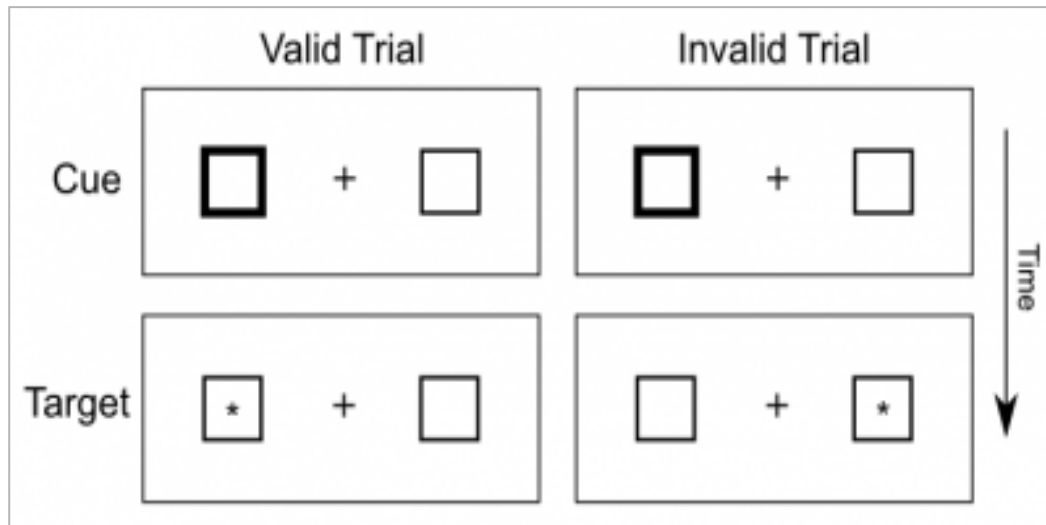




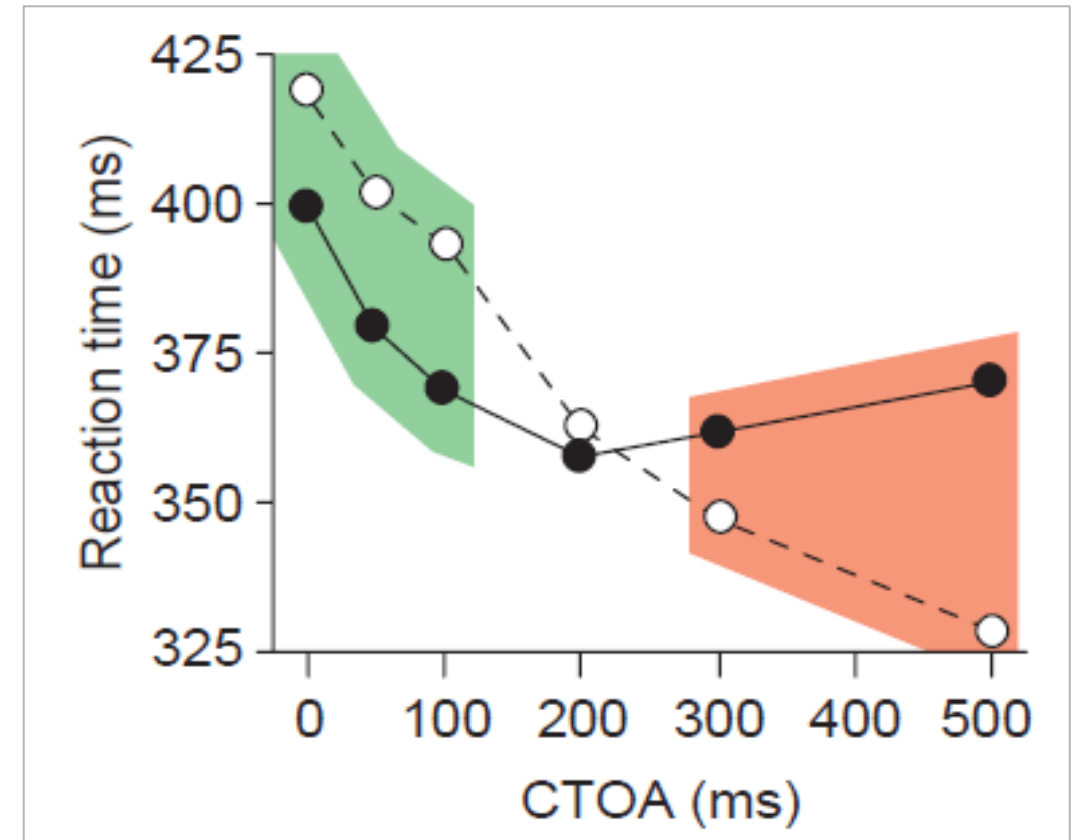
The Case Of The Missing Attention.

Background

Posner's Cueing Paradigm
(mental chronometry)



Facilitation vs Inhibition of Return (IOR)



A prototypical demonstration of facilitation and IOR.

Other Studies

- Tassinari G, & Berlucchi G., 1995 – *visual/somatic/acoustic stimuli, hemifields*
- Danzinger, S., & Kingstone, A., 1999 – *single or double cue manipulations (NLP, SLP, CLP)*
- Maruff, P., Yucel, M., Danckert, J., Stuart, G., & Currie, J., 1999 – *temporal overlap between cue/target*
- Pratt, J., Hillis, J., & Gold, J., 2001 – *spatial overlap/physical characteristics of stimuli*
- Mele, S., Savazzi, S., Marzi, C. A., & Berlucchi, G., 2008 – *cue luminance*
- Taylor, J. E., Chan, D., Bennet, P. J., & Pratt, J., 2015 - *with/without placeholders*
- MacInnes, W. J., 2017 – *spatial/temporal gradient with manual & saccadic mode*
- Malevich, T., Ardasheva, L., Krueger, H. M., & MacInnes, W. J. (in press) – *temporal expectations*

Experiment

Design:-

- Four possible target locations
- Saccadic Mode
- Exogenous Cueing
- Random Continuous CTOA
- 30 Subjects (1 excluded)

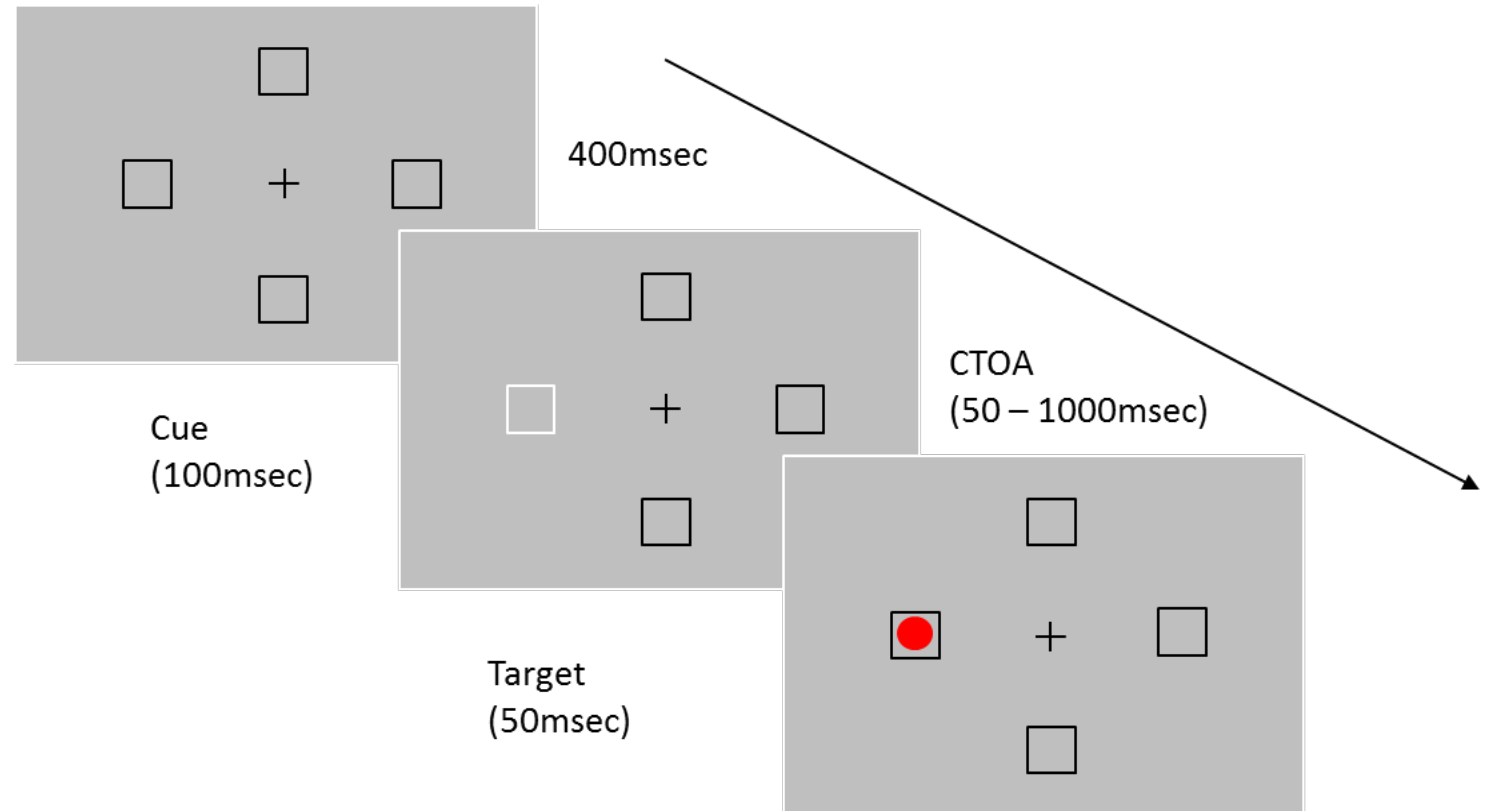


Illustration of a valid trial. In the last slide representation, the top and bottom boxes are the orthogonal position (relative to target), the box on the right is opposite and the box with the target is valid. The target shown in the horizontal hemifield.

Experiment

Independent Variables:

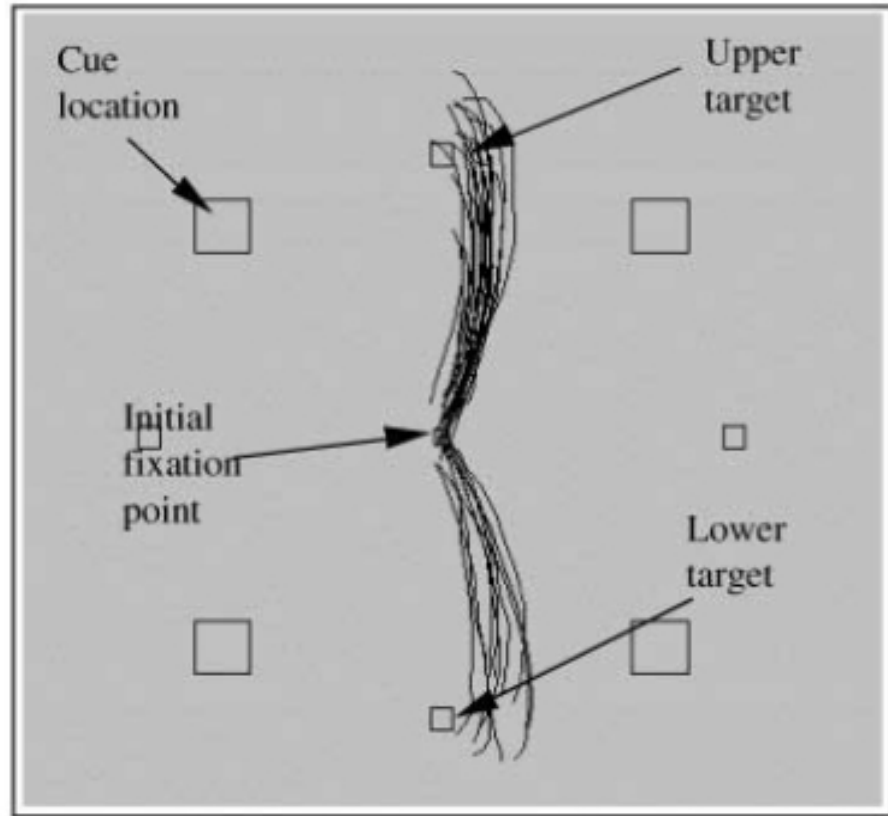
- Cue validity (valid or invalid)
- Target hemifield (vertical or horizontal)
- Cue target relative location (valid, opposite, orthogonal)
- Random continuous CTOA (50 – 1000 ms)

Dependent Variables:

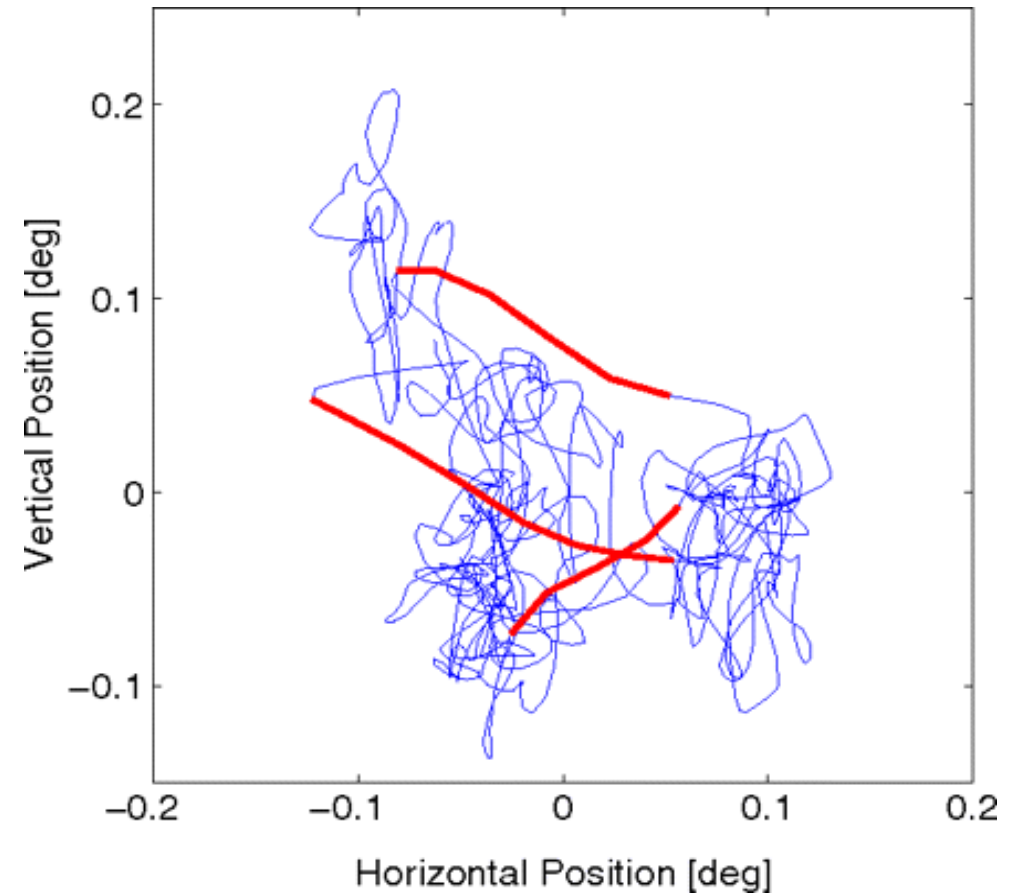
- Saccadic reaction time (SRT in ms)
- Saccadic curvature (towards or away from cue, espl. for orthogonal targets)
- Microsaccades between presentation of cue and target (rate and direction)
- Pupil size changes to the cue (positive or negative)

Metrics used

Saccadic Curvature (Doyle & Walker, 2001)

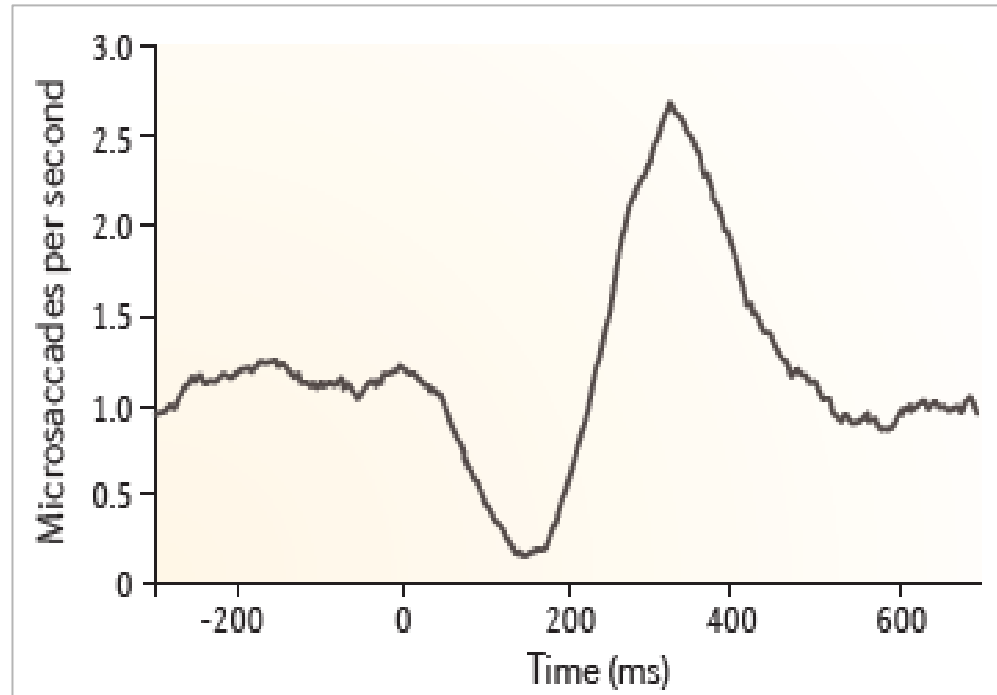


Microsaccades (Engbert et al., 2011)

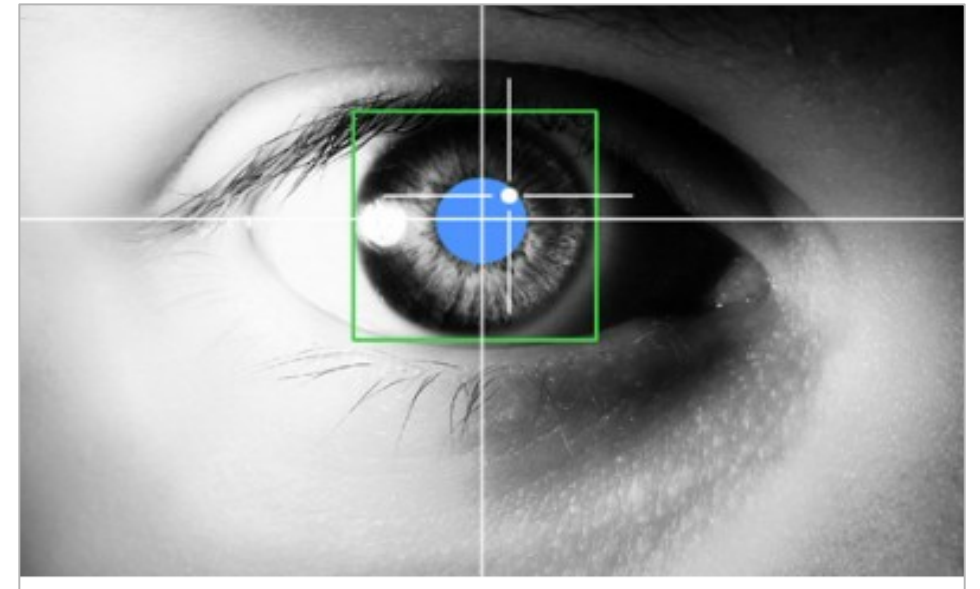


Metrics used

Typical micro-saccade rate inhibition after changes in peripheral stimuli (Martinez-Conde et al., 2013)

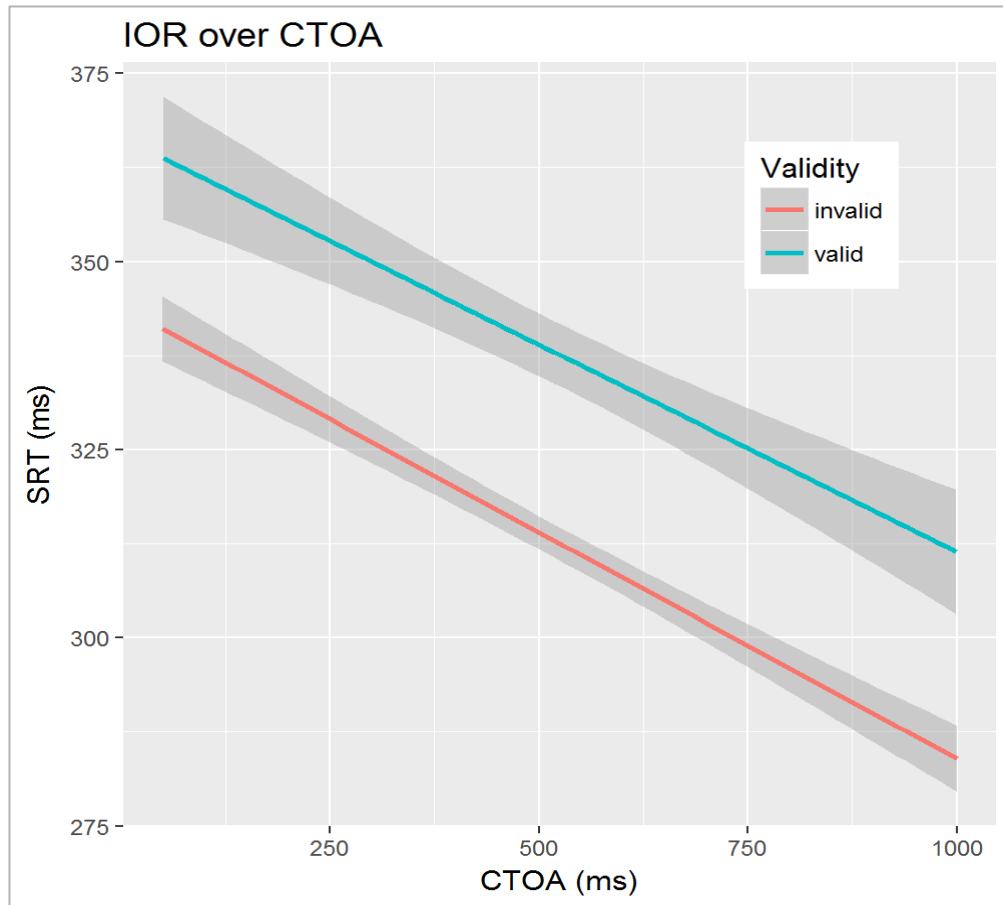


Pupil size changes



Results

Saccadic Reaction Time



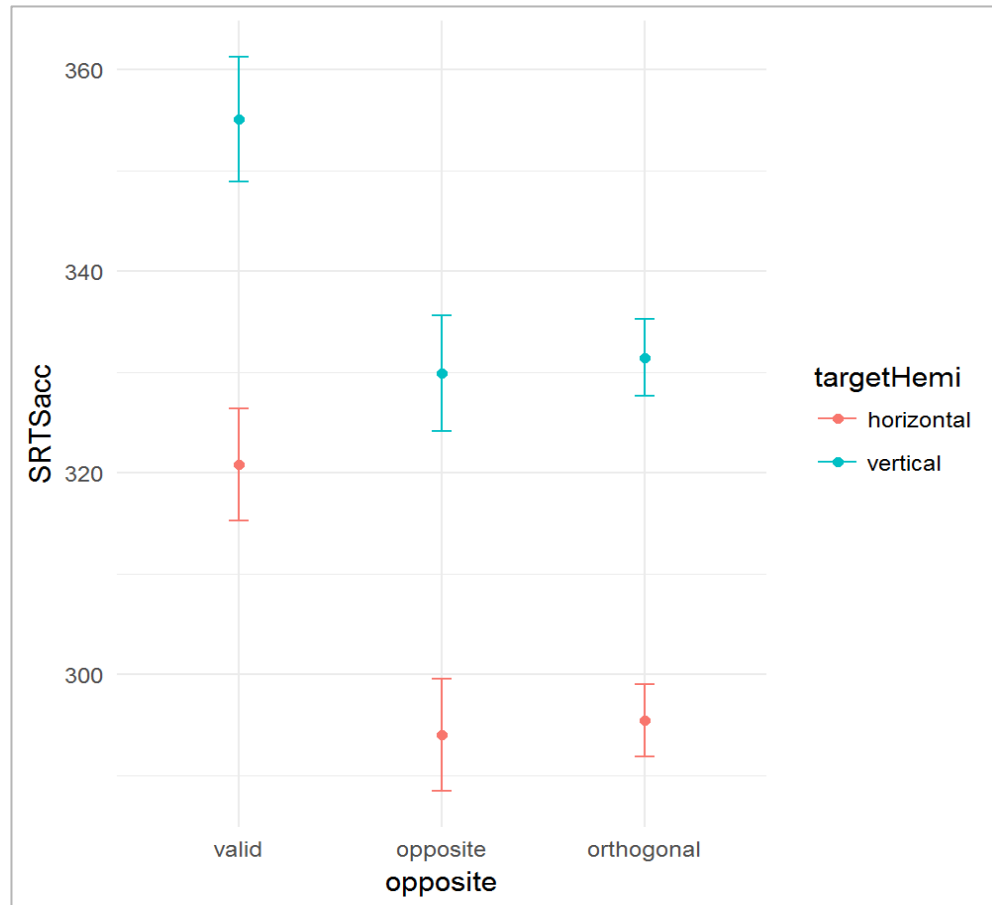
Facilitation ?

Mean model reaction time was 323ms, standard error 8.5ms (for the baseline condition of horizontal target hemifield, 50ms CTOA, invalid trial)

- Significant main effect of cue validity
- Strong IOR right from start
- No validity-CTOA interaction

Results

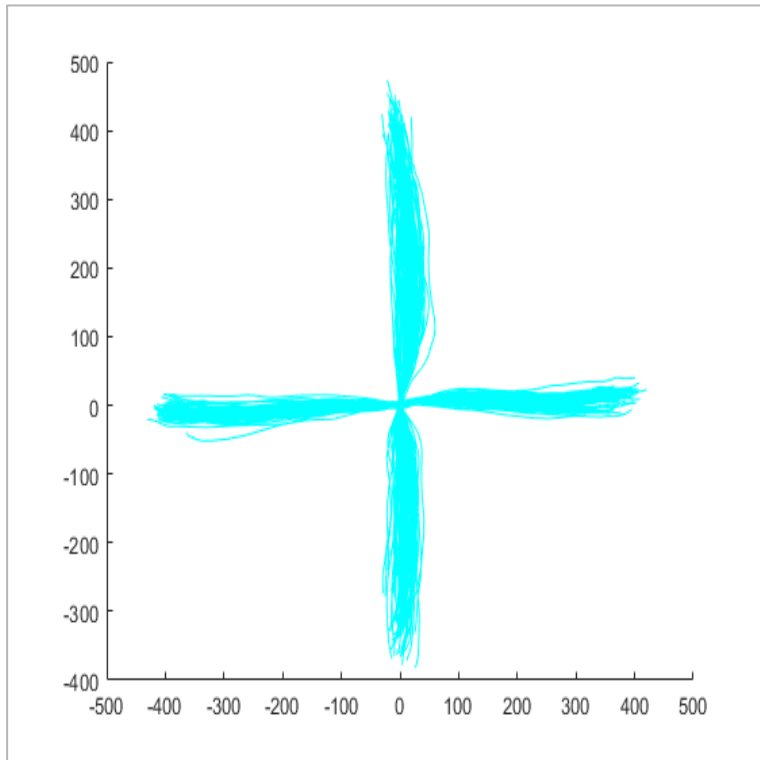
Target Hemifield



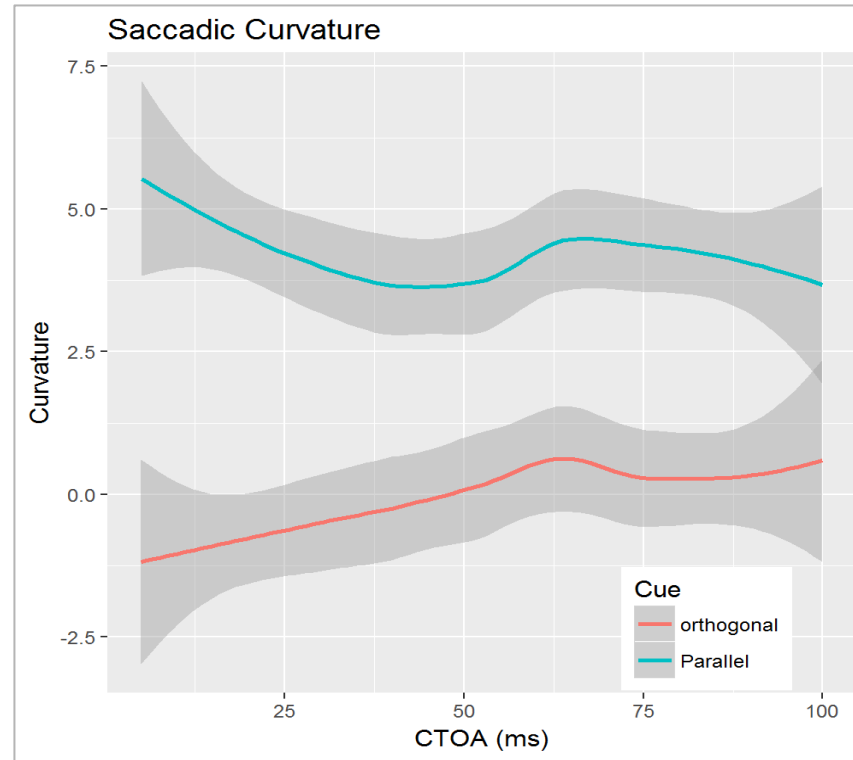
Strong significant target hemifield effect on SRT.
Early IOR observed.

Results

Saccadic Curvature



Sample Saccades from a participant



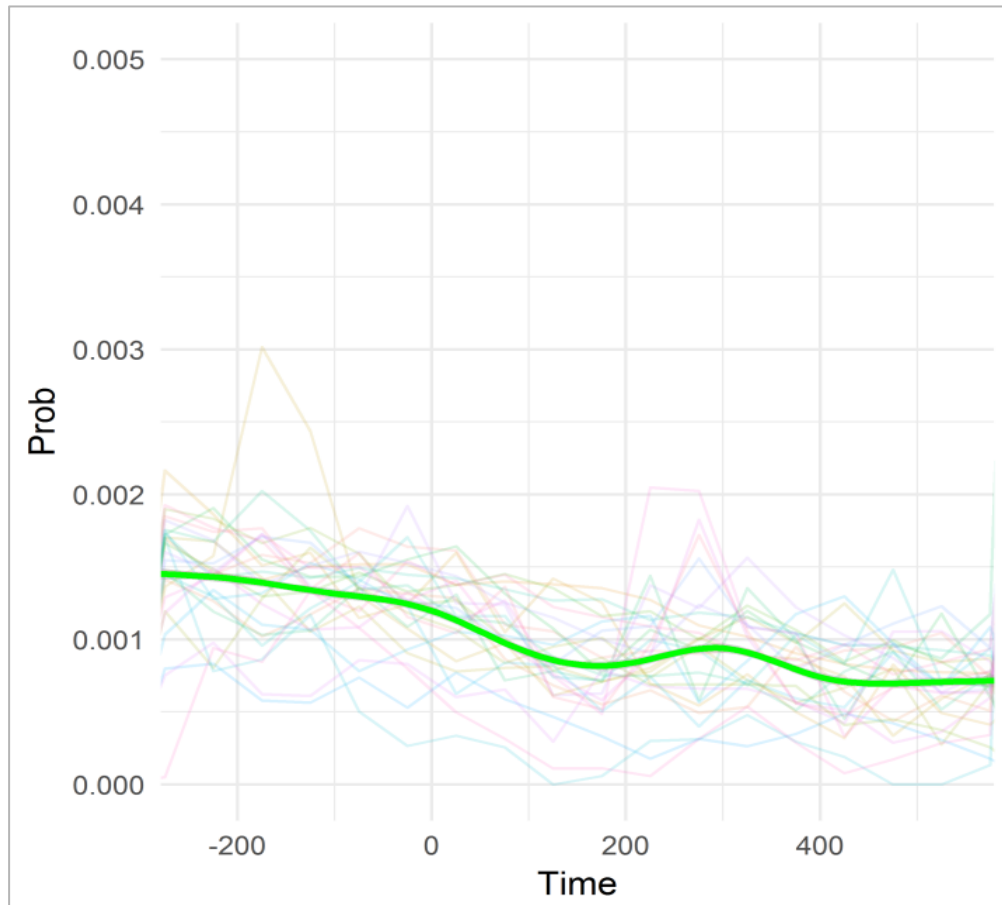
Orthogonal cue showed negative curvature at earlier CTOAs and positive at later CTOAs – small but significant effect.

Negative curvature – deviation away from the distractor

Opposite and Valid locations have been merged under 'parallel'

Results

Microsaccade Rate

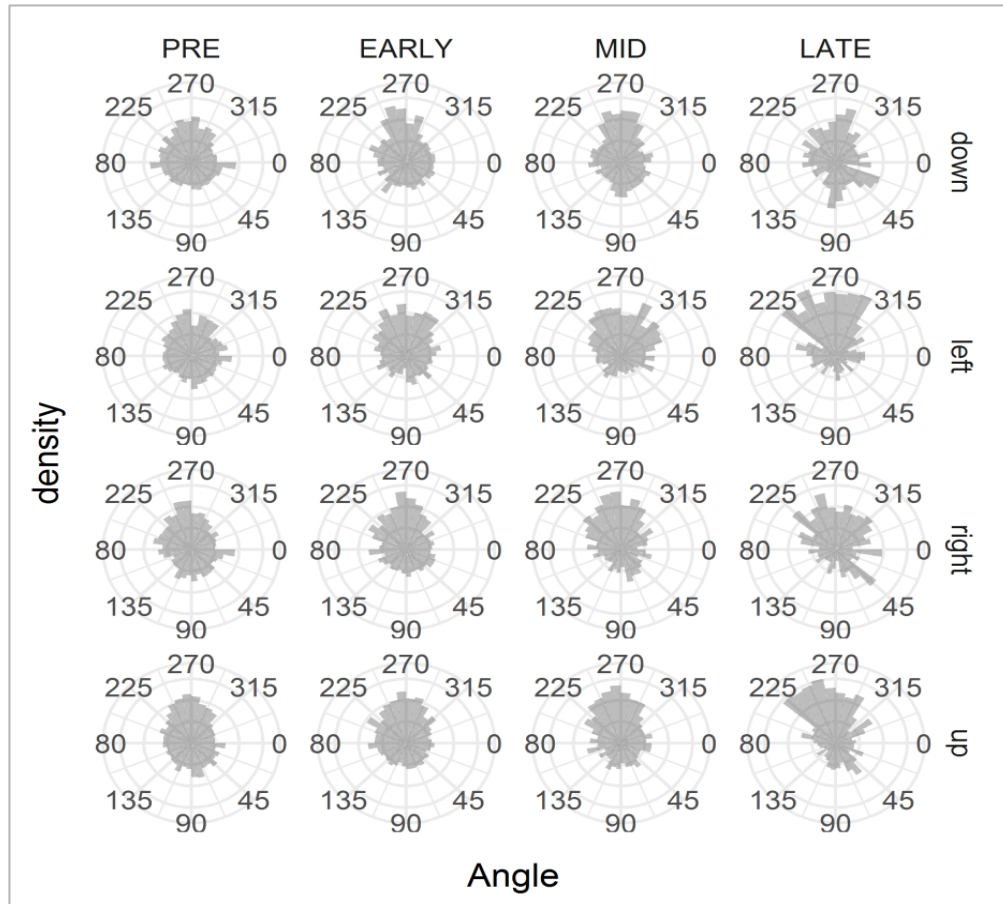


Microsaccades measured in the duration between cue onset and target onset.

Likelihood of a microsaccade at a given time compared to the cue onset with 0 time representing the onset of the cue. We do see a dip in microsaccade rate following the cue, but not a recovery of the rate at 300ms and later.

Results

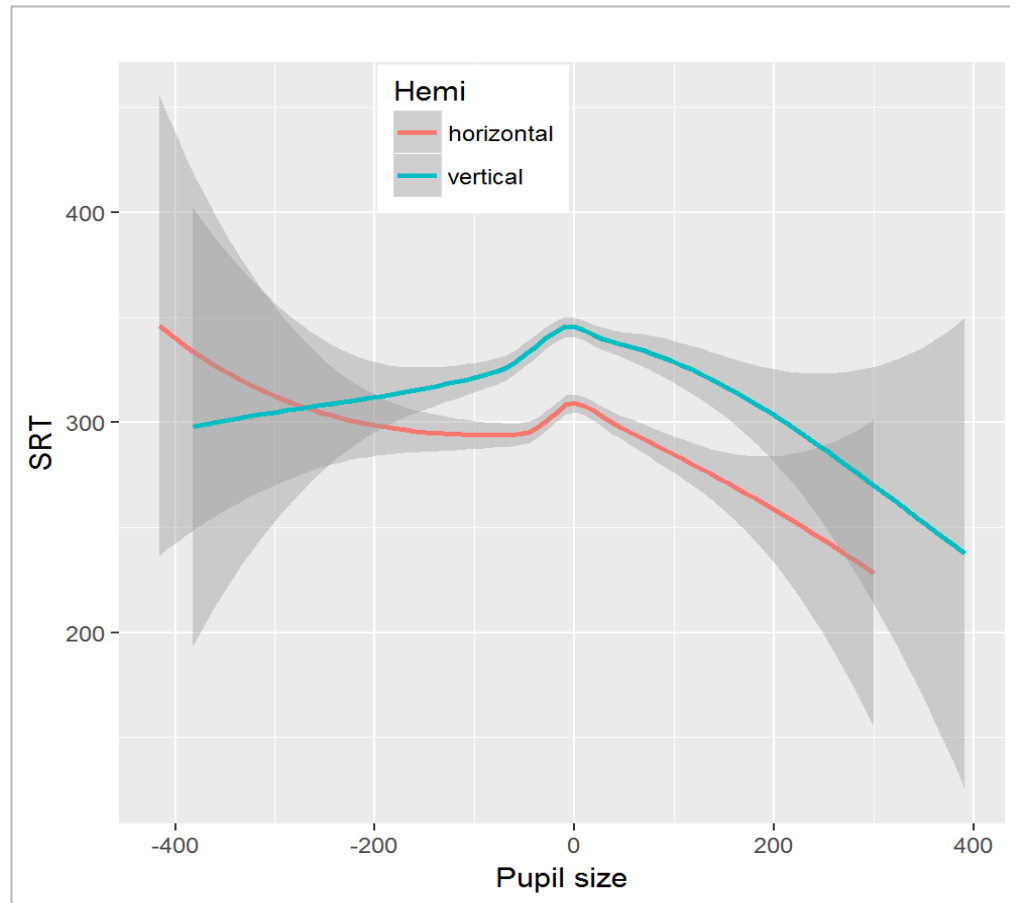
Microsaccade direction bias



Directional bias of microsaccades at various time frames relative to cue. Pre-cue was up to 300 ms before the cue, early, mid and late were up to 300, 600 and 900ms bins after the cue respectively.

Results

Pupil size



Pupil size change does not interact with validity to predict SRT
Marginal interaction with cue hemifield

So, what happened to attention?

Was the cue not attended ?

OR

Was attention removed so quickly that SRT failed to capture it?