Auditory stream segregation can be modeled by neural competition in cochlear implant listeners - DTU Orbit (22/10/2019)

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Auditory stream segregation is a perceptual process by which the human auditory system groups sounds from different sources into perceptually meaningful elements (e.g., a voice or a melody). The perceptual segregation of sounds is important, for example, for the understanding of speech in noisy scenarios, a particularly challenging task for listeners with a cochlear implant (CI). It has been suggested that some aspects of stream segregation may be explained by relatively basic neural mechanisms at a cortical level. During the past decades, a variety of models have been proposed to account for the data from stream segregation experiments in normal-hearing (NH) listeners. However, little attention has been given to corresponding findings in CI listeners. The present study investigated whether a neural model of sequential stream segregation, proposed to describe the behavioral effects observed in NH listeners, can account for behavioral data from CI listeners. The model operates on the stimulus features at the cortical level and includes a competition stage between the neuronal units encoding the different percepts. The competition arises from a combination of mutual inhibition, adaptation, and additive noise. The model was found to capture the main trends in the behavioral data from CI listeners, such as the larger probability of a segregated percept with increasing the feature difference between the sounds as well as the build-up effect. Importantly, this was achieved without any modification to the model's competition stage, suggesting that stream segregation could be mediated by a similar mechanism in both groups of listeners.

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