

**The influence of size and contrast on active eye fixation performance under monocular and binocular viewing conditions**

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**PURPOSE:** The human eye is under steady motion, even when fixating a stationary object. The aim of the present study was to characterise the impact of size and contrast on the precision and stability of visual fixation to blurred spots. Furthermore, the effect of binocularity was investigated.

**METHODS:** Eye position was recorded using a video-based eye tracker (Eyelink II, SR Research). The fixational stimulus was a blurred spot with a flat top central half diameter and a raised cosinusoidal skirt in its periphery. It was presented on a white background on a SONY display by means of a VSG2/5 stimulus generator card. Three target sizes (1, 0.5 and 0.2 deg in diameter) and five contrast levels (100, 40, 10, 4 and 1%) were tested, under binocular and monocular viewing. Fixation stability was analysed offline by fitting the Bivariate Ellipse Contour Areas (BECAs) containing 68% of fixation points on the scatter plots.

**RESULTS:** Under both binocular and monocular viewing BECAs were found to increase as a function of spot size. For spots of 0.2 deg in diameter the BECAs were always larger than the spot diameter. Target contrast was also found to influence fixation stability, with the effect being more pronounced for contrast levels below 10%. Under binocular viewing, eye fixation performance was always better for the dominant eye. BECAs were 2-4x larger under monocular compared to binocular viewing. This was more evident at lower contrasts. Eye dominance did not play a role in fixation performance when viewing monocularly: the occluded eye showed in all cases poorer fixation.

**CONCLUSIONS:** Stimulus visual properties play an important role in active fixation performance. In particular, low contrast spots, mainly due to their poorer visibility, result to increased areas of fixation. The poorer fixation performance under monocular viewing could partly be attributed to the reduced contrast sensitivity. However, the large difference between the two conditions may also arise from the activation of different groups of cortical neurons.