

Theta band oscillations during simultaneous processing of music and language

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Background: Studies investigating interactions between language and music processing (Patel et al. 1998; Koelsch et al, 2005) relied exclusively on signal averaging techniques, which do not adequately represent oscillatory electrical brain activity relevant for higher cognition.

Methods: In this study, we investigated the patterns of brain oscillations in multivariate EEG signals as recorded from human participants during simultaneous processing of harmonically regular or irregular music sequences with (syntactically or semantically) correct or incorrect language sentences (Koelsch et al, 2005).

Results: A harmonic violation presented simultaneously with a syntactically correct sentence produced an increase in low frequency oscillations, predominantly in the theta band (4-7 Hz) at the posterior parietal regions (150 – 600ms). A similar pattern was observed when a syntactical linguistic violation was presented simultaneously with harmonically correct music. Interestingly, this theta effect was diminished when the same syntactical violation occurred simultaneously with a harmonic violation. Further, the presence of a semantic violation occurring simultaneously with harmonically appropriate music produced a significant increase in late (350-700 ms) theta band power at the posterior regions; this effect was also decreased when the identical semantic violation occurred simultaneously with a harmonic violation.

Conclusions: These results support a putative role of theta band oscillatory power as a general substrate for syntactical and semantic integration which might be shared between language and music.