Temporal modulations of extrafoveal sensitivity to changes during fixation
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Introduction
Being able to correctly identify sudden changes in the environment is crucial for survival. Discriminating these changes can be influenced by the perceptual salience of the stimulus surround.

Goal: examine how visual sensitivity in a peripheral discrimination task changes over the course of time during a brief fixation, and how perceptual salience influences these temporal changes.

Experimental Paradigm

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<tr>
<th>Conditions</th>
<th>Non-salient flanks</th>
<th>Salient flanks</th>
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<td>Baseline</td>
<td><img src="img" alt="Baseline" /></td>
<td><img src="img" alt="Salient" /></td>
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**Experimental Paradigm**

- In the **fixation task** trials start with subjects fixating on a central marker on a 1/f grayscale noise background, which changes in every trial. Following this initial fixation, the target stimulus, a vertically oriented 8 cpd gabor patch (1 deg in size with a gaussian envelope of 0.5 deg std) appears flanked by two featureless gaussian blobs of the same dimension, 8 degrees to the left of the fixation point. Subjects are instructed to maintain fixation and monitor the peripheral stimulus for ~500ms. At a random point in time the target changes orientation briefly (50ms). At the end of the trial subjects report whether the target turned to the left or to the right with respect to its initial orientation.

- In the **saccade task** trials start with subjects fixating on a peripheral marker 4 degrees away from the center of the display. Then a central marker and the target (8 deg away from the central marker) appears and subjects are instructed to saccade to the central marker and maintain fixation at that location for 500ms. At a random point in time after the saccade offset the peripheral target changes orientation briefly (50ms). The rest of the trial evolves in the same way as described above. Saccade and fixation tasks are run in separate blocks. Stimuli were jittered to avoid visual fading.

Apparatus
We monitored eye-movements using a custom built digital dual purkinje image eye-tracker (US Patent 11003244B2).

Results

**Fixation Task**

- Subjects’ ability to discriminate the direction of a change in the stimulus orientation was highest right after the onset of stimuli and it drastically decreased over time.

- In the fixation task, overall, performance dropped ~17% around 350 ms (80% at 0-150ms, 63% at 350-450ms, p = 0.001, two-tailed t-test). This extensive drop over time was very consistent across subjects.

- A similar trend was reported when stimuli were brought into the field of view by means of a saccade rather than being flashed on the display.

- These results are the same regardless of whether or not microsaccades were performed during the trial.

- Sensitivity was not constant even during the brief 500ms fixation period and a progressive decline in performance was observed for changes happening at later time.

- Sensitivity reported from this study was not influenced by the saliency of the target surrounding, suggesting that, in this context, visual system is very efficient in suppressing static salient distractors embedded in the environment.

- The extensive drop in performance during the course of fixation reported here could be the result of exogenous attention or of the perceptual transient generated by either sudden onset of the stimulus or the saccade.

Conclusions

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