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# Learning the statistical properties of temporal patterns

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Series of discrete highly regular sensorimotor events are often experienced as temporal patterns. Studies on rhythm perception, sensorimotor learning and predictive coding in the auditory domain have shown that humans learn, are highly sensitive to and form expectations about the temporal regularities of the environment. A complete understanding of the basic mechanism supporting these abilities is far from clear.
Here we investigated the process through which humans learn the statistical properties of temporal sequences of auditory stimuli (empty intervals marked by brief tones). Specifically, we generated sequences using three first-order Markov processes, whose possible states were represented by three durations. According to the underlying generative process (i.e. experimental condition) these durations could alternate based either on random or predictable transition probabilities, leading to different mean duration and entropy rate of each process'stationary distribution.
The generated sequences were presented to human participants in a delayed temporal reproduction task. Behavioral performances were analyzed combining Bayesian modelling and data-driven approaches, with the aim of retrieving the statistical rules underlying participants'learning and comparing them with stimuli generative processes.
Results showed that participants'performance was bonded to the set of statistical rules defined by our experimental conditions, but also reflected other types of low- and high-level statistics, namely central tendency and block history, along with a shrinkage in the durations-states space.
These results suggest that the general human ability of detecting statistical regularities in the environment can serve as a basic mechanism for the learning of a broad range of temporal patterns, either partially or fully predictable, like musical rhythms.

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