Comparative Research on Beat and Isochrony Perception in Primates

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Background

Charles Darwin suggested the perception of rhythm to be common to all animals. While only recently experimental research is finding some support for this claim, there are also aspects of rhythm cognition that appear to be species-specific, such as the capability to perceive (and synchronize to) a regular pulse (or beat) in a varying rhythm.

Aims

In this paper I will discuss three recent empirical studies, that probe beat and isochrony perception in human adults, human newborns and rhesus monkeys (Macaca mulatta). Since all three studies used the same auditory oddball paradigm using EEG, it allows for an unprecedented direct comparison.

Method

Participants were presented with a rhythmic sequence in two versions: an isochronous version, that was acoustically accented such that it could induce a duple meter, and a jittered version using the same acoustically accented sequence but that was presented in a randomly timed fashion, as such disabling beat induction.

Results

Results show a clear difference of the MMN on beat vs offbeat positions in the isochronous condition for both human adults (N=34; Bouwer et al., 2016) and human newborns (N=27; Háden et al., 2022). This is taken as evidence for beat induction. However, such a difference was not found in monkeys (N=2; Honing et al., 2018). Nevertheless, monkeys are sensitive to the isochrony of the stimulus. In the latter case, the MMN was influenced by the isochrony of the stimulus, resulting in a larger MMN in the isochronous as opposed to the jittered condition. So, while the monkey brain appears to be sensitive to the isochrony of the stimulus, we find no evidence in support of beat induction.

Discussion/Conclusion

I will discuss these results, relate them to recent studies on beat and/or isochrony perception in primates (e.g. gibbons, chimpanzees, humans), and interpret all this in the context of the gradual audiomotor evolution (GAE) hypothesis (Merchant & Honing, 2014) that suggests beat-based timing to be omnipresent in humans but only weakly so or absent in nonhuman primates.

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