

# A Local Bias in Mental Model Updating

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## Deficits in Updating our Mental Models



Mental model updating deficits occur when:

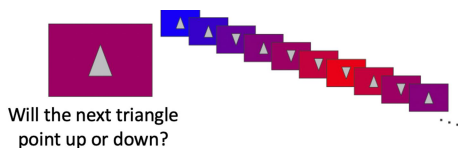
- Right or left insula is damaged (1).
- Probabilities are manipulated among patients with left or right brain damage (2).

## Global and Local Properties



## A Novel Global-Local Updating Task

Participants (n=72) completed our online task.



### Global probability

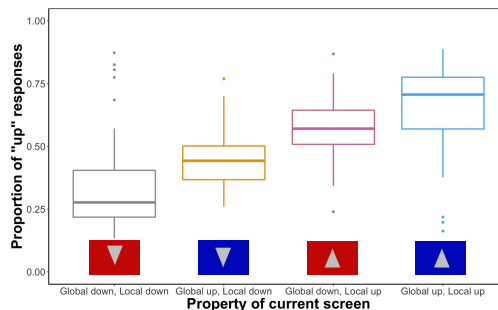
- Red background: 80% chance next triangle is down.
- Blue background: 80% chance next triangle is up.

### Local probability

- 80% chance next triangle is the same as the current triangle.

## Local Probability Significantly Predicts Participants' Choices

Participants' probability of choosing *up* according to the global and local properties of the current screen.



Multiple logistic regression model predicting participants' choice for the next triangle's direction.

The model was a significant fit to the data ( $\chi^2 = 18.39, p < .001$ ).

Variable	B	SE	$\beta$	OR [95% CI]
Constant	-0.70**	0.25		0.50 [0.30, 0.80]
Local	0.99**	0.35	2.66**	2.69 [1.38, 5.36]
Global	0.47	0.34	1.27	1.60 [0.82, 3.17]
Global x Local	-0.09	0.49	-0.25	0.91 [0.35, 2.37]

Note. B = unstandardized coefficients; SE = standard error of estimate;  $\beta$  = standardized coefficients; OR = odds ratio; CI = confidence interval

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$

## Why Did Our Task Lead to a Local Bias?

Our data show that participants based their guesses primarily on the local probability.

**Was the local bias due to global probability not being salient enough?**

Data from feedback questions show that participants detected the global probability to a lesser extent than the local probability. This may be due to the global probability occurring in the background, rather than within the triangle itself.

**Was the local bias due to a local precedence effect for non-visual tasks?**

Visual perception research has argued for a universal global bias (4). In the limited prior work on global and local probabilities, a local bias may be more common than anticipated. For example, a modified Posner cueing task with global and local probabilities co-occurring, detected a local bias in participant performance (5).

## References

- (1) Filipowicz, A., et al. (2020). *Inferior Frontal and Anterior Insular Damage Affects Mental Model Updating Strategies* [Manuscript in preparation].
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- (3) Stöttinger, E., et al. (2014). Statistical and perceptual updating: Correlated impairments in right brain injury. *Experimental Brain Research*, 232(6), 1971-1987.
- (4) Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology*, 9(3), 353-383.
- (5) Arjona, A., et al. (2018). The influence of the global/local probability effect on the neural processing of cues and targets. A functional systems approach. *International Journal of Psychophysiology*, 134, 52-61.