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Calibration of peripheral perception: A blocking paradigm that highlights generalization

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Pdf file of the poster:

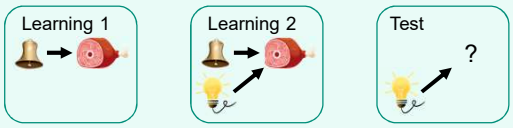
Introduction

With each saccade, a visual object shifts its eccentricity on the retina and so dramatically changes the form of its cortical representation. The visual system would deal with these saccade-induced changes by predicting the visual features of an object after an eye movement [1-2].

We recently proposed that to make these predictions, a general learning process would link together peripheral and foveal stimulus information [3]. More precisely, we suggested that a pre-saccadic object could, following its repeated association with a foveal image, act as a *conditioned stimulus* and therefore affect the peripheral perception of this object. This theory could explain biases in peripheral perception induced by modified periphery-fovea associations.

In the present study, we examined **the effects of learned transsaccadic associations on the perception of novel peripheral stimuli**. We adapted Herwig and Schneider's (2014)[1] protocol by implementing a blocking procedure[4] known to highlight some of the basic principles of classical conditioning.

Blocking procedure



We refer to the blocking effect when a previously conditioned stimulus interferes with the conditioning of a novel stimulus.

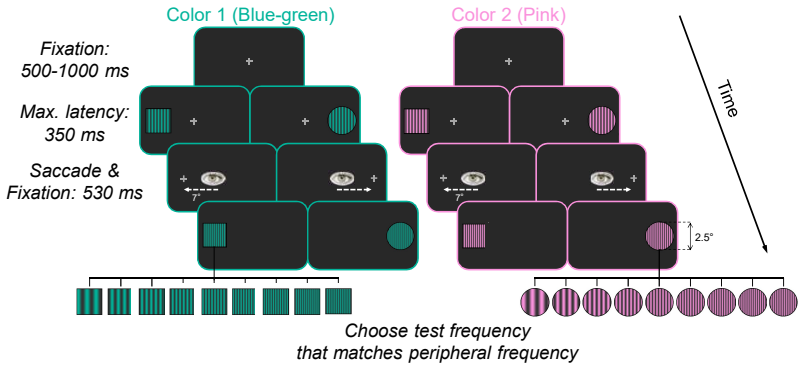
• Hypotheses

We hypothesized that if peripheral perception is a conditioned response, after two learning phases of a blocking procedure such an interference should occur and the perception of new stimuli should remain the same.
Alternatively, transsaccadic learning should generalize to novel stimuli.

Methods

1 & 4) Pre- and post-tests: before and after the two learning phases

192 interleaved trials. The target frequency was of 3.6 cpd in 128 trials (other target frequencies: 2.4, 3, 4.2 & 4.8 cpd).

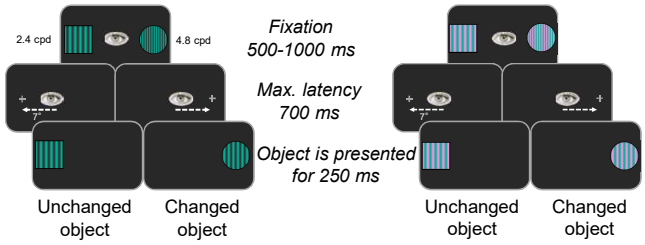


2) Learning 1, with color 1 stimuli

associates a peripheral frequency with a modified foveal frequency (240 trials).

3) Learning 2, with bicolor stimuli

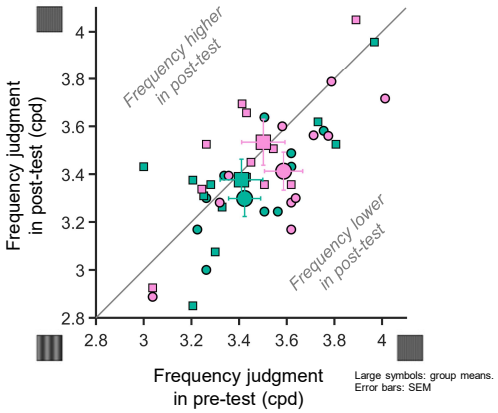
same as learning 1 but the second color is introduced.

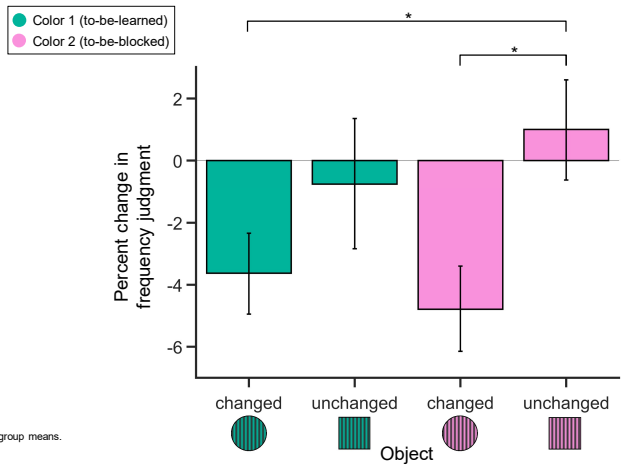


Results

The match of the foveal test frequency to the perceived frequency in the periphery is biased toward the frequency associated during the learning phase.
The bias is similar for both colors.

Analysis of the 128 trials with a 3.6-cpd target. *N*=11.



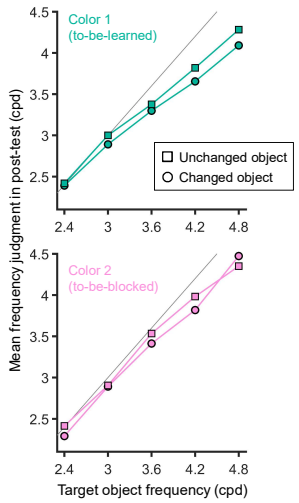


Percent change in frequency judgment:

$$PC = \frac{judgment_{Post} - judgment_{Pre}}{judgment_{Pre}}$$

Error bars: SEM.
Main effect of object type: p=.006; BF_{incl}=25.96
No effect of color: p=.841; BF_{incl}=.34
No interaction: p=.124; BF_{incl}=.59
* Significant post-hoc comparison (Bonferroni correction)

Frequency judgments are scaled with the physical frequency of the peripheral objects, suggesting that frequency perception is altered (simple decision biases can be ruled out).



Conclusion

During peripheral object recognition, the perception of object frequency was biased toward the previously associated post-saccadic foveal frequency, which is consistent with the literature[1]. Most importantly, we found no blocking effect. Rather, this bias was also observed for the stimulus introduced in the second learning phase (that might have functioned as a generalization training). Such a generalization highlights the importance of high level processes in peripheral perception.

References

1 - Herwig, A., & Schneider, W. X. (2014). Predicting object features across saccades: Evidence from object recognition and visual search. *JEP. General*, *143*(5), 1903-1923.
2 - Valsecchi, M., & Gegenfurtner, K.(2016). Dynamic re-calibration of perceived size in fovea and periphery through predictable size changes. *Current Biology*, *26*(1), 59-63.
3 - Paeye, C., Collins, T., Cavanagh, P. & Herwig, A. (2018). Calibration of peripheral perception of shape with and without saccadic eye movements. *Attention, Perception & Psychophysics*, *80*(3), 723-737.
4 - Kamin, L.J. (1969). Predictability, surprise, attention and conditioning. In B.A. Campbell & R.M. Church (eds). *Punishment and aversive behavior*, 279-296, New-York: Appleton-Cetury-Crofts.