Mitigating Modality-Based Interference: Multitasking practice and the distinctiveness of task representation in sensory brain regions

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Abstract

Representational overlap is debated as the neural basis of multitasking costs. Cognitive theories propose that overlapping task representations lead to an unintended exchange of information between tasks (e.g., crosstalk). Recently, modality-based crosstalk was suggested as a source for multitasking costs in multisensory settings. Robust findings of increased costs for certain modality mappings, even when both tasks use non-overlapping stimulus and response modalities, may be explained by crosstalk between the stimulus modality in one task and sensory action consequences in the concurrently performed task. This study (N = 54) employs functional neuroimaging, multivariate pattern analysis, and modality-specific interventions to investigate neural overlap in multitasking, emphasizing modality compatibility. Noteworthy, differences in single-task representations were found in the auditory cortex but not in fronto-parietal regions. Improved auditory decoding accuracy in modality-incompatible tasks predicted dual-task performance gains, eliminating modality-specific costs, exclusively for the modality-incompatible intervention group. This study provides neural evidence for modality-based crosstalk in sensory regions.

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