Piszczek *et al.: Intrinsic Activity*, 2019; **7**(Suppl.1):A3.39
doi:10.25006/IA.7.S1-A3.39
published online: 11 September 2019

INTRINSIC ACTIVITY

Joint Meeting of the Austrian Neuroscience Association (16th ANA Meeting) and the Austrian Pharmacological Society (25th Scientific Symposium of APHAR)

Innsbruck, 25–27 September 2019

MEETING ABSTRACT

A3.39

Data-driven exploration of mouse behavior in the Go/No-Go task

Łukasz PISZCZEK[1], Manuel PASIEKA[2], Andreea CONSTANTINESCU[1] and Wulf HAUBENSAK[1,*]

[1]*IMP – Research Institute of Molecular Pathology, Vienna, Austria;* [2]*Vienna BioCenter Core Facilities, Vienna, Austria*

Background: Executing behaviors are contingent on environmental settings, for instance conditionally withholding stereotypic responses in time. Impairment in this function underlies both impulsive and compulsive behaviors, which are symptoms of conditions such as: attention deficit/hyperactivity disorder (ADHD), obsessive compulsive disorder (OCD), as well as addiction. Maladaptive inhibitory control is highly correlated with increased trait impulsivity, a highly complex behavior, involving incentive salience, attention and the ability to suppress and/or cancel prepotent responses. In our study we have used the symmetrical, free-moving Go/No-Go task (GNG) as a model for behavioral inhibition to provide a deeper understanding of evolution of behavioral states in an impulsivity-related setting.

Methods: Here we combined the GNG task, with a machine learning approach to investigate animal behavioral strategies in the task. We have determined mouse behavioral states in a data-driven fashion using unsupervised clustering algorithms across several behavioral measures (*i.e.* distance traveled, position in the cage, immobility state, port visit among others). The results were benchmarked on mean data set from high/low impulsive, trained animals. Next, we evaluated how these states evolve during learning of the task. Finally, we have investigated how these parameters are affected by pharmacological manipulation using compounds known to affect impulsivity in both rodents and humans.

Results: In the first step we have determined mouse behavioral states in a data-driven fashion across different learning sessions, as well as in trained animals. We have successfully developed a machine learning pipeline to combine sensor data with video analysis into behavior states. Analysis of high and low impulsive animals show different temporal behavioral profile, probabilities and shifts within these states that are more complex than a simple mirror image as would be expected when looking at classical measures alone. This suggests that the animal behavior in the task goes beyond a simple poke execution. Lastly, we have investigated how these parameters are affected by pharmacological manipulation using compounds known to affect impulsivity in humans. Our preliminary data suggest that this analysis detects drug-induced changes in behavioral patterns that go beyond the classically investigated parameters. Similarly comparing this natural split and drug-induced impulsivity revealed use of divergent strategies in animals having comparable impulsivity levels (*i.e.* low impulsive animals vs. atomoxetine treatment) as measured by classical measures.

Discussion: Our preliminary data suggest that this analysis detects drug induced changes in behavioral patterns and strategies in animal behavior that go beyond the classically investigated parameters.

Acknowledgements: We would like to thank the IMP/IMBA Comparative Medicine Core Facility for colony management, W.H. was supported by a grant from the European Community's Seventh Framework Programme (FP/2007–2013)/ERC grant agreement no. 311701, the Research Institute of Molecular Pathology (IMP), Boehringer Ingelheim and the Austrian Research Promotion Agency (FFG).

Keywords: impulsivity – Go/No-Go task – behavior – mouse – amphetamine – atomoxetine

*Corresponding author e-mail: *wulf.haubensak@imp.ac.at*