Temporal expectations and their violations

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Abstract

This thesis contains a collection of papers that investigate temporal expectations. Responses that indicate that a stimulus is perceived as unnatural, complex, or surprising, as opposed to a stimulus being perceived as natural, simple, or unsurprising, are taken as indicators that expectations were not fulfilled but rather violated. The term 'expectation' implies an active role of the listener, who constantly predicts what events will happen at what time in the future. The more confident the predictions are, the more will an outcome that is different to what was predicted lead to the violation of an expectation. This makes the responses to violations of expectations informative about underlying cognitive schemes that generated the expectations.

Special consideration is given to musical expertise (rule-based learning through formal music training), exposure (implicit learning of statistical regularities), as well as innate cognitive mechanisms.

Two kinds of expectation determined by different salience of events in rhythmic patterns were shown to be active. The first one is based on hierarchical structuring of event salience. In this regard, it could be shown that meter is induced in all listeners, regardless of the level of formal musical training. Hierarchical structuring could be found on all levels of a musical measure. Furthermore, it was shown that the most fundamental instance of meter induction, namely the discrimination of the downbeat from other positions in a rhythm, was active in newborn infants. The second type of expectation based on event salience that was considered in this thesis was the serial position effect. It could be shown that for non-musicians, as well as for musicians (but less so), a mechanism was active that can be seen as complementary to hierarchical processing. Primacy and recency effects appeared, which led to an increased salience of events located at the beginning and at the end of a rhythmic pattern.

On a much smaller time-scale, support was found for the hypothesis that listeners are sensitive to deviations on a temporal micro-level, being able to distinguish tempo-transformed from non-transformed performances, by only focusing

on expressive timing. This is supporting previous evidence that timing does not scale proportionally with tempo, with the new finding that also non-musicians are sensitive to distortions. A more surprising finding was that not only the level of formal music training was responsible for this sensitivity, but that exposure to a certain musical genre was giving the listener an advantage in detecting the deviations.