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The Eyes Have It

Where's Waldo? Ask your microsaccades

By [Brooke Borel](#) Posted 02.25.2009 at 8:35 am  [0 Comments](#)

Microsaccades are tiny involuntary eye movements that are instrumental in vision, because they prevent the fading of stationary objects from the visual field. Without the tiny movements, objects could become invisible to the retina. Researchers at the Barrow Neurological Institute in Phoenix previously showed that these eye movements occur when the gaze is fixed on a specific point, like a dot or a cross projected on a screen. But it was unproven whether or not these findings could be generalized to more complicated, natural visual tasks, like freely looking at objects in a scene, or picking a face out of a crowd.

New research from Barrow shows that microsaccades do in fact occur during a variety of complex visual tasks, including locating Waldo in the classic search puzzle. According to Susana Martinez-Conde, one of the authors of the study, these findings put to rest the hypothesis that microsaccades only occur in rigid laboratory settings when subjects fixate on a specific point.

Precise Measurements

In the study, Martinez-Conde and her team used high-precision cameras to record where test subjects' gaze fell on various pictures, which included portraits of animals and people, *Life Picture Puzzle* books that require the viewer to determine differences between two similar images, and Waldo search puzzles. These visual stimuli are similar to that which we experience in everyday life, like looking at various features of natural objects or scenes, and searching for a specific object in a complex, distracting scene.

The subjects were asked to freely view the portraits, and to complete the visual tasks in both types of puzzle pictures (i.e. find the differences in the *Life* puzzles and locate Waldo). Microsaccade and saccade movements were recorded simultaneously, which allowed the researchers to pinpoint what the subjects were looking at during high levels of eye movement (see video, courtesy of Barrow Neurological Institute; Waldo is highlighted in a blue box and the microsaccades are indicated in red).

High Correlation

The researchers found that microsaccades are highly involved in both visual exploration and visual search tasks. In the portrait pictures, they found a very high correlation between microsaccades and salient characteristics like faces, as compared to other less prominent objects or the background. According to Martinez-Conde, this may indicate that microsaccades play a role in locating the most salient or interesting features in a scene.

In the visual search tasks, higher levels of microsaccades were associated with successful detections. For example, microsaccades occurred at a much higher rate when the test subjects found Waldo.

It is not yet clear why the microsaccades occur more frequently when the eyes are looking at a person's face or locating a specific object, although the researchers suspect two possible scenarios (which are not necessarily mutually exclusive). First, it could be that when the subject is looking for Waldo, the increase in microsaccades helps make his image more visible. The other possibility is that the subject first finds Waldo, and the resulting increase in microsaccades function to verify that the image matches the template of Waldo that was already present in the subject's mind. According to Martinez-Conde, the next round of experiments will explore these possible explanations.

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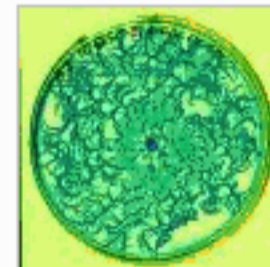
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