Entire valid hemifield shows IOR during reference frame task

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We perceive the outside world as stable, however our eyes make about three movements each second causing constant recalibration of the retinal image. The question of how this stability is achieved is still an active research question. Coding of visual input information happens mostly in retinotopic coordinates but must be understood in real world, spatiotopic coordinates. Inhibition of return (IOR) represents the involuntary delay in attending an already inspected location and therefore facilitates attention to seek novel locations in visual search. IOR would only be helpful as a facilitator if it were coded in spatiotopic coordinates, but recent research suggests that it is coded in both frames of reference. In this experiment we manipulated the location of the cue and the target with an intervening saccade and used a continuous cue-target onset asynchrony (CTOA) of 50 – 1000 ms.

Example of the trial with the target in the valid hemifield regarding the cue

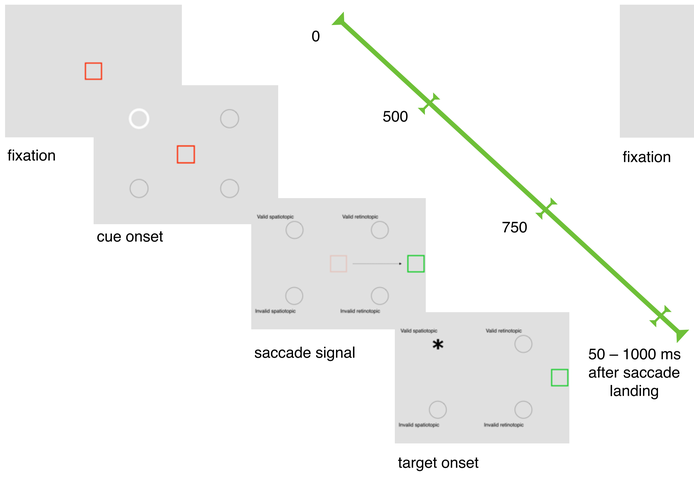

Figure 1. Trial with the valid location of the target

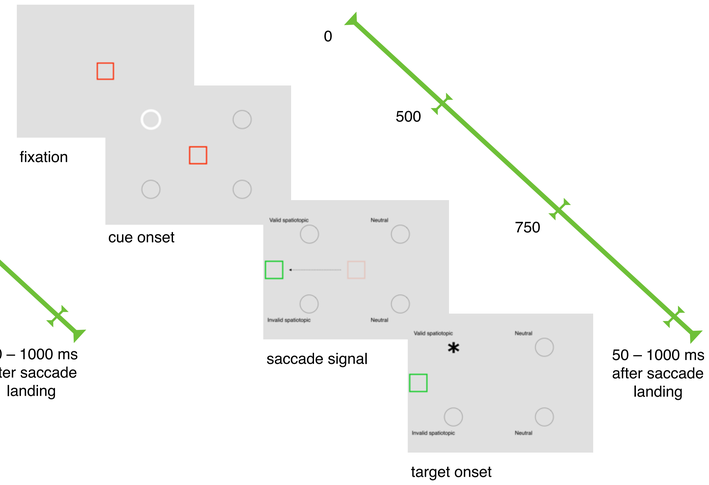

Figure 2. Trial with the neutral location of the target

- N=16
- Non-informative exogenous cues
- Two cue-target locations: valid, invalid
- Three frames of reference: spatiotopic, retinotopic, neutral
- Random target onset: 0-1000ms
- Random choice of four target locations
- No placeholders
- E1: MRT, speeded button response
- E2: SRT, eyes fixation on the target

Independent variables:

- target onset time: *early < 300 ms, long > 300 ms*
- validity: *valid or invalid location*
- frame of reference: *spatiotopic, retinotopic, neutral*

Linear mixed effects analysis tested on all three variables

Statistics:

MRT: x^2(early time)=390, p<0.001, x^2(early time and validity)=11.186, p<0.001, x^2(early time, validity and reference frame)=12.498, p=0.1867

SRT: x^2(early time)= 283.55, p<0.001, x^2(early time and validity)= 13.067, p<0.001, x^2(early time, validity and reference frame)= 11.468, p= 0.02178

Golomb observed attentional traces at retinotopic location following after saccade and Mathôt and Theeuwes find IOR to be initially retinotopic (and spatiotopic for late CTOAs), while Pertzov et al. and Hilchey et al. bring evidences for spatiotopic IOR. MacInnes in 2014 considered that retinotopic gradient might be a part of spatiotopic gradient. As MacInnes we used continuos time measure for stimulus onset. But here we used only four exact locations for cue and stimulus appearance that allowed us to control for reference frames with a forced saccade and increase cue-target matching.

Results

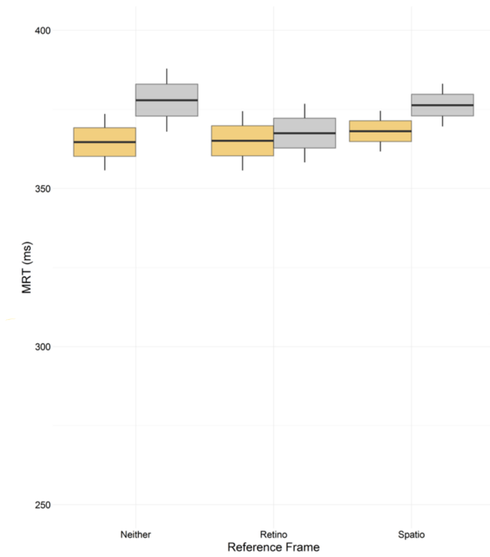

Figure 3. MRT statistics

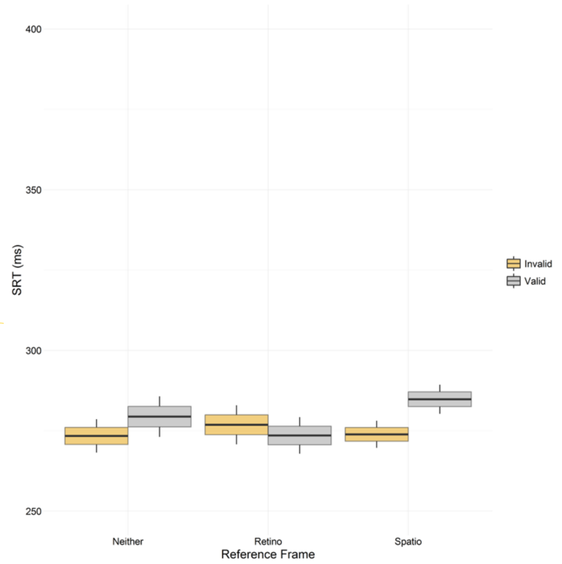

Figure 4. SRT statistics

- Significant IOR in both MRT and SRT conditions, main effect of validity for both
- No independent source of retinotopic IOR for SRT
- IOR in entire valid hemifield for MRT
- The only differences in MRT and SRT conditions are in coverage of IOR
- Neither MRT or SRT has retinotopic IOR that is separable from spatiotopic.

Discussion:

IOR on the entire valid hemifield might mean that either participants attended the entire valid hemifield or the gradient of IOR is large enough to encompass multiple locations.

References:

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