

# The sensory component of inhibition of return

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## Introduction

After a stimulus is briefly presented in the periphery, we take a bit longer to react to a target presented at the same location if it is presented more than 300 ms later – the inhibition of return (IOR) effect [1].

*What is inhibited in IOR?*

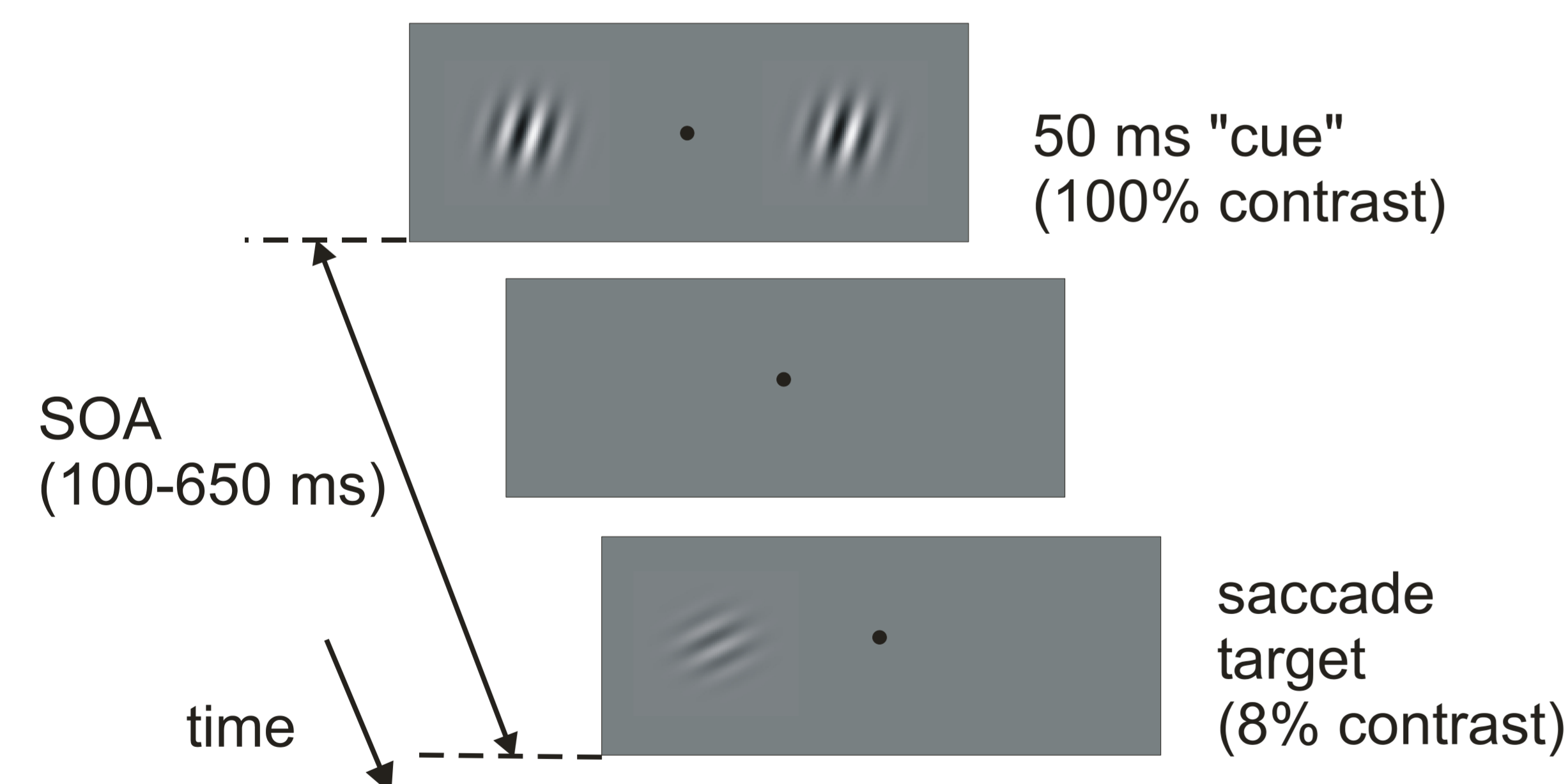
Mostly motor preparation and orienting of spatial attention according to most reports.

*A third way?*

Processing of a repeated stimulus may be attenuated [e.g. 2] even in the absence of a spatial attention or motor preparation bias.

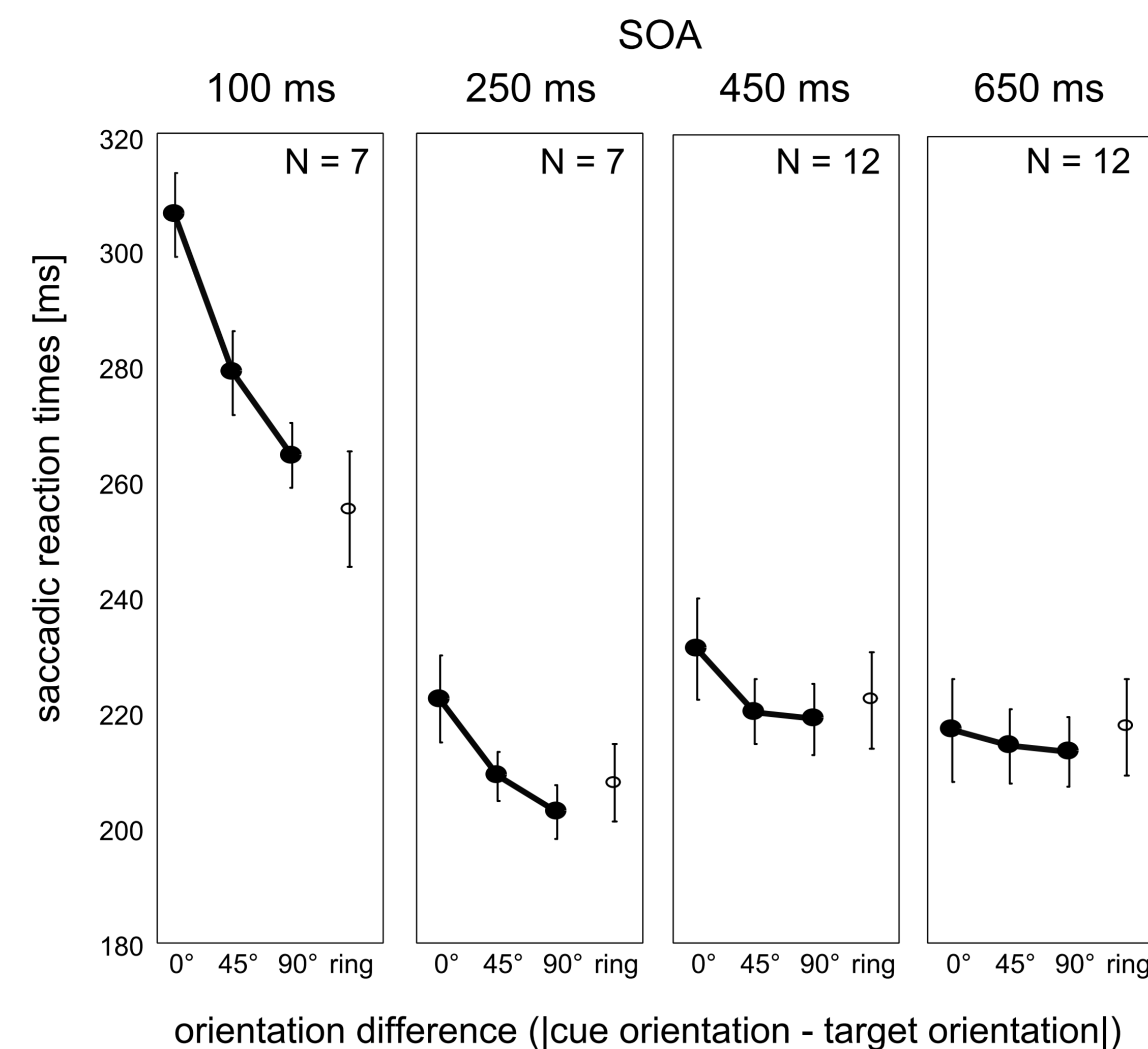
If the repetition attenuation effect does not wear-off within 300ms, we may find that IOR, and saccadic latencies in general, depend on the visual similarity between *cue* and *target*.

## Methods



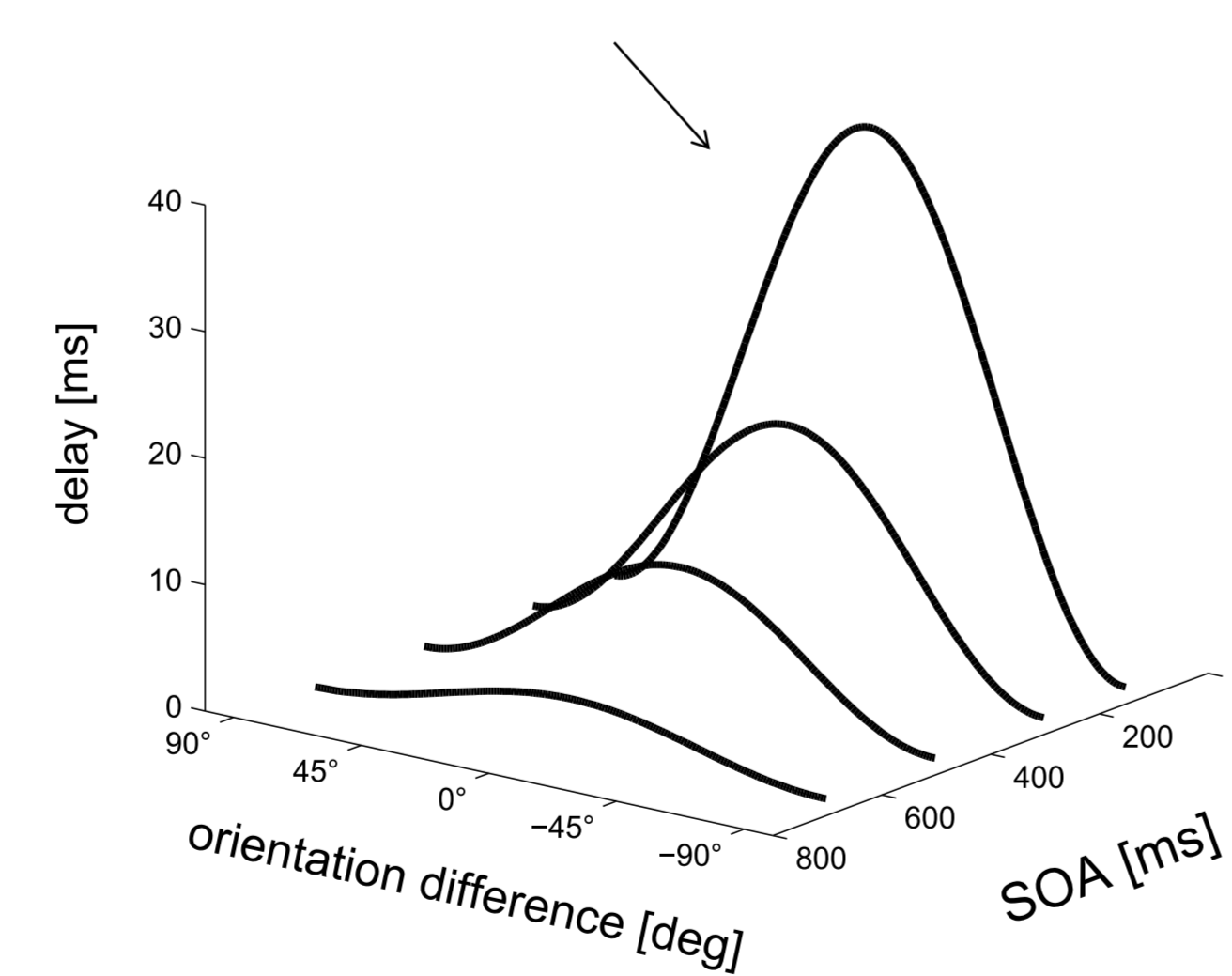
**Bilateral presentation of 100% contrast gratings at a random orientation (cue), and then a rotated (i.e. 45° CW) low-contrast grating in the left or right side. The task is to saccade to the second grating.**

## Bilateral presentation (Exp. 1)

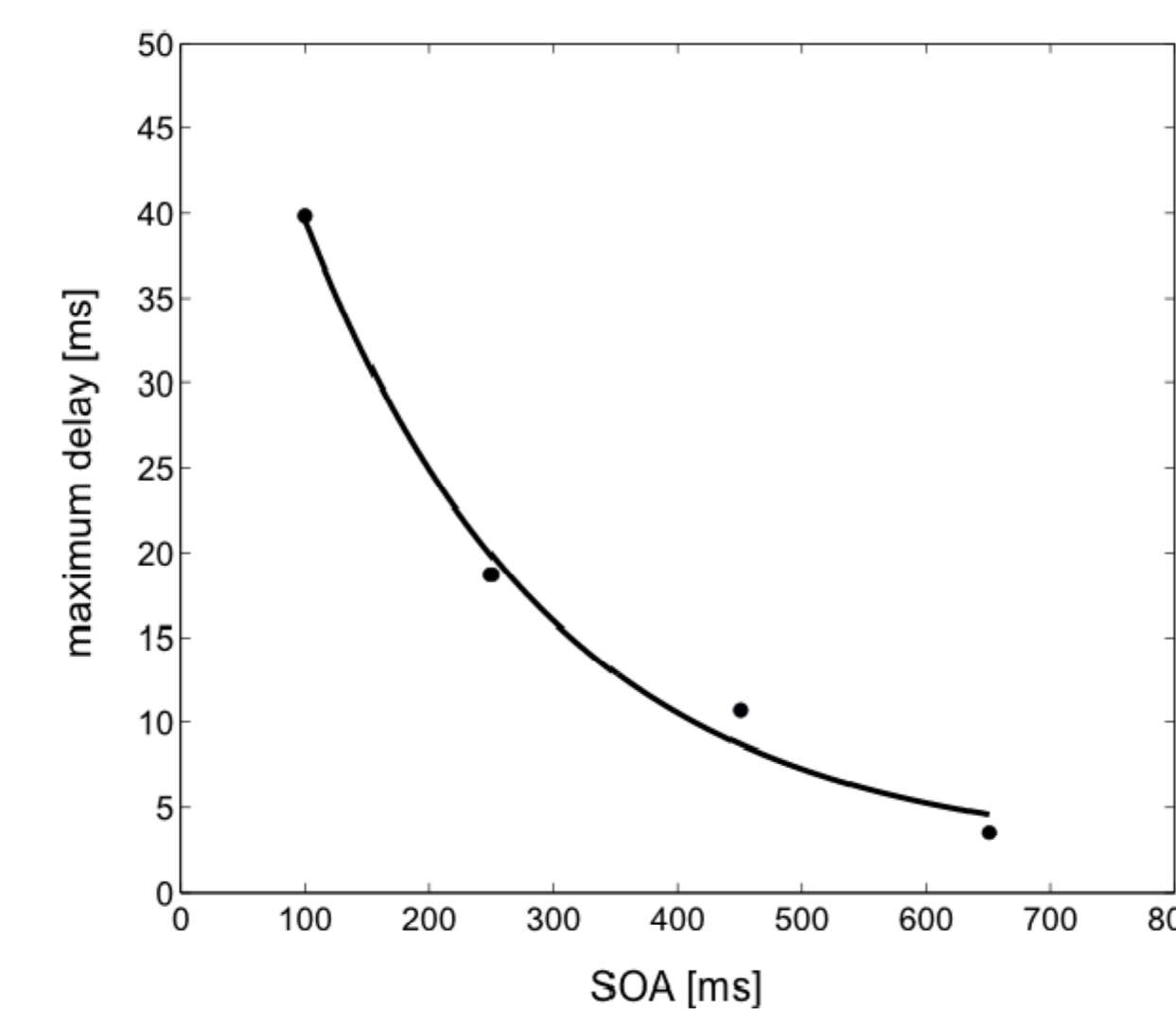


**Significant effect of cue-target similarity (orientation difference) on saccade latencies up to the 450-ms SOA.**

$$\text{delay} = a + b \cos(2 \Delta \text{orientation})$$

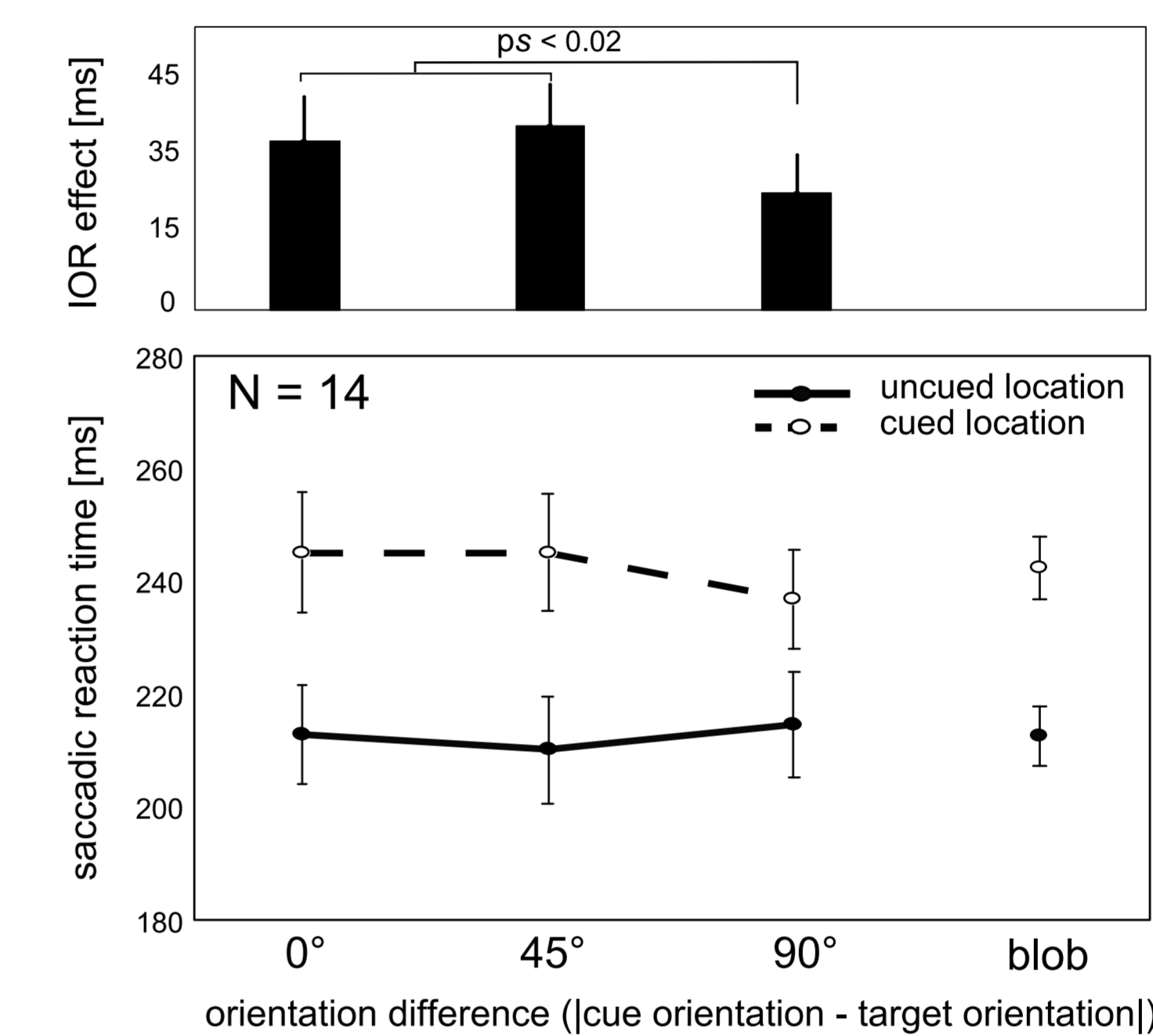


**An exponential decay models the orientation-dependent effects.**

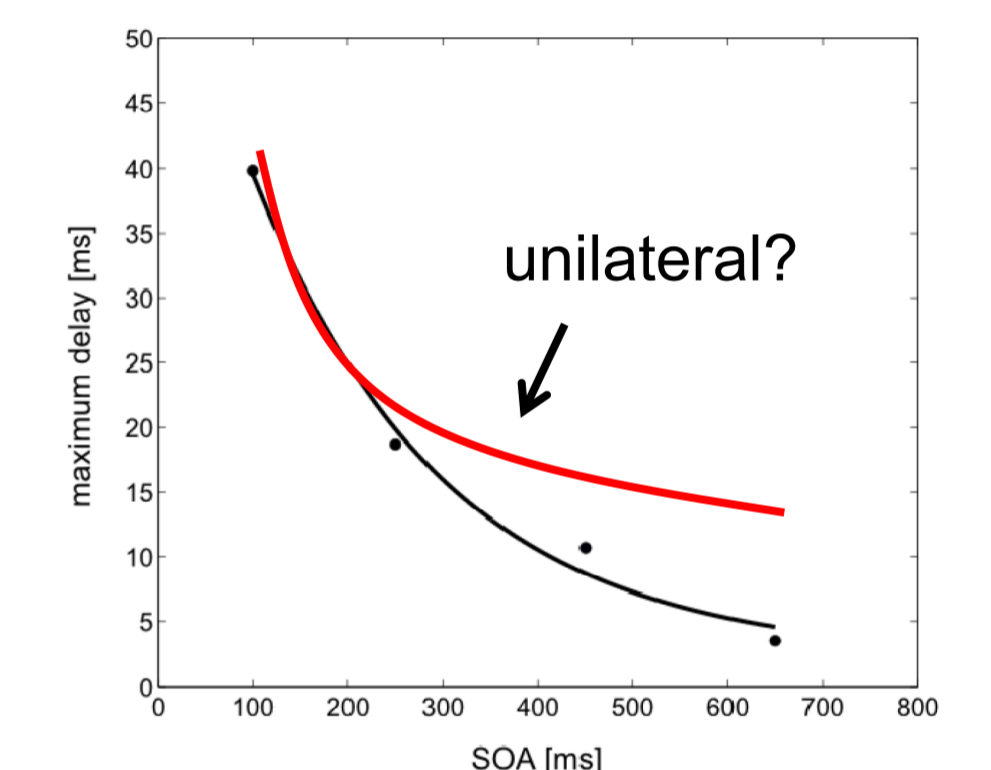


## Unilateral presentation or IOR paradigm (Exp. 2)

Longer lasting orientation-specific effects if attention is grabbed by the cue [3]? In **Exp. 2**: the cue was presented unilaterally at the longest SOA.



**IOR is modulated by orientation difference with a 650-ms SOA**



## Discussion

A non-classical component is present in the IOR effect (300 to about 700 and maybe more), reflected in an additional delay for iso-oriented cues and targets.

Orientation-dependence may be due to an (unusually) long-lasting attenuation of the response to stimulus repetition in early visual areas, that may be boosted by spatial attention to the first stimulus [3] – Exp. 2. The apparently lawful decay of the orientation-dependent delay indicates a similar mechanism for the early and late SOAs.

We may also refer to the effect as an inhibition of previously attended features.

## References

- [1] Posner MI & Cohen Y (1984) Components of visual orienting *Attention and performance X*, eds Bouma H & Bowhuis D (Erlbaum, Hillsdale, NJ), pp 531-556.
- [2] Murray SO, Olman CA, & Kersten D (2006) Spatially specific fMRI repetition effects in human visual cortex. *J. Neurophysiol.* 95(4):2439-2445
- [3] Ling S & Carrasco M (2006) When sustained attention impairs perception. *Nat. Neurosci.* 9(10):1243-1245.