

Can listeners reweight binaural cues in accordance with the visual feedback they receive?

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Abstract

Normal hearing listeners use two binaural cues, the interaural time difference (ITD) and the interaural level difference (ILD), for sound localization in the horizontal plane. They apply frequency-dependent weights when combining them to determine the perceived sound source location. Cochlear implant (CI) listeners, however, rely almost entirely on ILDs, while ITDs contribute only very little or not at all. Since current CI-systems do not reliably convey ITD information, CI listeners might learn to ignore ITDs and focus on ILDs instead. This study investigated, whether the just described reweighting of the binaural cues is generally possible. 20 normal-hearing participants, assigned to two experimental groups, completed an experiment consisting of a pretest, measuring the initial weights of ITD and ILD, a seven-day training phase, in which visual feedback was given to reinforce one of the cues, and a posttest, to measure the weights again. Participants lateralized a narrow-band noise stimulus, bandpass-filtered around a centre frequency of 2.8 kHz. In the training, various combinations of spatially inconsistent ITD and ILD were presented and participants received visual feedback at the locations corresponding to either ITD or ILD through a virtual visual environment. In both groups, the root mean square error (RMSE) related to the reinforced (target) cue declined more strongly from pre- to posttest than the RMSE related to the non-target cue, suggesting that participants reweighted the binaural cues in accordance with the visual feedback. Interestingly, only in the ITD target group, this can partially be attributed to ignoring of the non-target cue.