

#3097 Title: Temporal and spectral dynamics of reward and risk processing in the amygdala revealed with stereo-EEG recordings in epilepsy.

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Objectives/Aims:

To examine the temporal and spectral characteristics of local field potentials recorded from the amygdala in epilepsy in the context of the anticipation and receipt of rewards and losses using an incentive learning task and a risky decision-making task.

Methods:

16 Epilepsy patients completed two tasks. In the monetary incentive delay (MID) task, patients saw reward and loss cues which indicated whether money could be won or lost depending on whether a subsequent response was or was not quick/ accurate enough, respectively. This was compared with neutral cues where responses were neither rewarded nor punished regardless of response.

In the risk task, patients were presented with two face down cards with values ranging from 1 to 10. When the first card is revealed, patients have to choose whether to bet or not bet that the second card is higher. After the card is revealed, patients receive a monetary reward if it is higher and a loss if it is lower. If patients do not bet, they receive nothing.

Results:

In both tasks, patients showed larger left amygdala theta band oscillatory activity to the receipt of monetary rewards compared to no money. In contrast, there were no significant responses to monetary losses. During the decision phase of the risk task, there was increased theta activity when patients chose to bet instead of not betting and when the decision had low risk (card ≤ 5) compared to high risk (card above 5). There were no effects of uncertainty.

Conclusions:

The combined results of these two studies embellish our understanding of the role of the amygdala in motivation and decision-making processes and lend further support for its role in reward related processes rather than its often cited fear-related functions (Baxter & Murray, 2002; Murray, 2007). Theta activation is linked to cognitive processes in frontal cortices and coupled to MTL activity (Helfrich & Knight, 2016). As left amygdala theta activation was only recruited when patients were making their bet and not just anticipating reward, the pattern of results lend support to its role in cognition-emotion interactions specific to risk and reward but not uncertainty. Indeed, the hemispheric asymmetry is highly consistent with EEG studies showing left prefrontal dominance in reward processing (Manssuer et al., 2021).