

Contributions of the right and left mesial temporal lobes to music memory: Evidence from melodic learning difficulties

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Abstract

Background to the research or performance/installation

Previous research has indicated that the mesial temporal lobes (MTL) in the brain are crucial for music learning and memory, however the relative contribution of each lobe remains unclear.

Interdisciplinary issues

Understanding the neurobiological basis of human learning and memory is fundamental to understanding human behaviour and its disorders. A clearer understanding of music memory may shed insight into the specialisation of the left and right cerebral hemispheres, particularly for speech and music. The findings also have diagnostic implications for detecting structural or functional brain damage underpinning memory disorders.

The issue/hypothesis under investigation

Our goal was to assess the effects of left- and right-sided MTL damage on melodic memory using a newly-developed arbitrary relational learning task, namely the musical paired associate learning (PAL) task.

Findings/description

Participants included patients with MTL damage (n=23), patient controls (n=16), musicians (n=22), and musician controls (n=18). The musical PAL task was sensitive to melodic learning across three trials with better performance for tonal (easy) compared to nontonal (hard) melody pairs. The learning curves showed striking group differences with right MTL patients failing to learn tonal melody pairs. Both patient groups had difficulty learning nontonal pairs. Performance was greatest for the musicians, particularly for nontonal pairs. Group differences were not primarily attributable to impairments in pitch discrimination or pitch working memory.

Conclusions/future directions

The findings support the sensitivity of the musical PAL task to melodic learning difficulties in the presence of structural damage in the left or right MTL. Both groups showed impaired pitch interval processing in the absence of a familiar musical context. Specificity emerged for right MTL patients who were unable to utilise tonal knowledge to facilitate learning. This points to differential contributions of the left and right mesial temporal lobes to new melody learning. Further research is required to investigate mechanisms underpinning these differential effects.