

## **Useful Field of View shows why we miss the search target when we “look at” it**

Chia-Chien Wu<sup>1,2</sup>, Jeremy M Wolfe<sup>1,2</sup>

<sup>1</sup> Brigham and Women's Hospital

<sup>2</sup> Harvard Medical School

How much of the visual world do we process with each fixation? What is the “useful field of view” (UFOV). The answer to that question depends on the task. If the task is peripheral recognition, the answer is constrained by acuity and crowding. If the task is visual search, we need to know if an item in the periphery can attract the next fixation. To measure the UFOV for visual search, observers were asked to mouseclick on the target letter, T, among distractor, Ls, while their eye movements were recorded. Once the target letter was clicked, a new T would immediately appear at a random location and all other letters would rotate by a random angle to mask any pop-out of the new target. Os collected 500 targets in a session. The results show that saccade length distributions are identical except for the last saccade to the target. The positively skewed distribution has a peak at about 4 degrees and an average of 5.7 degrees. It is likely that observers forage for targets within region defined by that saccade spacing. Similar distributions were found when searching for conjunctions, ambiguous Ts and Ls, and a TvsL display of a different density. This suggests that Os adopted a scanning strategy with roughly constant saccade lengths to explore the search display until the target fell within their UFOV. The length of the last target-fixating saccade can be used to calculate an effective size of the search UFOV; 3.5 - 5 degrees for these stimuli. Twenty Hz serial deployments of attention within the UFOV can model the saccade length distribution and can explain why the target is sometimes missed even when it is within the UFOV. Our results help to distinguish between the UFOV for peripheral recognition and the UFOV for visual search.

Acknowledgement: NIH EY017001 / Army Research Office R0000000000588