

# ZSIGMOND TAMÁS KINCSES



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## RESEARCH AREA

One of the best method to acquire data about brain structure and function is magnetic resonance imaging (MRI). The structure can be measured at different levels: the volume of the brain, gray and white matter and the subcortical structures can be estimated from structural scans, and microscopic information about the tissue integration can be gathered from diffusion weighted MRI images.

Brain regions activating during certain tasks can be identified with MR sequences sensitive for the blood oxygen content. And the very same functional MRI acquisition can be utilised to detect the resting activity fluctuations in the brain. The synchronous activity fluctuations of remote brain regions identifies functional networks. The time-dependent changes of these connections mark out brain states.

In our research group we investigate the alterations of brain structure and function in various neurological disorders.

Headache disorders: Our studies pointed out that the pathomechanism in migraineurs experiencing aura symptoms before the headache is very different from those patients who has no aura symptom. The microstructure of the white matter shows marked differences in the two subtype of the disease that is correlated with the resting activity fluctuation of the white matter.

Multiple sclerosis: We showed that the disintegration of the periventricular white matter has a close relationship with the cortical atrophy. Our results called attention to the fact that various forms of clinical disability and cognitive disfunction is defined by different set of MRI measured parameters.

Stroke: Our investigations showed that the resting activity fluctuation of the hypoperfused brain is delayed as compared to the homologous contralateral normal side. Furthermore we showed that the functional hyperaemia is delayed in stroke patients. Our newest results indicated that the functional connectivity of the contralesional motor cortex is altered that is a function of functional recovery.

## TECHNIQUES AVAILABLE IN THE LAB

Theory of the MRI measurements. Human neurophysiological techniques: EEG, evoked potentials, transcranial magnetic and direct current stimulations.

Structural MRI investigations: Brain volumetry, processing of diffusion tensor images, tractography.

Functional MRI investigations: Detection of task-related brain activation patterns, evaluation of resting state fMRI data, independent component analysis, dynamic functional connectivity

Basic programming skills: Matlab, Python, bash

Statistical approaches: conventional model based approaches, permutation, bootstrapping

Neurological examination of patients. Neuroradiological evaluation of MRI images.

## SELECTED PUBLICATIONS

Faragó, P., Tóth, E., Kocsis, K., Kincses, B., Veréb, D., Király, A., Bozsik, B., Tajti, J., Párdutz, Á., Szok, D., Vécsei, L., Szabó, N., **Kincses, ZT.** (2019) Altered Resting State Functional Activity and Microstructure of the White Matter in Migraine With Aura. *Front Neurol.* **10**:1039.

Kincses, B., Hérák, B.J., Szabó, N., Bozsik, B., Faragó, P., Király, A., Veréb, D., Tóth, E., Kocsis, K., Bencsik, K., Vécsei, L., **Kincses, ZT.** (2019) Gray Matter Atrophy to Explain Subclinical Oculomotor Deficit in Multiple Sclerosis. *Front Neurol.* **10**:589.

Kocsis, K., Csete, G., Erdei, Z., Király, A., Szabó, N., Vécsei, L., **Kincses, ZT.** (2019) Lateralisation of the white matter microstructure associated with the hemispheric spatial attention dominance. *PLoS One.* **14**(4):e0216032.

Tóth, E., Faragó, P., Király, A., Szabó, N., Veréb, D., Kocsis, K., Kincses, B., Sandi, D., Bencsik, K., Vécsei, L., **Kincses, ZT.** (2019) The Contribution of Various MRI Parameters to Clinical and Cognitive Disability in Multiple Sclerosis. *Front Neurol.* **9**:1172.

Veréb, D., Szabó, N., Tuka, B., Tajti, J., Király, A., Faragó, P., Kocsis, K., Tóth, E., Kincses, B., Bagoly, T., Helyes, Z., Vécsei, L., **Kincses, ZT.** (2018) Correlation of neurochemical and imaging markers in migraine: PACAP38 and DTI measures. *Neurology.* **91**(12):e1166-e1174.