

Music, Emotion, and Memory: Neural Mechanisms and Therapeutic Potential

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Abstract:

Music is a universal feature of human societies, owing in part to its power to connect people and evoke strong emotions. Converging evidence demonstrates that music-evoked emotions engage the mesolimbic dopaminergic reward system, including the release of dopamine in the nucleus accumbens. In addition, music robustly activates the anterior hippocampal formation, a region involved in emotions and memory, and one of the earliest sites of neurodegeneration in Alzheimer's disease. Notably, both the dopaminergic reward system and the hippocampal formation are dysregulated across a wide range of conditions, including mental health disorders, chronic pain, Parkinson's disease, and Alzheimer's disease. Music may therefore provide a unique means to target neural mechanisms underlying affective and cognitive dysfunction. In this talk, I ask whether the engagement of these neural systems by music can be harnessed for therapeutic benefit. I will present findings from our longitudinal randomized clinical trial investigating the effects of singing-based music therapy in individuals with, or at risk for, Alzheimer's disease. An active control group performed physical activity, and a passive control group did not receive either intervention. Structural MRI data indicate that music therapy attenuates hippocampal volume loss over 12 months, particularly in the left anterior hippocampus, while physical activity shows complementary effects in the right hemisphere. Importantly, hippocampal preservation was associated with improvements in episodic memory, reductions in depressive symptoms, and enhanced activities of daily living. Preliminary analyses suggest that music therapy may slow brain ageing in temporal and frontal regions vulnerable in early stages of the disease. These findings support the view that music is not only a potent emotional stimulus but also a promising tool for modulating neural systems central to health and disease. Understanding how music engages emotion and memory circuits may open new avenues for multisensory, experience-based interventions aimed at promoting brain health and well-being.