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Abstract Title: ***Changing the Frequency-dependent Weighting of the Localization Cues***

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Abstract

Which cues the auditory system uses to determine the sound source location largely depends on the sound's frequency content. For low-frequency (LF) narrowband sounds, the interaural time difference (ITD) is the dominant cue, while for high-frequency (HF) narrowband sounds, the interaural level difference (ILD) dominates. For mid-frequency narrowband sounds, ITD and ILD appear to have about equal weights in determining the perceived location. We recently showed that the ITD/ILD weighting for a narrowband stimulus can be changed by visual feedback training in a virtual acoustic environment [Ferber et al. , JASA, 143, 1813 (2018)]. Here, we examined whether a similar or stronger adaptation can be achieved by visually guided training on broadband stimuli in a real reverberant environment. This training eliminates issues related to the fidelity of the virtual environment, like limited externalization or audio-visual binding, thus potentially enhancing adaptation. Separate groups of 12 listeners each were trained either to increase the HF weighting or the LF weighting for broadband stimuli. The stimuli consisted of 2 or 4 one-octave noise bands, together covering the range 0. 7 – 11. 2 kHz, presented from neighboring speakers selected from a range of 11 speakers spanning the angles of -56° to 56° with separation of 11. 25°. Visual feedback, co-located either with the HF components or the LF components, was used to instruct the subjects about the correct target location. On each training trial, the audio-visual stimulus was played continuously while the listener performed a head-turn towards it and then back to straight ahead, so that both static and dynamic cues were available while the visual signal guided auditory adaptation. This training was successful for the HF group, but not for the LF group. However, the changes in spectral weighting only partially generalized into changes in the ITD/ILD weights. Additionally, we explored whether using a simple computer game-like adaptive discrimination task is sufficient to induce reweighting. The game training was found to be less effective. These results show that frequency-dependent weighting of the binaural cues can be modified in the real environment, as well as in the virtual environment, as shown in Ferber *et al*. (2018). The results are likely to have implications for training of bilateral cochlear-implant listeners and for creation of adaptive virtual auditory environments. [Supported by: Danube Partnership project APVV DS-2016-0026, H2020-MSCA-RISE-2015 #691229]