Foveal and peripheral processing during the course of fixation
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QUESTION
How is our ability to localize changes in foveal and peripheral stimuli modulated during the course of fixation?

TASK
Participants (N=6) were instructed to shift their gaze from an initial fixation point to the center of the display. Subjects maintained fixation at that location which was surrounded by four bars. In different, interleaved conditions bars could be located either all in the fovea or all in the periphery (UNI condition), or two in the fovea and two in the periphery (MIX condition). Stimuli in the periphery were enlarged to compensate for cortical magnification.

At a random time during fixation, one of the bars briefly (50 ms) changed its orientation. The change in orientation was fixed for each stimulus location and participant, and it was chosen so that it yielded 80% correct localizations.

Each trial lasted a maximum of 2.1 s. At the end of the trial participants were asked to report the location of the bar that changed orientation.

RESULTS
Orientation change thresholds were higher in the fovea than in the periphery. That is, a larger orientation change is needed at the fovea for above threshold localization.

When stimuli are presented peripherally, performance gradually improves from fixation onset. This improvement is less pronounced when stimuli are presented foveally. Error bars are SEM. Asterisks indicate a statistically significant difference in performance when the change occurred in the fovea vs in the periphery (p<0.01).

The ability to localize changes at the foveal scale is better during the first 300 ms of fixation. This pattern of results is the same regardless of whether foveal and peripheral stimuli are presented together or separately (MIX vs UNI condition). Error bars represent SEM. Asterisks indicate a statistically significant difference (p<0.01).

CONCLUSION
Humans' ability to localize abrupt changes is not constant during the course of fixation. The difference in performance suggests that there is a natural advantage for processing foveal stimuli early on during fixation.