Theme: Cognitive Neuroscience

A novel interface for rt-fMRI neurofeedback using music

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Abstract:
Music is a universal language, transcending cultures and deeply rooted in human history. Its creation and appreciation activate the brain's limbic and reward systems, allowing it to evoke emotions ranging from happiness and sadness to tenderness and grief. Intriguingly, the brain networks involved in music processing overlap significantly with those of pain perception, opening new avenues for interdisciplinary research.

This study introduces and validates a musical interface for real-time fMRI neurofeedback, adaptable to various experimental paradigms. Using a previously explored motor imagery connectivity-based framework, we evaluate its feasibility and efficacy by comparing the modulation of bilateral premotor cortex (PMC) activity during functional runs with real versus sham (random) feedback. We also assess its performance against a visual feedback interface.

The experiment involves a 50-minute MRI session, including anatomical scans, a PMC localizer run, and four functional runs (two with active feedback and two with sham feedback). Pre- and post-session questionnaires assess mood, musical background, and subjective feedback experiences. During functional runs, participants practice motor imagery of finger-tapping, with feedback delivered as a dynamic, pre-validated chord progression that evolves or regresses based on the correlation between left and right PMC activity.

This work highlights the potential of musical feedback as a more intuitive and engaging interface in neurofeedback protocols, paving the way for enhanced participant experience and training outcomes.

Keywords: music, neurofeedback, interface, reward