

Eye movements in humans: a potential biomarker of incipient neurological disorders

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Eye movements have been largely used in the past as a tool to better understand brain function. They are particularly interesting because they are closely linked to vision (probably the most important sensory system) and involve a rather simple motor system (the oculomotor plant). Thus the control of eye movements is a fascinating sensory-motor system. Of particular interest are saccades and smooth pursuit that allow orienting the visual axis in space (active gaze movements). In this talk, I will illustrate the interest of recording eye movements in patients in order to better understand brain function and to help in the diagnostic of specific neurological disorders at their early stage. Indeed, smooth pursuit eye movements are largely dependent on the integrity of the frontal lobes. In particular, predictive mechanisms that improve pursuit performance in some situations are impaired by frontal lesions. In the present study, the oculomotor performance of very mild frontotemporal lobar degeneration (FTLD) patients was investigated in visually-guided and predictive tracking tasks and compared to the performance of mild Alzheimer's disease patients (AD) and age-matched control subjects. In the predictive tracking task, we demonstrated that the measurement of predictive eye reacceleration during target blanking could serve as a cheap and efficient biomarker for early differential diagnosis of FTLD. In a separate study, we investigated predictive eye movements in Parkinson's disease patients in comparison with age-matched control subjects. This allowed us to show that temporal expectation and implicit timing of eye movements are largely unaffected in that disease. This is in contrast with the well-known major influence of basal ganglia dysfunction on explicit timing tasks.