

Abstract EFAS/DGA 2007

Increasing Frequency Intervals Improves Melody Recognition in Cochlear Implant Users

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Background:

Music perception is a well known problem for most of the cochlear implant users [1]. Usually, limiting factors are melody and timbre recognition whereas rhythm can be identified satisfactorily [2, 3]. The aim of this study was to investigate the melody recognition of known melodies presented with increased distance between the notes and to relate the performance to the results of a frequency discrimination task.

Methods:

Ten cochlear implant subjects and five normal hearing volunteers were investigated.

Each subject was asked to choose 10 out of a repertory of 23 nursery songs with a maximum of six different tones. Melodies were presented as a sequence of sinus tones in four different conditions. Besides the original version, the songs were played in three different frequency spread (FS) conditions: FS1: musical intervals were stretched by a factor of 4. A semi-tone step in a tune becomes a step of four semitones, a major third. FS2: An artificial octave was created within a pitch range from 130.8 Hz to 3500 Hz. FS3: each note of the song is played in a separate octave. Rhythm only was investigated as a fifth condition. In a second experiment, the rhythm information was excluded from all four conditions. In a third experiment, frequency discrimination was determined using a 2AFC algorithm. Frequency steps were 1/4 tones in five frequency ranges (200Hz, 500Hz, 1kHz, 2kHz, 4kHz).

Results:

Normal hearing subjects and cochlear implant patients exhibited large inter-individual differences. While some of the patients were able to identify songs in all conditions others only judged on the basis of rhythm. Most of the patients exhibited best results in the frequency spread conditions exceeding their personal frequency discrimination abilities. However, no clear preference was observed.

Conclusions:

These results indicate that music perception might be increased on the basis of individually adopted frequency allocations.

Literatur:

- [1] Gfeller K., Turner C., Mehr M., Woodworth G., Fearn R., Knutson J.F., Witt S., Stordahl J. 2002. Recognition of familiar melodies by adult cochlear implant recipients and normal-hearing adults. *Cochlear Implants International* 3(1), 29-53.
 - [2] Kong Y.-Y., Cruz R., Ackland Jones J., Zeng F.-G. 2004. Music perception with temporal cues in acoustic and electric hearing. *Ear & Hearing* 25:2, 173-185.
 - [3] Laneau J., Wouters J., Moonen M. 2006. Improved music perception with explicit pitch coding in cochlear implants. *Audiol Neurotol* 11, 38-52.
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