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Probing the representation of melody, an ERP study

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Background

Though quite a few studies have been conducted to demonstrate the ERP response to missing notes or unexpected pitches (cf. Besson, Faita & Requin, 1994), very little work has been done on the systematic investigation on the traces of the evolving mental representation of a musical melody. This is a pity as the question of how the structure of melodies is stored (as sequence of pitches, as interval jumps, contour, as pitch functions within the key, or as a combination of these), has been very productive in behavioral studies (cf. Dowling, Tillmann & Ayers, 2001).

Aims

In our experiment we investigated the full ERP traces during listening and imagining four melodies (Magulis). Grouping the data in different ways over the melodies (contrasting different pitches, interval jumps, harmonic functions, beat level and contour turns) we aim to find more pronounced differences for aspects that are more fundamental to the processing and encoding of melodic structure.

Method

The experiment was conducted at Stanford CLSI, as a part of a larger study. 18 subjects received 36 repetitions of 4 melodic sequences, followed by a segment with a probe tone (not studied here). EEG was recorded with electrodes placed according to the International standard 10/20 system.

Results

All pitches were labeled according to their position in the melody, the interval from the pitch preceding it, the beat level, harmonic function, and place in melodic contour. Preliminary results show much clearer patterns for perception than for imagery, which is likely due to individual strategies in mental imagery. In perception, it appears that specific events (first note, highest metrical level, certain interval jumps) cause a different structure of the traces. It remains to be seen if this will enable a decomposition of the ERP trace into components linked to the structure coded in a mental representation.

Conclusions The investigation of the EEG signature of single pitches in the context of a melody will shed more light on the nature of mental representations of musical melodies. The standard decomposition of ERP components (N1, P2, P300, ..) fails when rapidly evolving stimuli are presented, and a clearer view is needed about how traces of the parts and the aspects of complex material are combined into the trace of the evolution of an integrated percept.

Key words: Melody perception, Melodic imagery

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