Evidence for neural categorization of rhythm in human newborns

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Humans show an outstanding capacity to perceive, learn, and produce musical rhythms. These skills rely on mapping the infinite space of possible rhythmic sensory inputs onto a finite set of internal rhythm categories. What are the brain processes underlying rhythm categorization? One view is that rhythm categories stem from neurobiological predispositions constraining internal representations of rhythmic inputs. However, a growing body of work suggests that rhythm categorization is plastic, open to be shaped by experience over the course of life. To tease apart the relative contributions of neurobiological predispositions and experience in rhythm categorization, we measured neural responses to rhythm in healthy full-term human neonates, capitalizing on their minimal post-natal experience.
Scalp electroencephalography (EEG) was recorded from newborns while they were exposed to acoustic sequences consisting of repeating patterns of two inter-onset intervals ranging from isochrony (1:1 interval ratio) to long-short patterns (2:1 ratio). In a second experiment, we separately recorded neural (EEG) and behavioral (sensorimotor synchronization) responses to the same rhythms in adult participants. The data were analyzed using a novel approach combining frequency-domain and representational similarity analyses.
Preliminary results indicate significant rhythm categorization in neonates, with categories encompassing the 1:1 and 2:1 integer ratio rhythms, and with a categorical structure similar to the neural and behavioral responses of adults. These findings suggest that internal representations of rhythm may be biased towards categorical structure by neurobiological properties already in place at birth. This study thus paves the way to further investigate the neural processes by which these internal categories would be further shaped by individual and cultural experience, leading to the diversity in music perception and behaviors observed worldwide.

Keywords: musical behavior, development, rhythm perception, electroencephalography