

Novel Parkinson's disease diagnosis and therapy monitoring using tablet computers and artificial intelligence



Figure 1: A subject performs an eye movement measurement in the waiting room using a tablet computer

A German research network launched in June 2018, consisting of Thomas RECORDING GmbH, the Department of Neurology at the University Hospital Marburg and the Neurophysics Group at the University of Marburg is close to completing the development of a novel neuromedical diagnostic system for the individual early detection of Parkinson's disease (PD). For this, an algorithm that analyzes the eye movements of patients and providing them as biomarkers will be used. The research project, with a volume of more than €1 million, is funded by the German Federal Ministry of Education and Research (BMBF). The devices, called TOM (Thomas Oculus Motus), are already available for basic research to investigate the causes of brain diseases and possible therapies in more detail. This is currently being carried out as part of a key experiment by Prof. Dr. Lars Timmermann, Director of the Department of Neurology at Marburg University Hospital. The clinical trial on the way to approval as a medical device is about to start shortly, with the aim of soon establishing the developed devices for measuring eye movements in the daily clinical routine. The study will exploit the fact that Parkinson's disease causes subtle but characteristic changes in the way the eyes move. These can be elicited by certain stimuli and detected by special intelligent algorithms, in some cases already in the early stages of the disease, i.e. before the cardinal symptoms become visible.

Currently, the diagnosis of PD is mainly based on an evaluation of the symptoms or complex imaging procedures such as MRI or PET scans. However, only a few clinics have the equipment to be able to do this. In addition, both approaches require interpretation of the collected data by experienced specialists. Objectively measurable parameters, such as those that can be obtained for other diseases by means of a blood test, are often lacking. As a result, the correct diagnosis can only be made in patients with Parkinson's disease when the typical symptoms appear. In Parkinson's disease, for example, these are motor disorders such as slowed movement or the typical tremor of arms and legs. Patients often visit various doctors for several years with non-specific symptoms such as depressive mood before a diagnosis is made.

The research team would soon like to significantly facilitate and improve diagnosis by means of a tablet (TOM - mobile) and special software. For differential and fine diagnostics, another, high performance system (TOM - stationary) is available that can detect even the smallest differences in eye movements. During a measurement, a subject views a customized stimulus on a screen, for example a short video clip. The eye movements made during this process are then extracted and categorized. For example, the time it takes a subject to react to a particular change can be measured. The results of this measurement are then analyzed by an artificial intelligence in the cloud, graphically processed and made available to the attending physician. The system should then enable correct and individualized therapy much sooner, as well as rapid selection of the appropriate drug and dosage. This would reduce or even completely avoid the side effects of unnecessary therapy and the costs of incorrect treatment.

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Figure 2: Logo of the tablet-based system TOM - mobile



Figure 3: Logo of the high performance system TOM – stationary