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Cortical circuit processing of FM-tones during auditory learning and adaptation of behavioral strategies

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The primary auditory cortex (AI) plays a fundamental role in auditory processing, perception and learning. During auditory learning, the spectrotemporal complexity of the acoustic stimuli determines the degree to which learning depends on the auditory cortex. Frequency-modulated (FM) components are essential for animal communication and, in contrast to pure tone detection, it has been shown that their discrimination is cortex-dependent. Therefore, we investigate the role of AI in the discrimination of FM-tones during a two-way avoidance shuttle-box training in Mongolian gerbils (Meriones unguiculatus). Our experimental design consists of five different phases, in which the contingency (Go/NoGo) of FM sweeps (in lower and higher frequency bands) is varied multiple times. During this period, the choice-outcome variations force the animals to change their behavioral strategy several times. Simultaneously, we perform local field potential (LFP) recordings across all cortical layers of the AI with a chronically implanted multichannel electrode. We use this data to analyze synaptic spatiotemporal activation patterns by current-source-density (CSD) distributions during all training phases. We hypothesize that layer-specific cortical circuit mechanisms do correlate with the auditory-guided choice behavior and different strategies of the animals. We will present and discuss the behavioral data and electrophysiological results in this framework.