Musical consonance processing in newborns: An electrophysiological investigation of the Mismatch Negativity elicited by more or less consonant sounds

Paolo Barbieri, P. Sarasso, A. Rossi Sebastiano, K. Poles, G. Rocco, C. Peila, C. Perathoner, E. Bertino, K. Sacco, F. Garbarini, I. Ronga

Department of Psychology - University of Turin - Turin
BIP research group, Department of Psychology - University of Turin - Turin
Manibus Lab, Department of Psychology - University of Turin - Turin
Manibus Lab, Department of Psychology - University of Turin - Turin
Neonatal Unit - Ospedale Sant'Anna, CittÃ della Salute e della Scienza - Turin
Neonatal Unit - Ospedale Sant'Anna, CittÃ della Salute e della Scienza - Turin
Neonatal Unit - Ospedale Sant'Anna, CittÃ della Salute e della Scienza - Turin
Neonatal Unit - Ospedale Sant'Anna, CittÃ della Salute e della Scienza - Turin
BIP research group, Department of Psychology - University of Turin - Turin
Manibus Lab, Department of Psychology - University of Turin - Turin
BIP research group, Department of Psychology - University of Turin - Turin

Recent neurocomputational models in aesthetics highlight the relationship between the sense of beauty and sensory processing. More specifically, we previously suggested that aesthetic preferences may represent the conscious feedback of sensory processing enhancements. In 4 out of 5 adult participants, consonant, rather than dissonant, sounds elicit an enhanced sensory processing, as expressed by greater EEG Mismatch Negativity (MMN) responses, a well-validated index of implicit learning phenomena. Not surprisingly, greater MMNs significantly correlate with higher aesthetic judgements. Previous studies suggested that this matching between aesthetic preference and sensory processing enhancements may reflect an evolutionary neural tuning toward the processing of consonant inputs, such as the human voice. However, how such a neural tuning evolves within ontogeny, and whether it is innate or acquired, are still debated issues. To investigate the development of consonance neural tuning within the lifespan, we performed an EEG study in newborns. The aim was to assess whether newbornsâ€™, as adults, show an enhanced sensory processing for consonant sounds. Twenty-two full-term healthy newborns were exposed to a sequence of auditory stimuli, while recording the EEG. Our paradigm was composed of sounds differing in their frequency (high and low pitch) and consonance level (fifth and tritone intervals). Newborn participants performed 6 runs of the auditory paradigm, with trains of 288 stimuli per run. 3 runs included only fifth intervals, whereas the remaining 3 runs were selectively composed of tritones. Within each run, standard-repeated sounds alternated with deviant-novel sounds. We then computed the MMN (i.e., deviant minus standard responses) for consonant (i.e., fifth) and dissonant (i.e., tritone) sounds separately. Results show that more consonant sounds elicited a significantly larger MMN as compared to less consonant sound. To the best of our knowledge, this represents the first electrophysiological evidence linking musical consonance to an enhancement of sensory processing in human newborns. This finding seems to confirm the presence of a neural attunement toward the sensory information provided by consonant stimuli since a few hours after birth. From an evolutionary point of view, the presence of such an attunement, enhancing the processing of the consonant sounds, such as the voices of conspecifics, might represent one of the neural mechanisms promoting social communication early in life. The present result, if confirmed by future studies, lays the groundwork for prenatal studies directed to investigate whether humans are endowed with this mechanism within their genetic heritage or whether they learn it during the intrauterine life.

Musical consonance processing in newborns: An electrophysiological investigation of the Mismatch Negativity elicited by more or less consonant sounds

References:

Tipo presentazione: ORALE