cf. 2)
  - -One familiar & one part-rearranged (PR)
- -Only one is *Standard* for that trial (blur = 5 or 7)
  - -Other = blur 5, 7 or 9
  - -Participants unaware of which is *Standard*,
    - -must keep both in WM
  - -Familiar & PR = *Standard* equally often

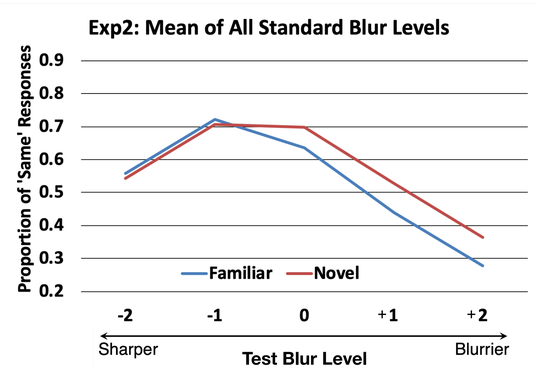


***Standard* & *Test* in different locations**
- -*Test* object = same as *Standard*
- -Increased delay before *Test*

720 Trials

Experiment 2 Results

Exp 2: familiar object = lamp (N = 20)



Standard Blur Level	Centroid Value		P
	Familiar	Novel	
5	-0.29	-0.16	0.036
7	-1.34	-1.01	0.010
Overall	-0.68	-0.48	0.003

Summary and Conclusions

Familiar object perceived as sharper with WM load = 2.

Schurgin et al: LTM replaces active maintenance in WM.

Here LTM representation sharpens the appearance of the familiar object.
- -converging evidence for our previous work, suggesting that LTM sharpens the appearance of familiar object borders.

Presented at Vision Sciences Society 2019

For a pdf version of this poster:

Contact: Diana Perez
dianaperez@email.arizona.edu

ONR N00014-14-1-067

THE UNIVERSITY OF ARIZONA

References

1)Carrasco M, et al. (2004). *Nature Neuroscience*, 7, 308-313.
2)Perez D, et al. (2018). *Journal of Vision* ,18(10):1320.
3)Lupyan, G. (2017). *Journal of experimental psychology: human perception and performance*, *43*(4), 794.
4)Schurgin, M. W., et al. (2018). *BioRxiv*, 381848.