

Growth and shrinkage of saccade facilitation

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The study we wish to present here focuses on two parameters of oculomotor behavior during the perception of natural scenes. As has been known since Buswell's discoveries (1935), the duration of individual gazes (fixations) increases during the first few seconds of viewing images. At the same time, the size of saccades decreases.

The first questions we address are therefore: "what makes fixation durations increase", and "what makes saccade amplitudes decrease" over time? Several authors in the past have described a number of reasons for either, but so far, no effort seems to have been taken to integrate the temporal effects on both fixation durations and saccade amplitudes. The temporal coincidence suggests however, that saccade amplitude and fixation duration are somehow controlled by a common mechanism.

We propose a simple exponential model containing two parameters that describe the changes of both saccade amplitude and fixation duration quite accurately. The parameters of the model show that saccade amplitude and fixation duration may be controlled by a common mechanism.

The second aspect we wished to address is temporal correlation between saccade amplitude and fixation duration. Earlier studies have shown no correlation between fixation duration and the subsequent saccade amplitude (e.g. Viviani, 1990). The present study shows that a strong albeit non-linear relationship between saccade amplitude and fixation duration does exist in picture viewing.

A formal model, based on notions laid out by Findlay and Walker's (1999) model of saccade generation and on the idea of two modes of visual processing (Trevarthen, 1968), was developed to explain this relationship. The model both fits the data quite accurately and can explain a number of related phenomena.