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**Institutionen för Klinisk Neurovetenskap
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Detailed analysis of slow oscillatory movements of eye position

AKADEMISK AVHANDLING

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ABSTRACT

Our eyes make continuous movements even when attempting to fixate a stationary object. The involuntary eye movements occurring during fixation are referred to as fixational eye movements. There is a general agreement on three types of eye movements occurring during visual fixation: tremor, drift and microsaccade. Previously, in a 20-minute long recording of eye position during visual fixation, we observed a slow periodic fluctuation in the eye position signal. The characteristics of this fluctuation did not match any of the three known components normally occurring during visual fixation on healthy subjects.

The hypothesis in this thesis has been that the slow fluctuation found in the recording is a never before described, fourth component of the fixational eye movement system. The aim of the project has been to test this hypothesis and to further elaborate the underlying control mechanism of this slow eye movement component. Study 1: The main purpose of this first study was to prove that the fluctuation was not an artifact due to recording system, sampling frequency or filtering technique. The analysis procedure to filter out the fluctuation was developed and tested. Study 2: The influence of different visual stimuli was evaluated to investigate the perceptual influence on the oscillation. Study 3: The effect of increased extraocular muscle tonus was explored during a convergence task.

The results indicate that a slow oscillatory movement occurs during visual fixation together with tremor, drift and microsaccade. This slow eye movement has a low frequency of 0.04 to 0.10 Hz and amplitude of less than 0.50 degrees. The underlying control mechanisms for amplitude and frequency are different: visual perception seems to have an effect solely on the amplitude whereas varying muscle force only changes the frequency.

It has not been the purpose to describe the underlying reason for why the eyes oscillate and we still have no clear idea of why this oscillation is present in normal healthy subjects. We speculate that the light energy in the optical focus is distributed in an oscillatory mode around the fovea that might be a retina protective mechanism.

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