

Abstract

The ability to effectively study neural responses to continuous naturalistic stimuli is a relatively new development. It is an important development as these stimuli are most akin to the stimuli we encounter in everyday life, making the study of them of great interest and importance to those seeking to better understand the processes underlying our responses to them. These methods involve using linear models which treat neural responses as a linear combination of stimulus features. This methodology has recently shown promising results in the study of neural responses to speech, melodic and visual stimuli, as well as the process of attention. It has been shown in the past that neural responses are shaped in part by our expectations of stimuli. In a musical context, these expectations are in turn shaped by our ability to learn the statistics of the musical stimuli at hand, as well as from our preexisting notions of musical structure that we have learned from past exposures. Our wider ability to learn the statistics and structure of the world around us is thought to be a generalisable and fundamental element of the brain. Hence, new information about this process from a specific context could better inform us of this broader phenomenon. Recent work has showed encoding of melodic expectations in subjects' EEG responses for the first time using continuous naturalistic stimuli. The current work sought to expand upon these developments and ideas to study how EEG responses from the brains of adult and infant subjects reflected their melodic expectations of sung nursery rhymes. Nursery rhymes had never previously been used for these purposes, and this was also the first time that melodic perception had been studied in infants using these new methodologies. Infant data was recorded across a longitudinal period at 3, 7, and 11 months of age. To perform this investigation, melodic expectation features were derived using a statistical model of melodic surprise, which has been shown to mimic the statistical learning properties of the brain in a physiologically plausible way, and then regressed with subjects' EEG responses using linear models in the form of temporal response functions. Significant encoding of these features was not found within the adult subjects' responses. The infants showed a non-significant improvement in their encoding of melodic expectation features as they aged. This effect was still interesting however as previous works on this same dataset suggest that it could not be explained purely by the attention of the subjects.