**Sampling your preferences with different (but equally preferred) alternatives: Is your decision making a noiseless activity?**

Santiago Guardo Maya\*, Mandy Renfro\*, Ricardo Pizarro, Silvia Lopez Guzman.

**Introduction:** Most of every day’s decisions occur under uncertainty (not knowing the exact likelihood of an outcome). To make choices, there should exist a mechanism for comparing different offers in a way that is abstract (allowing for comparison) and concrete (preserving the details of the factors that influence the reward of an option) (1). Maladaptive decision making is common among several neurological and psychiatric disorders (2). However, their neurobiological causes are not completely understood. Part of this issue is the limitation of noninvasive methods which measure metabolic (and not neural) activity with poor temporal resolution.

**Materials and Methods:** To tackle this issue, we use the opportunity given by patients (n=2 and increasing) with refractory epilepsy who undergo intracranial recordings to isolate the epileptogenic foci. We use a value-based decision-making task amenable to mathematical and computational modeling (3). In this task, patients choose between a certain amount of money or playing a lottery with different probabilities of reward (risky decisions), for some lotteries not all the probabilities are shown (uncertain decisions). First, we, do a calibration session from which we model behavior and calculate subjective value (SV) using maximum likelihood estimation. Then, we redesign the trials to sample the same subjective value difference (SV of the lottery - SV of the safe option), using different values of safe and lottery options. This way, we can examine the internal noise of the decision-making process and increase the SV model fit.

**Future directions:** we will examine value risk and uncertainty encoding using human local field potentials (LFP) recorded from patients with intracranial electrodes; with a special focus in anterior insula and orbitofrontal cortex. And expect to see spectrotemporal coding in the high gamma band, as has been previously reported (4) and communication dynamics for the decision-making process. From this, we will build a decoder for safe, risky, and uncertain choices; and, a separate decoder for choice stochasticity for options with the similar SV (internal uncertainty).

**Significance:** identifying areas involved in adaptive and maladaptive decision making that would serve as more precise targets for neuromodulation and potential therapeutic applications.

**References:**

1. Abstract Value Encoding in Neural Populations But Not Single Neurons. Justin M. Fine, David J.-N. Maisson, Seng Bum Michael Yoo, Tyler V. Cash-Padgett, Maya Zhe Wang, Jan Zimmermann, Benjamin Y. Hayden. Journal of Neuroscience 21 June 2023, 43 (25) 4650-4663; DOI: 10.1523/JNEUROSCI.1954-22.2023
2. Daeyeol Lee, Decision Making: From Neuroscience to Psychiatry, Neuron, Volume 78, Issue 2, 2013, Pages 233-248, https://doi.org/10.1016/j.neuron.2013.04.008.
3. Konova AB, Lopez-Guzman S, Urmanche A, et al. Computational Markers of Risky Decision-making for Identification of Temporal Windows of Vulnerability to Opioid Use in a Real-world Clinical Setting. JAMA Psychiatry. 2020;77(4):368–377. doi:10.1001/jamapsychiatry.2019.4013
4. Integrated Amygdala, Orbitofrontal and Hippocampal Contributions to Reward and Loss Coding Revealed with Human Intracranial EEG. Luis Manssuer, Ding Qiong, Liu Wei, Ruoqi Yang, Chencheng Zhang, Yijie Zhao, Bomin Sun, Shikun Zhan and Valerie Voon Journal of Neuroscience 30 March 2022, 42 (13) 2756-2771; DOI: https://doi.org/10.1523/JNEUROSCI.1717-21.2022