Emotional Music Modulates Episodic Memory During Recollection and Induces False Traces

Sophia Kaltsouni Mehdizadeh[1]

Yiren Ren[2]

Grace Leslie[1,3]

Thackery I. Brown[2]

[1] *ATLAS Institute, University of Colorado Boulder*

[2] *School of Psychology, Georgia Institute of Technology*

[3] *College of Music, University of Colorado Boulder*

Abstract

While music's influence over both emotion and memory is relatively well-known, limited studies have explored interactions between musically induced emotion and memory modification. We investigate whether music can infuse episodic memories with altered emotional details, effectively "rewriting" their emotional content. Participants (N = 44) completed a three-day episodic memory task with separate encoding, recollection/reconsolidation, and retrieval phases. Using emotionally neutral word sets from the Affective Norms for English Words (ANEW) database (Bradley & Lang, 1999), we created fictional scenarios simulating autobiographical memories. On day 1, participants experienced these scenarios, forming true (laboratory-based) memories. On day 2, we recorded fMRI while participants recalled each scenario, paired with positively-valenced music, negatively-valenced music, or silence, and selected words on a screen that aligned with their recollections. Music was from the "Film Soundtracks" dataset (Eerola & Vuoskoski, 2011). On day 3, participants completed a final retrieval test. Scenarios paired with music during memory recollection (day 2) exhibited a more emotional tone when subsequently retrieved on day 3, congruent with the paired music's valence ($F(2) = 8.927$, $p < 0.001$, $\eta_G^2 = 0.074$). Behavioral and neuroimaging data from day 2 supports that music enhanced attention towards and encoding of emotional content (amygdala, anterior hippocampus, and inferior parietal lobule activity, all $p < 0.001$), and possibly impacted recollection vividness (enhanced functional connectivity between the amygdala and visual cortex). These findings demonstrate intricate interactions between music cognition, emotion processing, and episodic memory, and provide insight into how memory might be reshaped as it is re-experienced. This work provides support and new perspectives for therapeutic applications of music, particularly regarding mood disorders, emotional biases, and stressful memories.

Bradley, M. M., & Lang, P. J. Affective Norms for English Words (ANEW): Instruction manual and affective ratings. *Tech. Rep. C-1, The Center for Research in Psychophys., Univ. of Florida* **49** (1999).

Eerola, T., & Vuoskoski, J. A comparison of the discrete and dimensional models of emotion in music. *Psychol. Music* **39**(1), 18–49 (2011).