

LISTENING THROUGH A COCHLEAR IMPLANT

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Abstract

A cochlear implant (CI) partially restores hearing for profoundly deaf patients. It is a surgical implanted electronic device. It includes an array of electrodes that are inserted into the inner ear. These electrodes stimulate the auditory nerve by short electric pulses. To transmit spectral information of the sound it uses the concept of frequency-place transformation, which is observed in the healthy cochlea. Thus, a key part of the signal processing is a filterbank analysis. Due to the filterbank processing and a subsequent envelope extraction, the sound processing of a CI severely affects sound information. This talk will focus on two aspects of sound perception through a CI. The first aspect is perception of speech. CI processing is optimised for speech recognition. However, some aspects of speech are not preserved when transmitted through a CI which causes CI listeners to have more difficulties in complex acoustic environment to understand speech than normal-hearing listeners. This talk will address the role of reverberation in speech recognition and the ability to recognize talkers through a CI. The second focus is on music perception with a CI. Music still poses a particular problem to CI users. Whereas the CI signal processing roughly preserves the temporal structure such as rhythms, recognition of melodies or certain instruments is significantly harder. This is presumably partly due to the limited frequency resolution of a CI, leading to a reduced pitch percept. In the light of the altered pitch percept with a CI we investigated perception of musical consonance. We have addressed this issue by specific experiments where we focussed on consonance perception for chords in isolation and in successions (cadences). Overall, it is shown that a CI is a powerful utility to restore hearing but that further research is required to overcome the limitations of a CI in complex acoustic environments.

Short Biography

Jesko Verhey is a professor at the Otto von Guericke University Magdeburg, Germany. He studied physics in Göttingen, Germany, and then moved to Oldenburg (Oldb), Germany, where he did his PhD in 1998. As a research associate, he moved 2000 to Cambridge (United Kingdom). At the end of 2002, he returned to Oldenburg as Juniorprofessor in Neurosensory Sciences, did his Habilitation in Applied Physics in 2007 and was Research Professor until December 2010. In January 2011, he started at the Medical Faculty of the Otto von Guericke University Magdeburg as full Professor for Audiology. His main research interest is auditory perception. His focus is on the perception of normal-hearing and hearing impaired listeners. His research fields include test methods in audiology, listening through cochlear implants, as well as basic and applied psychoacoustics. Currently he is the President of the German Acoustical Society (DEGA).