**26.302**

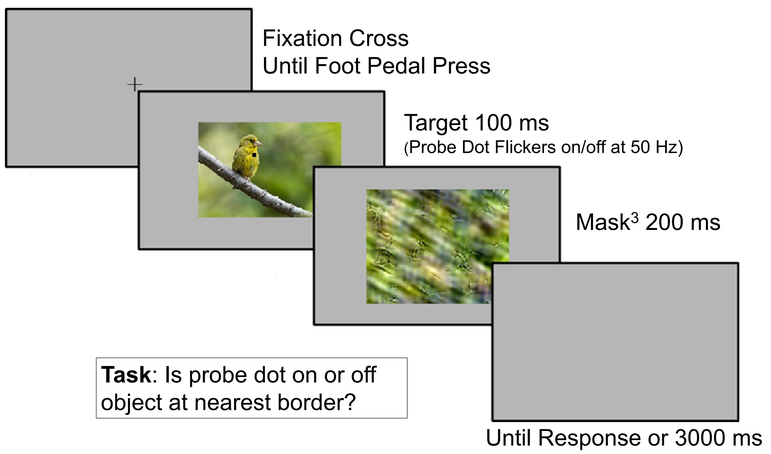
# Does Semantic Activation Affect Human Object Detection in Natural Scenes?

Colin S. Flowers, Rachel M. Skocypec, & Mary A. Peterson

THE UNIVERSITY OF ARIZONA.

## Background

Dot-probe localization task[1] for natural images (CoCo set[2])




Object category does not predict on/off response.
- Context-based guessing disabled.
- Unlike CNN and AFC choices, indexes precise location information.

## Goal

Investigate relationship of processing 'what' and 'where'.
Can basic-level word prime improve on/off localization?

**Exp. 1**
Compare on/off & categorization accuracy (8 AFC).

**Exp. 2**
Does basic-level prime before image affect on/off task?

## Methods

384 images 8 categories

| | | | |
|---|---|---|---|
| Apple | Bird | Person | Zebra |
| Bowl | Car | Chair | Fork |

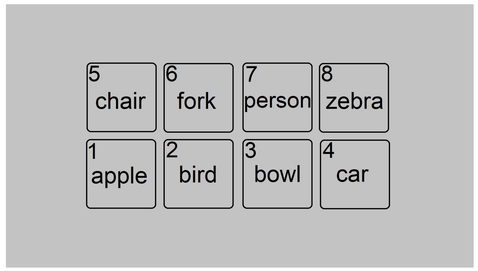
(48 images; 24 with dots within 2º, 24 with dots 2.01º - 5.16º)

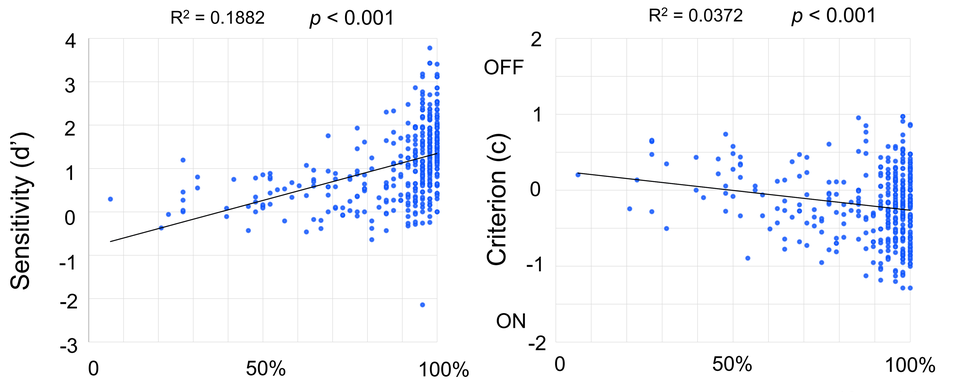
Each image shown 1x: probe dot 'ON' or 'OFF' object.
Across subjects each image seen equally often with on/off version.

Analyses are within pictures.
- Criterion and d' calculated across participants.

## Exp. 1: Localization followed by Categorization

After on/off localization response.




Sensitivity & criterion not correlated (r = -0.004)

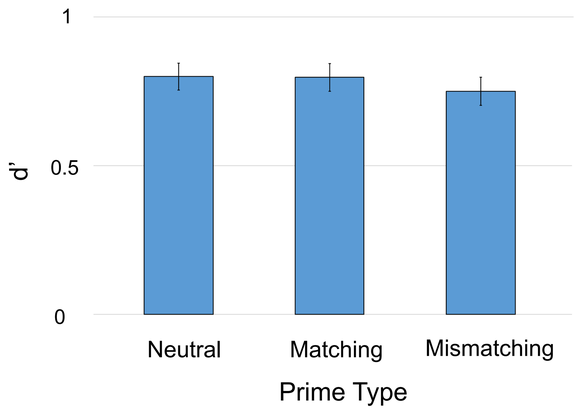
## Exp. 2: Does successful categorization increase d'?

300-ms unmasked word & 100-ms ISI before scene

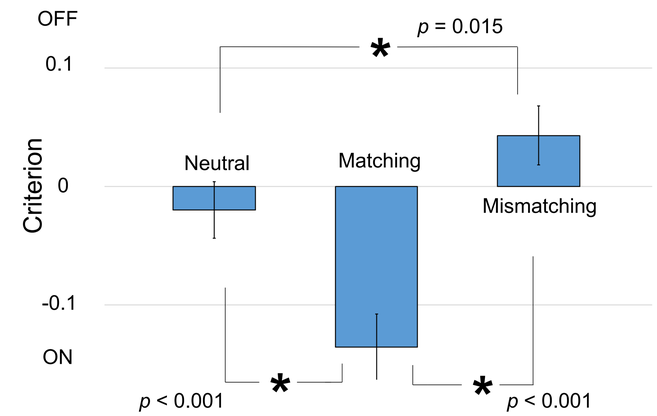
**Neutral**: XXXXXX → Bird
**Matching**: bird → Bird
**Mismatching**: fork → Bird (always different superordinate category)

Expect better categorization with matching primes.

**NO**: d' does not vary with prime type.




n = 21 participants




Matching prime → more 'ON' responses.
Mismatching prime → more 'OFF' responses.

Successful categorization does not improve localization.

## Summary

Localization task indexes precise location information.
- Important component of object detection.
- Correlated with categorization.
- Not caused by categorization.

## Future Directions

- Add 8 AFC categorization test to Exp. 2 method.
  Test how much prime improved categorization accuracy.
- Have flashing probe dot appear before scene.
  Assume improve localization, does it improve categorization accuracy?
- Investigate specific image characteristics.
  Central/peripheral, spatial frequencies, etc.

**References**

[1] Flowers, C., & Peterson, M. (2018). Human Object Detection in Natural Scenes: Evidence From a New Dot Probe Task. *Journal of Vision, 18*, 393-393.
[2] Lin, T. Y, et al., (2014). Microsoft coco: Common objects in context. In *European Conference on Computer Vision*, pp. 740-755.
[3] Portilla, J., & Simoncelli, E. P. (2000). A parametric texture model based on joint statistics of complex wavelet coefficients. *International Journal of Computer Vision, 40*, 49-70.

ONR N00014-14-1-067

Contact: Colin S. Flowers
cflowers@email.arizona.edu

Office of Naval Research Science & Technology

Peterson Lab