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RESEARCH AREA

Autism spectrum disorder (ASD) is marked by highly heterogeneous symptoms, both in their phenotype, severity and aetiology. In addition to repetitive behaviours, challenges with social communication, motor anomalies and atypical sensory processing, the condition is characterized also by impaired cognitive abilities. In our investigations, using a valproic acid-induced idiopathic rodent model of autism, we aim to assess mechanisms underlying altered cognitive processing in the hippocampus, a brain centre for spatial navigation, learning and memory. To monitor neural activity and neuromodulator dynamics, we apply chronic multi-channel electrophysiology recordings and fiber photometry, respectively, in combination with high-resolution spatial-temporal behavioural tracking in hippocampal tasks.

TECHNIQUES AVAILABLE IN THE LAB

- Surgery techniques (multi-channel electrode and optic fiber implantation)
- Silicon-probe recordings in freely moving mice
- Fiber photometry in freely moving mice
- Freely moving behavioural experiments
- Fluorescent immunohistochemistry (tissue processing, fluorescence microscopy)
- Analysis using Matlab and Python

SELECTED PUBLICATIONS

Nyilas, R., Kelemen, A. B., Lükő, B., Sümegi, M., Ujfalussy, B. B., & Makara, J. K. (2025). Adaptation of hippocampal spatial and contextual representations to task structure. *Sci Adv* **11**(46): eadu4899.

Szőnyi, A., Sos, K. E., **Nyilas, R.**, Schlingloff, D., Domonkos, A., Takács, V. T., Pósfai, B., Hegedüs, P., Priestley, J. B., Gundlach, A. L., Gulyás, A. I., Varga, V., Losonczy, A., Freund, T. F., & Nyiri, G. (2019). Brainstem nucleus incertus controls contextual memory formation. *Science* **364**(6442): eaaw0445.

Nyilas, R., Gregg, L. C., Mackie, K., Watanabe, M., Zimmer, A., Hohmann, A. G., & Katona, I. (2009). Molecular architecture of endocannabinoid signaling at nociceptive synapses mediating analgesia. *Eur J Neurosci* **29**(10): 1964–1978.

Pernía-Andrade, A. J., Kato, A., Witschi, R., **Nyilas, R.**, Katona, I., Freund, T. F., Watanabe, M., Filtz, J., Koppert, W., Schüttler, J., Ji, G., Neugebauer, V., Marsicano, G., Lutz, B., Vanegas, H., & Zeilhofer, H. U. (2009). Spinal endocannabinoids and CB1 receptors mediate C-fiber-induced heterosynaptic pain sensitization. *Science* **325**(5941): 760–764.

Nyilas, R., Dudok, B., Urbán, G. M., Mackie, K., Watanabe, M., Cravatt, B. F., Freund, T. F., & Katona, I. (2008). Enzymatic machinery for endocannabinoid biosynthesis associated with calcium stores in glutamatergic axon terminals. *J Neurosci* **28**(5): 1058–1063.