

## **When do you find the next item?: Using occluders to uncover the time course of visual foraging**

Anna Kosovicheva<sup>1</sup>, Jeremy M. Wolfe<sup>2,3</sup>

<sup>1</sup> Department of Psychology, Northeastern University

<sup>2</sup> Brigham and Women's Hospital

<sup>3</sup> Harvard Medical School

When searching for multiple instances of a target, observers might wait until they collect one target before beginning to look for the next. Alternatively, they could be searching ahead. We developed a novel procedure for tracking attention during visual foraging search. Subjects collected 4, 7, or 10 T shapes among 20, 17, or 14 Ls. Both targets and distractors were intermittently occluded by filled squares, in a regular on-off cycle, each with a randomly selected phase. There were three visibility conditions: 1s-on/3s-off, 4s-on/4s-off, and continuously visible. Subjects were instructed to click on targets as quickly as possible, regardless of whether they were visible or occluded when clicked. Since targets must be visible in order to be located, we can infer when a target was found from its history of visibility. Averaged across visibility conditions, peak visibility for targets was 719 ms before the click on that target location. Importantly, peak visibility for the next target occurred 30 ms before the click on the current target. These results are consistent with eye tracking data in unoccluded search. Here, subjects first fixate a target 610 ms before the corresponding click, and fixate the next target 66 ms after the click on the current item. The peak of the visibility distribution shifts toward later time points when fewer targets remain in the display, and it takes longer to find the next target. In a control experiment, all items were randomly shuffled between locations on each click, forcing observers to re-start the search after each click. Here, the peak of the visibility distribution for the next item was 374 ms after the click on the current target. Together, these results indicate that observers search for and find the next item before collecting the current item.