Accumulation of evidence during perceptual decision-making under NMDAR hypofunction

Alexis Cerván, Tiffany Oña, Daniela Barzallo, Jaime de la Rocha, Carles Sindreu (IDIBAPS)

During perceptual decision-making, neural circuits must faithfully represent relevant stimulus features, transform them into decision evidence, accumulate this evidence along the stimulus duration and commit to a choice. However, despite the central role that this computation has in decision-making, the dynamics of evidence accumulation are not yet well understood. We have developed a novel auditory two-alternative forced-choice (2AFC) task, in which head-fixed mice listen to two concomitant, intensity-fluctuating stimuli, each presented through a speaker on either side of the head. Mice have to infer which sound (left or right) was louder on average and lick in the associated spout to receive a water reward. Mice were able to discriminate up to 2dB inter-aural level difference (ILD) and display psychometric curves. Moreover, mice exhibit a tendency to repeat their previous response and this trial history bias is best explained as repeating lapses rather than a bias term that alters the decision criteria of the categorization. The temporal weighting of the evidence shows a clear primacy effect, as revealed by reverse correlation analysis (i.e. psychophysical kernels). In addition, under systemic administration of NMDAR non-competitive antagonist MK-801, the tendency to repeat and the primacy effects are enhanced. Together, our results show that early stimulus information is weighted more strongly on choice, that mice exhibit non-sensory biases, and that both suboptimal features are afected by NMDAR blockade.