NEURAL CORRELATES OF ACOUSTIC DISSONANCE: EXPLORING THE ROLE OF MUSICIANSHIP AND EXPECTATIONS

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Background: In western music, harmonic expectations can be fulfilled or broken by unexpected chords. Musical irregularities in the absence of auditory deviance elicit well-studied neural responses (e.g. ERAN, P3, N5). These responses are sensitive to schematic expectations (induced by syntactic rules of chord succession) and veridical expectations about predictability (induced by experimental regularities). However, the cognitive and sensory contributions to these responses and their plasticity as a result of musical training remains under debate.

Aims: To explore whether the neural processing of pure acoustic violations is affected by syntactic rules of chord succession and by experimentally-induced expectations. More specifically, we investigate whether the neural responses to dissonance change as a function of the position that the chords occupy in a harmonic sequence (Experiment 1). Second, we study whether these responses are modulated by the predictability of dissonant endings (Experiment 2). Crucially, we investigated whether these two factors interact with long-term musical training.

Method: We registered event-related potentials (ERPs) in both musicians and non-musicians while listening to 5-chord harmonic sequences. In Experiment 1, we compared the ERPs elicited by dissonant clusters placed either at the middle or the ending position of the cadences. In Experiment 2, we presented to the listeners with a high proportion of cadences ending in a dissonant chord. In both experiments, we compared the ERPs of musicians and non-musicians.

Results: At early time windows, we observed that dissonance is processed based on acoustic deviance independently of syntactic rules. At longer latencies, listeners may be able to engage integration mechanisms, which are enhanced in musicians. Musicians showed larger responses related to the detection of dissonance (EN) and the attraction of attention (P3a), suggesting that dissonance in a musical context are more surprising for musicians. At late latencies, the neural responses of musicians reflective of attention allocation (P3a) and model-updating (P3b) were indeed influenced by syntactic (but not experimental) regularities.

Conclusions: Our results show that, at early latencies, acoustic deviance may be processed independently of schematic and veridical expectations. They also show that musical training modulates the neural responses to unexpected dissonance by enhancing and refining them.

Keywords: Harmonic expectations, Musical training, Dissonance, Music cognition

Publications:

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