

Mechanisms of Contextual Plasticity Explain Shifts in Human Sound Localization

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Abstract.

Contextual plasticity is a form of plasticity in sound localization induced by preceding stimulations. It is observed as shifts in responses and in standard deviations to a target click stimulus when, on interleaved trials, the target is preceded by an identical adaptor coming from a fixed location. Here we present the results of two experiments, one performed in real and one in virtual environment, evaluated in the context of two models of the neural mechanisms underlying spatial hearing in humans. The first model (Carlile et al., 2001) encodes spatial location by activity of a large population of neurons aimed at accurately encoding the stimulus location. The second model (Lingner et al., 2018) assumes that spatial location is encoded in activity of 4 opponent-processing channels optimized for sound source separation, not localization. The modeling found that performance in the real environment is more aligned with the first model, while performance in the virtual environment is more aligned with the second model, suggesting that listeners use different strategies and/or neural mechanisms when localizing sounds in real vs. virtual environments.