

Comment

# Is the distinction between intra- and extra-musical meaning implemented in the brain?

## Comment on “Towards a neural basis of processing musical semantics” by Stefan Koelsch

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Received 12 May 2011; accepted 17 May 2011

Available online 23 May 2011

Communicated by L. Perlovsky

Based on the results of a series of seminal studies very clearly reviewed in the paper, Stefan Koelsch proposes a neurobiological theory of musical meaning [4]. In this theory, the distinction between extra- and intra-musical meaning [5] is implemented in the brain of the listener, with the N400 reflecting extra-musical meaning and the N5 associated with the processing of intra-musical meaning. The finding of an N400-like effect (unrelated *minus* related) in semantic priming experiments when the prime is a musical sound and the target a word (or vice versa) is indeed good evidence that the semantic properties of both elements are combined in an extra-musical conceptual space to determine whether they are semantically related or unrelated.

Because the occurrence of words in an experimental design may encourage labeling of the musical sounds (e.g., mental generation of the word “heroic” when listening to an excerpt of Beethoven’s 3rd Symphony), one of the most interesting experimental condition is when two non-linguistic sounds are successively presented as prime and target. Importantly, Aramaki et al. [1], Frey et al. [2] and Grieser-Painter and Koelsch [3] reported an N400-like effect in such a condition of reduced linguistic mediation.

However, if an N400 is generated in a purely musical condition (e.g., sound–sound) in which a musical element (be it a note, a chord, the first theme in the sonata form ...) is driving expectations for another musical element, why should we consider the N400 as reflecting the processing of extra-musical meaning rather than the processing of intra-musical meaning? The possibility that the N400 also reflects intra-musical meaning is supported by the results of Steinbeis and Koelsch [6] showing an interaction between the N400 and the N5. This interaction implies that the processes underlying the N5 and N400 components are not independent and draw, at least partly, on the same pool of neural resources. It is thus possible that the N5 is, in fact, a delayed N400. In other words, the implementation in the brain of the extra-musical vs intra-musical meaning distinction may not be as straightforward as one would like it to

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DOI of original article: [10.1016/j.plrev.2011.04.004](https://doi.org/10.1016/j.plrev.2011.04.004).

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be. The good news, however, is that the fascinating issues raised by Stefan Koelsch in his review open very exciting new perspectives.

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