

Multiple forms of learning yield temporally distinct electrophysiological repetition effects.

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Prior experience with a stimulus leads to multiple forms of learning that facilitate subsequent behavior (repetition priming) and neural processing (repetition suppression). Learning can occur at the level of stimulus-specific features (stimulus learning), associations between stimuli and selected decisions (stimulus-decision learning), and associations between stimuli and selected responses (stimulus-response learning). While recent functional MRI results suggest that these distinct forms of learning are associated with repetition suppression (neural priming) in dissociable regions of frontal and temporal cortex, a critical question is how these different forms of learning influence cortical response dynamics. Here, electroencephalography (EEG) measured the temporal structure of neural responses when participants classified novel and repeated stimuli, using a design that isolated the effects of distinct levels of learning. Event-related potential and spectral EEG analyses revealed electrophysiological effects due to stimulus, stimulus-decision, and stimulus-response learning, demonstrating experience-dependent cortical modulation at multiple levels of representation. Stimulus-level learning modulated cortical dynamics earlier in the temporal processing stream relative to stimulus-decision and stimulus-response learning. These findings indicate that repeated stimulus processing, including the mapping of stimuli to decisions and actions, is influenced by stimulus-level and associative learning mechanisms that yield multiple forms of experience-dependent cortical plasticity.