ATTILA NAGY

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RESEARCH AREA

Our research focuses on the basal ganglia system, which refers to a group of subcortical nuclei located within the white matter of the cerebrum. It is generally known that the basal ganglia play a part in the motor control since Parkinson's disease patients' altered muscle tone and mobility are caused by malfunctions in this system. However, the basal ganglia are involved in much more than just a motor control. We are interested in investigating these extra aspects of the basal ganglia.

In our research on animals, we examine the multimodal roles of the ascending tectofugal system, which is derived from the superior colliculus of the brainstem, that has a close association related with the basal ganglia. We aim to comprehend how multisensory environmental information is represented in this system and what role this information plays in regulating the motor activities of animals.

In our human studies, we examine the efficiency of multisensory-guided associative learning, which is also linked to basal ganglia function. This type of learning entails the establishment of associations between the stimuli and information that are logically unrelated. We analyze the learning abilities of the individuals in healthy states as well as those with neurological and psychiatric disorders connected to basal ganglia dysfunction. Our research focuses on the patient populations with migraine, Tourette syndrome, and obsessive-compulsive disorder. Our goal is to provide answers to questions regarding the impact of these illnesses on cognitive functions and whether there are disease-specific patterns of cortical activity (EEG) that could offer diagnostic potential in the conditions we are investigating.

TECHNIQUES AVAILABLE IN THE LAB

- Extracellular, multichannel recordings using multi-electrode arrays in rodent and large animal (domestic cat) models
- EEG studies in rodent model
- Human psychophysiological/cognitive tests: application of learning tests examining associative learning
- Development and validation of new learning tests for associative learning
- EEG studies of cortical activity in humans
- Complex monitoring of physiological parameters
- Mastery of Python and Assembly programming environments
- Acquisition of skills in biomathematical and bio-informatics analyses
- Microelectronics – printed circuit board design
- Use of 3D printing techniques

SELECTED PUBLICATIONS

Nagy A, Eördegh G, Paróczy Z, Márkus Z, Benedek G (2006) Multisensory integration in the basal ganglia. **Eur J Neurosci 24:** 917-924.

Nagy A, Kruse W, Rottmann S, Dannenberg S, Hoffmann KP (2006) Somato sensory-motor neuronal activity in the superior colliculus of the primate. **Neuron 52:** 525-534.

Puszta A, Pertich Á, Katona X, Bodosi B, Nyujtó D, Giricz Z, Eördegh G, **Nagy A** (2019) Power-spectra and cross-frequency coupling changes in visual and Audio-visual acquired equivalence learning. **Sci Rep 9:** 9444.

Eördegh G, Pertich Á, Tárnok Z, Nagy P, Bodosi B, Giricz Z, Hegedűs O, Merkl D, Nyujtó D, Oláh S, Őze A, Vidomusz R, **Nagy A** (2020) Impairment of visually guided associative learning in children with Tourette syndrome. **PLoS One 15:** e0234724.

Tót K, Braunitzer G, Harcsa-Pintér N, Kiss Á, Bodosi B, Tajti J, Csáti A, Eördegh G, **Nagy A** (2024) Enhanced audiovisual associative pair learning in migraine without aura in adult patients: An unexpected finding. **Cephalalgia 44:** 3331024241258722.