



When You Heard it First: Age of Exposure Affects Functional Connectivity between Auditory and Reward Networks

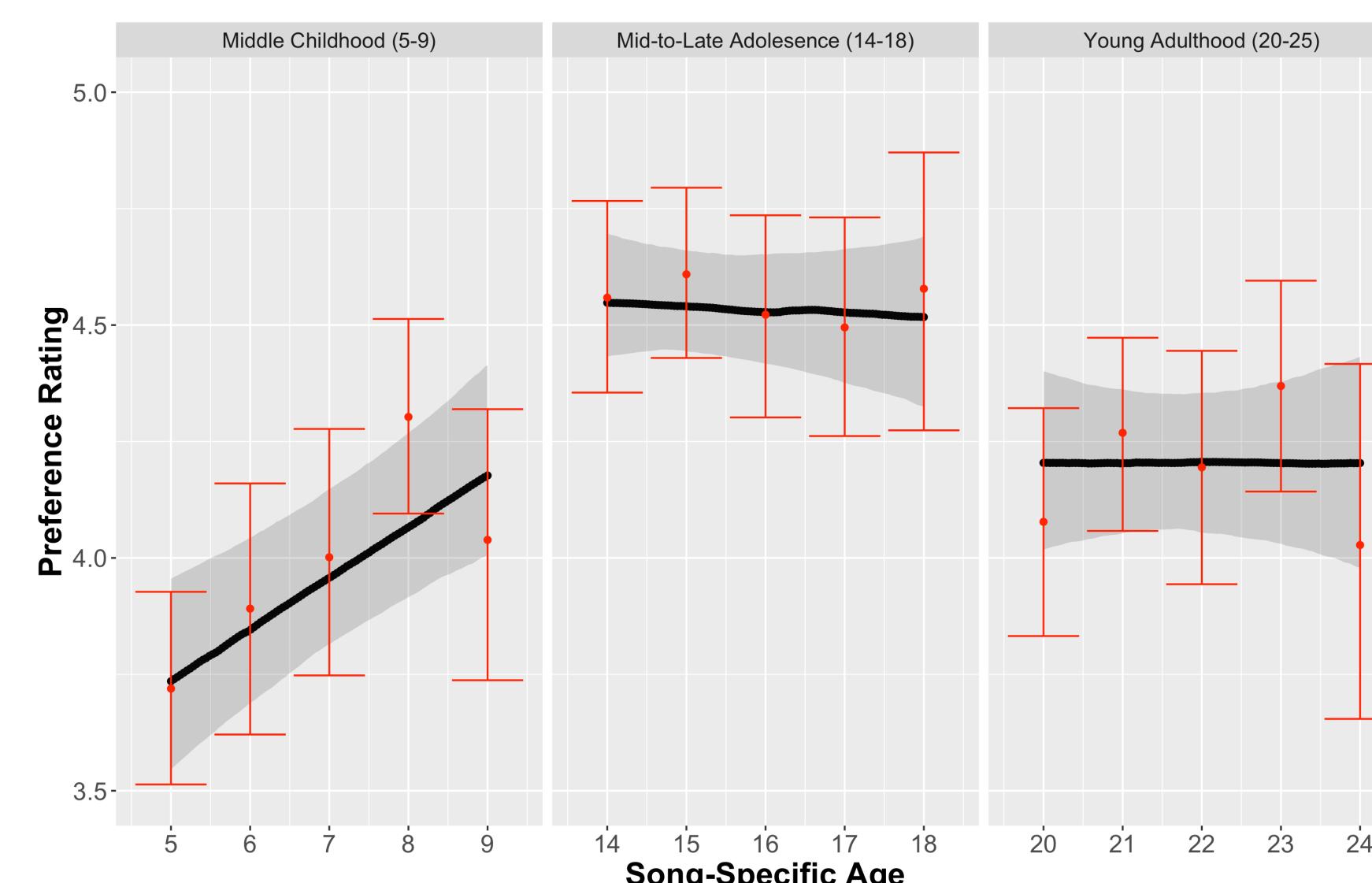
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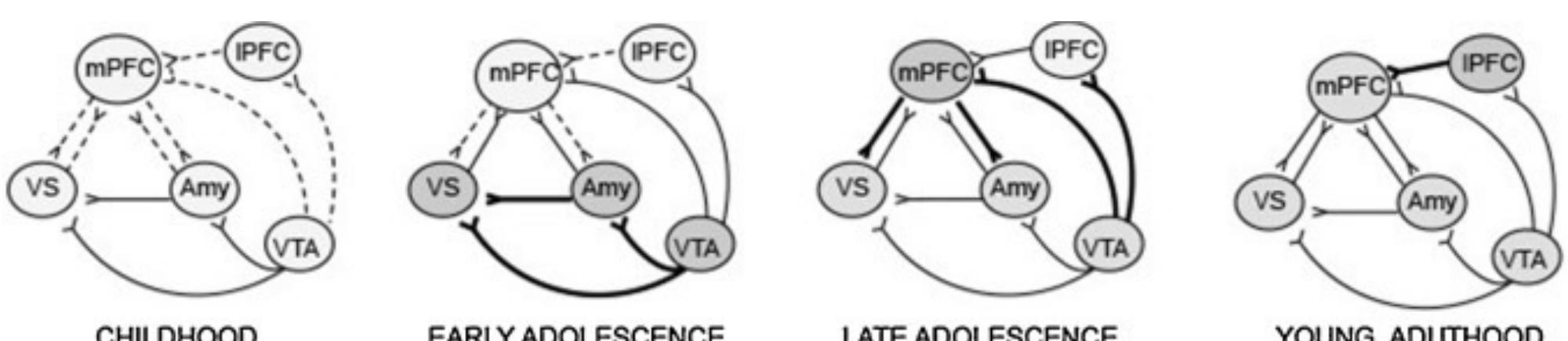


Background

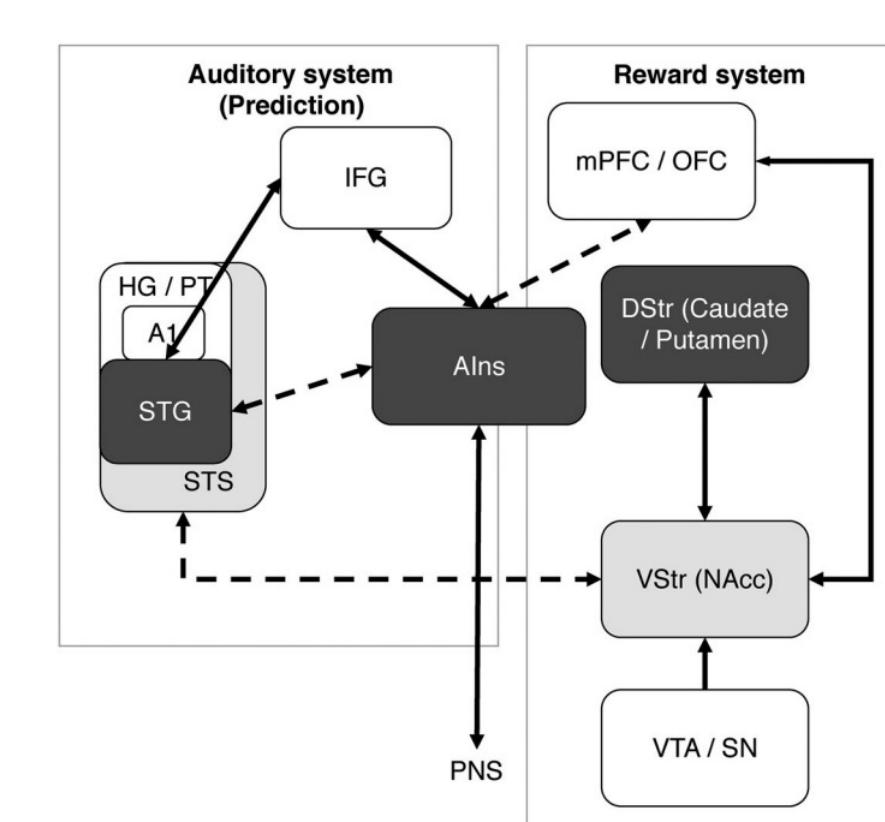
Older adults tend to recall a disproportionately high number of autobiographical memories from their adolescence compared to any other time across the lifespan (the “reminiscence bump”)¹. For example, music first heard during adolescence, is often more preferred, more frequently recalled, and evokes more autobiographical memories, compared to music first heard during childhood or young adulthood.



Adolescents display relatively high sensitivity to reward, attributed to maturation of subcortical reward regions compared to regulatory prefrontal regions.^{2,3}



Pleasurable music listening experiences involves similar circuitry, as the anterior insula facilitates interactions between the auditory and reward systems.^{5,6}

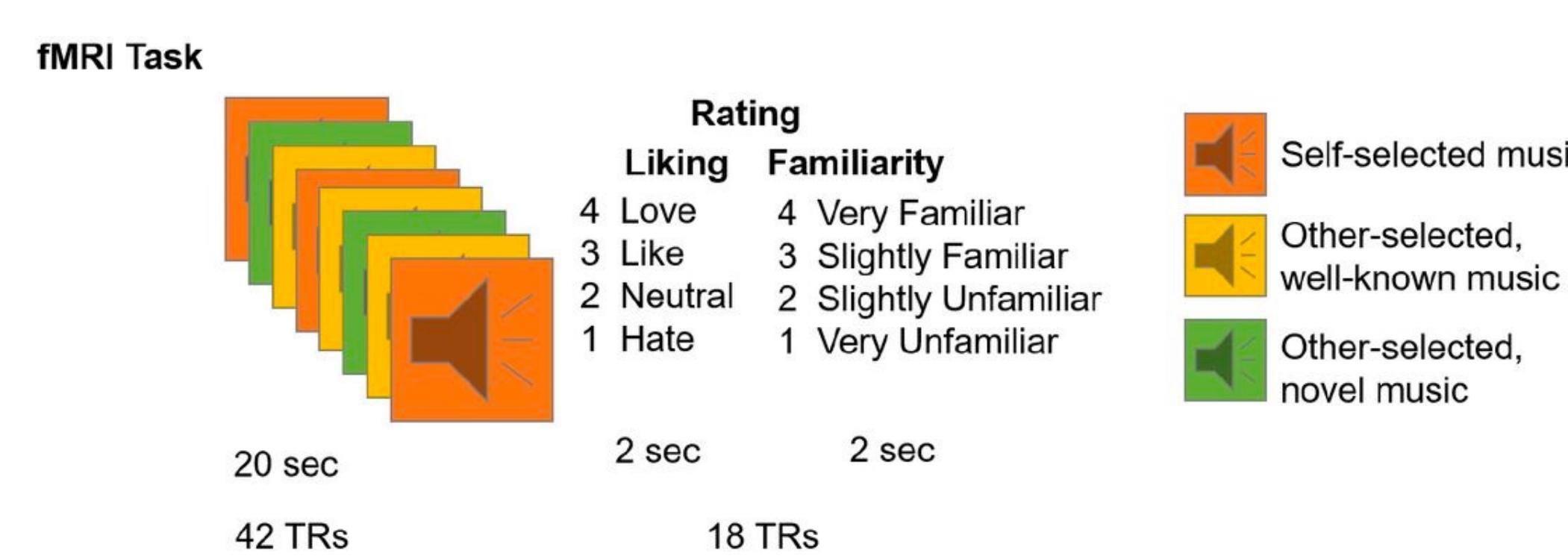


Increased preference for music from one's adolescence might, in part, reflect increased responsivity to & connectivity of reward and auditory regions that persists across the lifespan.

Hypothesis: Music first heard in listeners' adolescence will show functional connectivity patterns that reflect this developmental trajectory

Methods

18 cognitively healthy older adults (ages 54-89; M=66.6).



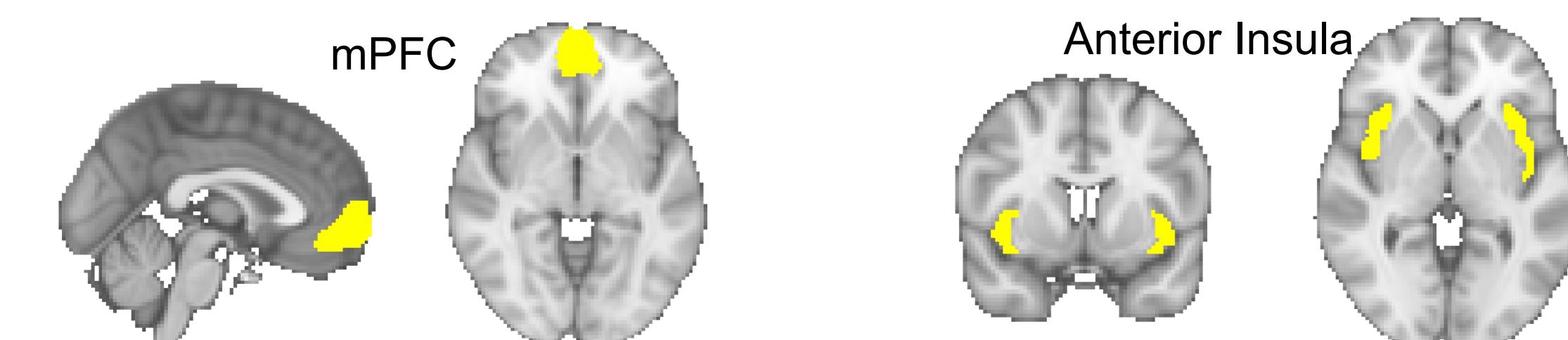
Ten participants completed a follow-up interview in which they reported when they thought they first heard familiar clips.

Clips were categorized based on timing of exposure: childhood (0-11), adolescence (12-18), young adulthood (19-25), and adulthood (26-45) using self-reports & Song-Specific Age (SSA).

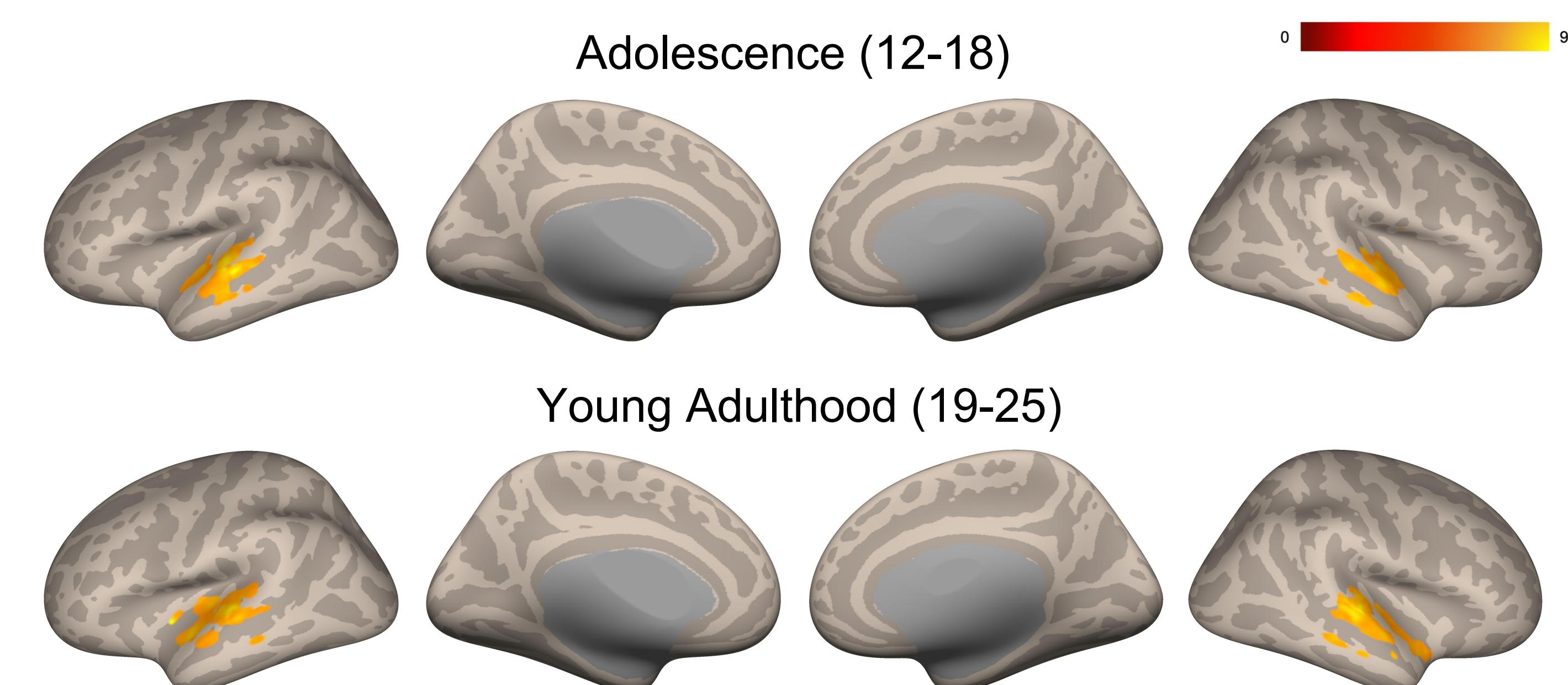
fMRI data were acquired using a Siemens Magnetom 3T MR. Continuous acquisition was used for 1440 volumes with a fast TR of 475 ms. Forty-eight axial slices were acquired as echo-planar imaging (EPI) functional volumes covering the whole brain (voxel size = 3 mm³).

Data Acquisition & Regions of Interest

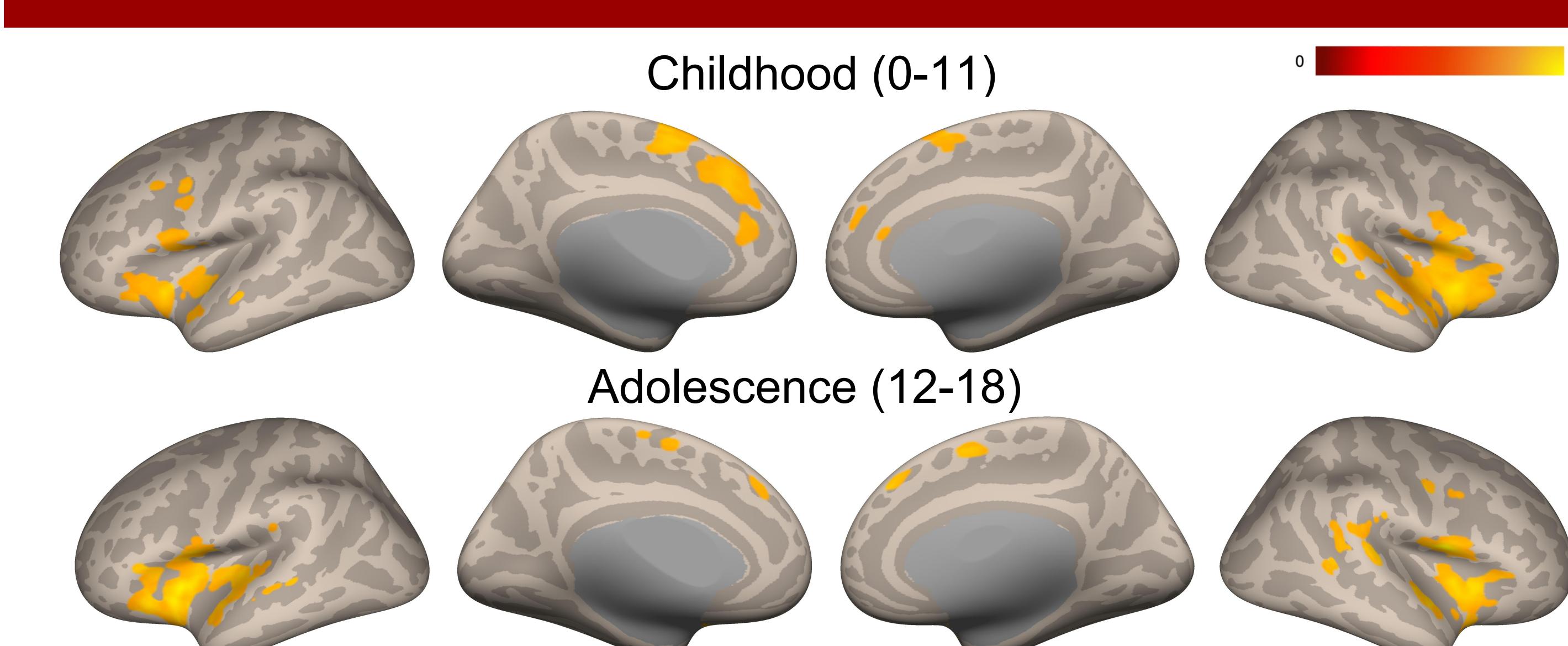
Data were preprocessed and analyzed using SPM12 (Statistical Parametric Mapping) software⁷ and the CONN Toolbox⁸. For seed to whole brain functional connectivity analyses, we seeded the mPFC as defined by the CONN toolbox, the anterior Insula⁹, and the Auditory Network⁶. For ROI-ROI connectivity analyses, we seeded the Reward and Auditory Networks⁶ along with the mPFC & anterior Insula.



Univariate Main Effect of Age of Exposure

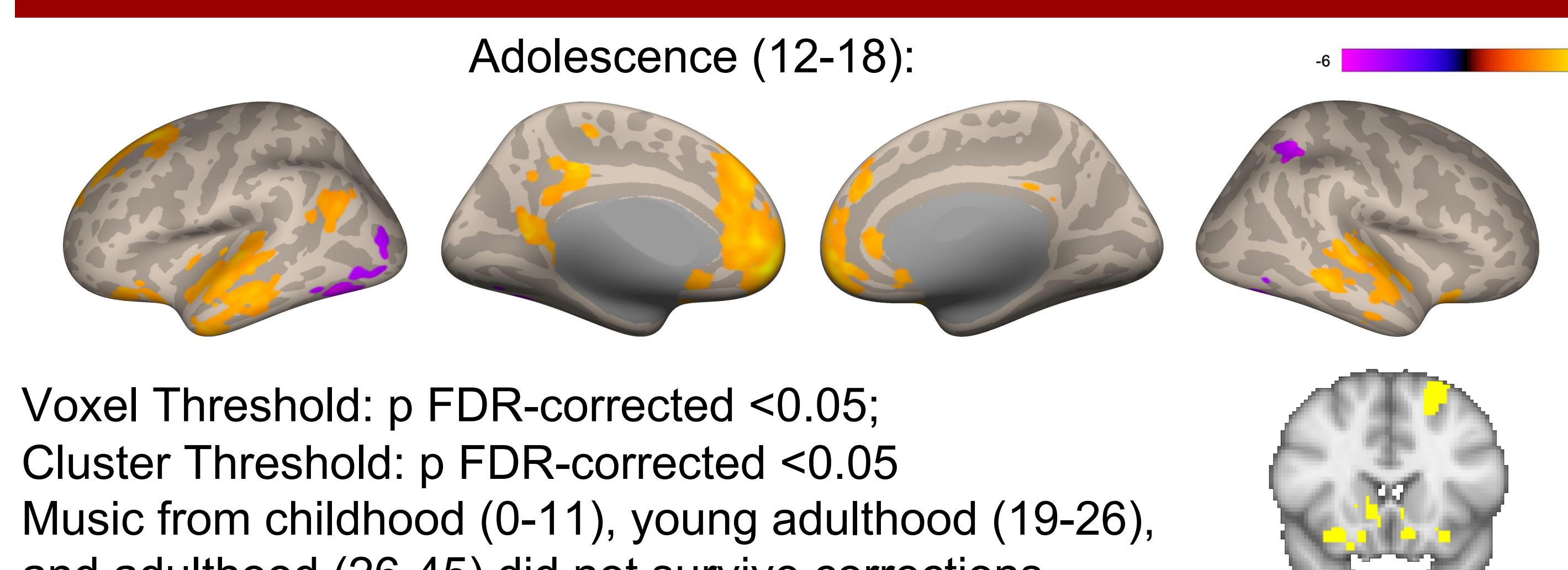


Anterior Insula Seed-Based Connectivity

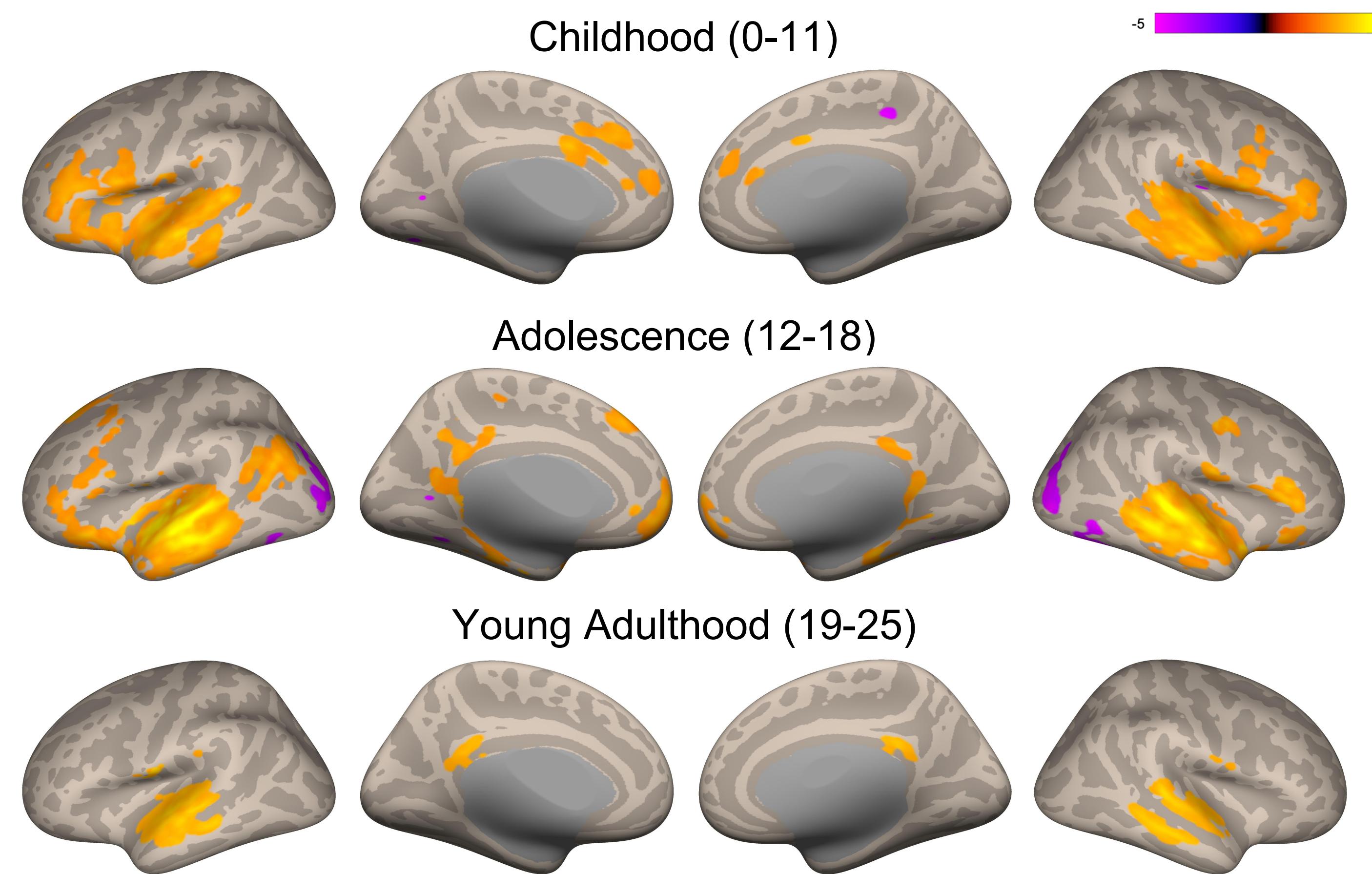


Voxel Threshold: p FDR-corrected <0.05;
Cluster Threshold: p FDR-corrected <0.05
Music from young adulthood (19-25) and adulthood (26-45) did not survive corrections.

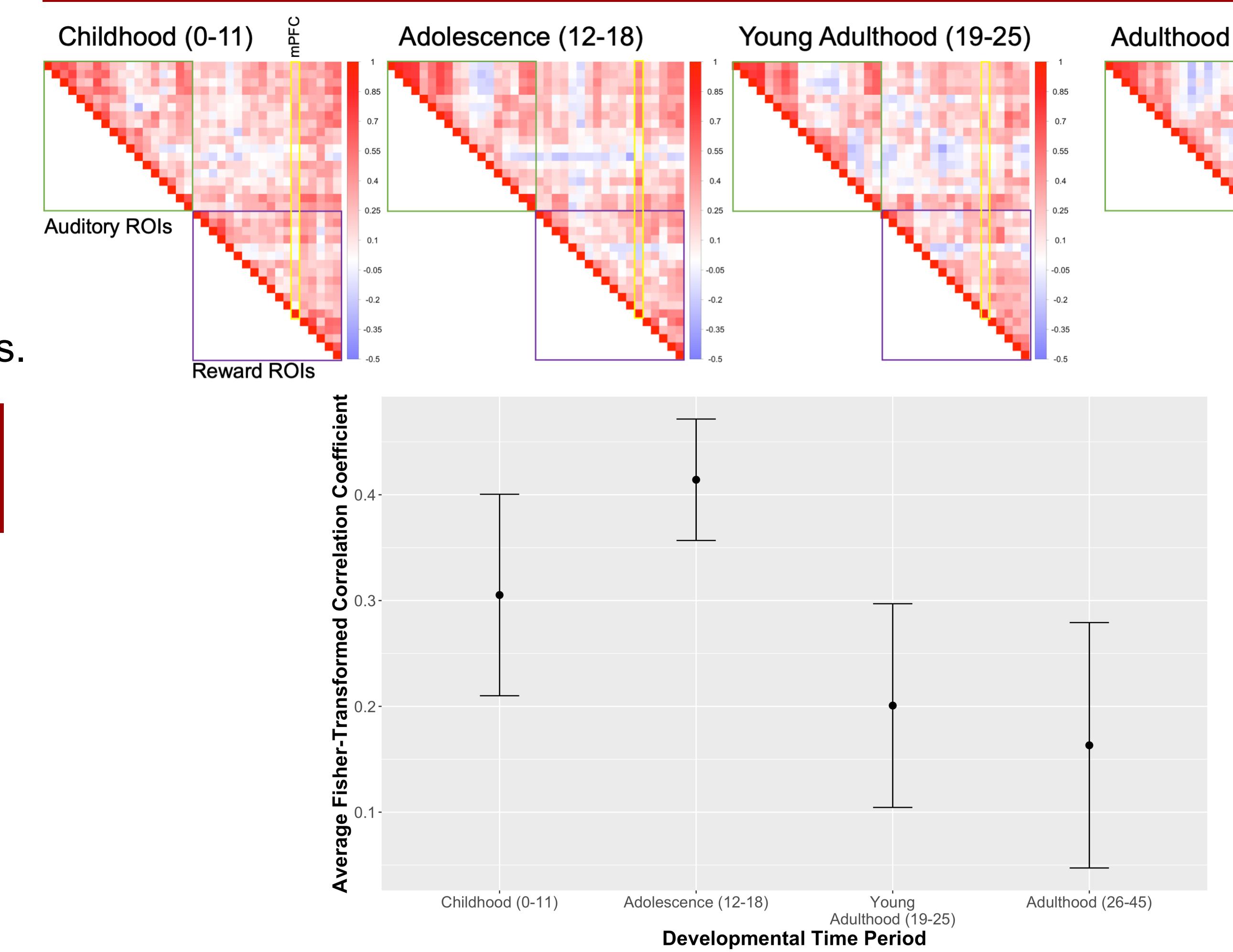
mPFC Seed-Based Connectivity



Auditory Network Seed-Based Connectivity



ROI-ROI Connectivity



Music encoded during adolescence differed in its functional connectivity patterns from those outside this time period, connecting the auditory network & Anterior Insula to reward regions (particularly the mPFC). These preferences may reflect heightened sensitivity to reward-predictive cues in adolescence that persists across the lifespan.

Adolescent sensitivity to social reward may also account for these preferences, consistent with the Music for Social Bonding hypothesis.¹⁰

Future Directions: Cross-sectional & longitudinal music-listening fMRI studies; investigation of age-related differences on music reward-learning paradigms; SSA fMRI analyses in clinical populations.

References

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