

MONAURAL AND BINAURAL CATEGORICAL LOUDNESS SCALING IN ELECTRIC HEARING

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In this study two types of an adaptive procedure for categorical loudness scaling in electric hearing were developed: monaural and binaural. For the monaural procedure, the aim is to measure the loudness growth as a function of the current level of the electric stimulus using a categorical scale. The binaural procedure takes additionally the binaural loudness summation into account. The procedures are based on the Oldenburg adaptive and constant stimuli procedures for normal hearing listeners (Brand and Hohmann, 2002; J. Acoust. Soc. Am. 112, 1597-1604) and were adapted to the requirements for cochlear implant listeners.

Seven binaural cochlear implant listeners were tested, five of whom were postlingually deafened and two prelingually deafened. In the monaural case the stimulus was presented at one electrode, in the binaural case the stimulus was presented at one interaural electrode pair.

The monaural results were used to approximate the loudness growth functions, which were modeled as modified power functions. The results showed that the exponent of the loudness growth function differed across the subjects. It was greater than 1.5 for the postlingually deafened subjects and smaller than one for the prelingually deafened subjects.

The loudness growth functions obtained for the two ears were verified in a binaural loudness balancing test using an adjustment procedure. Additionally, the data were compared to the results obtained by the constant stimuli procedure. The analysis showed that the binaurally loudness-balanced current pairs were more consistent with the results of the adaptive procedure than with the results of the constant stimuli procedure. Compared to the constant stimuli procedure, the adaptive procedures showed a better adaptation to the dynamic range of the subjects, resulting in a better representation of the loudness functions.

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