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# Do you hear that beat? Expectation versus uncertainty as influenced by background noise

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## Abstract

The human ability to perceive and synchronize to musical beat has communicative importance beyond the purely musical context. Entrainment to the beat hints at more general deductive and predictive mechanisms. Evidence for beat entrainment and its related mechanisms was found in behavioural as well as neuroimaging studies. However, the mechanisms behind this phenomenon are not yet fully understood, and in particular, it is not known whether beat entrainment relies on lasting, sensory-specific cortical activity. To answer this question, we asked participants to listen to sequences of isochronous and non-isochronous beats. The sequences faded above and below an individual participant's hearing level, into either silence or background noise. Participants were asked to press a button for as long as they heard the sequence, and let go once they no longer hear it. Results show a consistently lengthened button press for isochronous sequences, beyond the actual fade-out period (leptokurtic, slim fit). The release delay to the non-isochronous sequences was instead characterized by uncertainty (platicurtic, broad fit). Background noise appeared to improve the isochronous sequence ending detection, possibly by raising the level of attention to sounds. These results support the view of entrainment mechanism as an internal, self-sustaining circuit. The activity of such a mechanism, driven by temporal regularity, together with the gradual disappearance of the beat, might create an illusory perception of beat continuation.

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