JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Contrast sensitivity during the initiation of smooth pursuit eye movements

Alexander C. Schütz, Doris I. Braun & Karl R. Gegenfurtner

Justus-Liebig-University Giessen

Contact: alexander.c.schuetz@psychol.uni-giessen.de

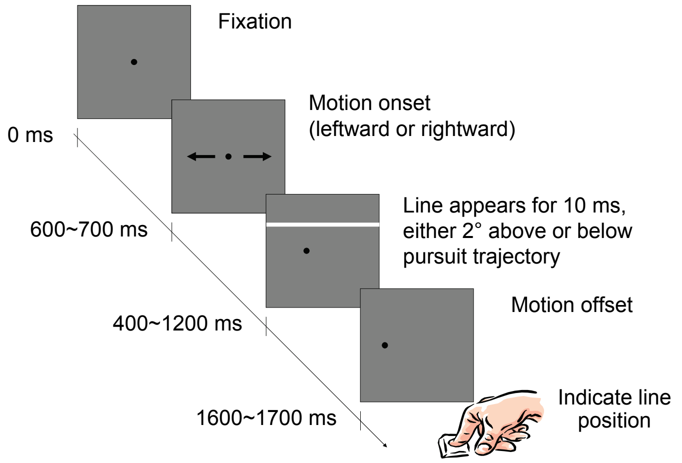
Introduction

Eye movements challenge the perception of a stable world by inducing strong retinal image motion, resulting from an acceleration of the eyes. For saccades there is strong evidence that this perceptual stability is accomplished by saccadic suppression [1]. Here we explore whether suppression also occurs during smooth pursuit initiation.

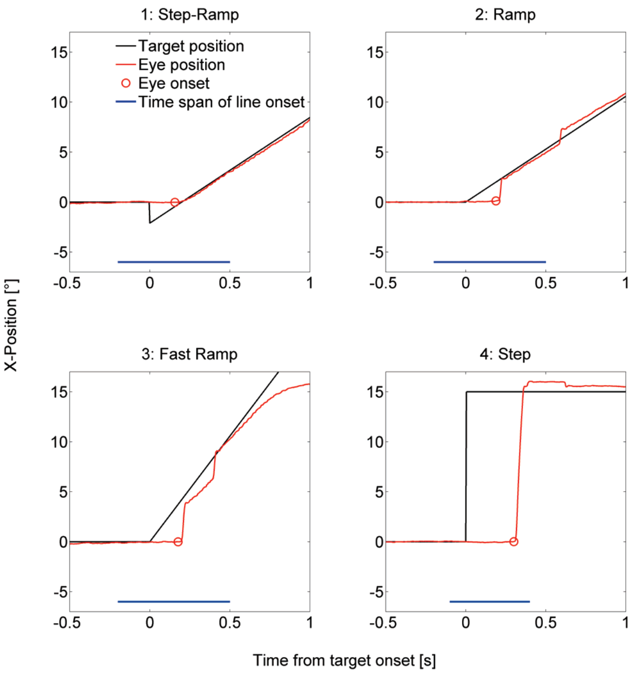
Methods

In a 2AFC design we investigated the sensitivity for threshold-level stimuli during the initiation of smooth pursuit and during saccades. Eye movements were elicited by 4 different target conditions: step-ramp [2], ramp, fast ramp and step stimuli. At any time from 200 ms before target onset to 500 ms after target onset, a blurred 0.3 deg wide horizontal line appeared for 10 ms either 2 deg above or below the pursuit trajectory. The peak contrast of the line was adjusted to a level just above threshold for each subject. Subjects had to indicate whether the line appeared above or below the pursuit target.

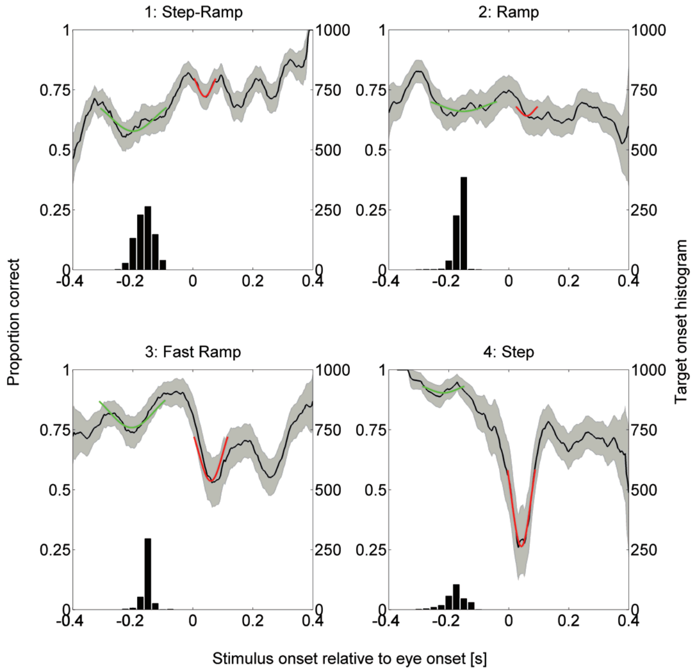
Experimental Procedure



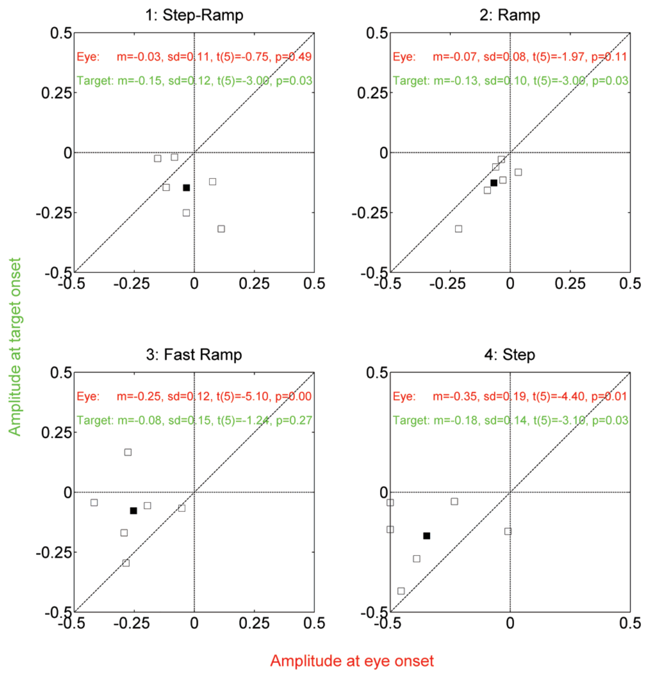
Experimental Conditions



Results



The detection rate was plotted over time by means of a weighted sliding histogram. In Experiment 1, the detection rate is aligned to pursuit onset, otherwise to saccade onset. To quantify the amount of suppression, the amplitudes of fitted Gaussian distributions were used. Two regions of interest were tested: The time around target onset (green) and the time around eye onset (red).



Conclusion

The results do not show any suppression at the onset of pursuit, if the pursuit is elicited by a step-ramp stimulus. If the pursuit is elicited by a ramp stimulus, the initiation of smooth pursuit is accompanied by initial saccades for which saccadic suppression can be observed (only for large saccades). Moreover a slight attenuation of contrast sensitivity occurs at target onset. This attenuation is probably due to inattentional blink, caused by the generation of the following eye movement.

Acknowledgments:
We thank Stefanie Bader, Nadine Lipke and Maria Höfer for collecting data and Martin Stritzke for beeing subject.
This work was supported by the DFG Forschergruppe FOR 560 “Perception and Action” and the DFG Graduiertenkolleg GRK 885 “NeuroAct”.

References:
[1] Ross, J., Morrone, M. C., Goldberg, M. E., & Burr, D. C. (2001). Changes in visual perception at the time of saccades. Trends in Neuroscience, 24(2), 113-121.
[2] Rashbass, C. (1961). The relationship between saccadic and smooth tracking eye movements. Journal of Physiology, 159, 326-338.