EXPLORING DIFFERENT TRAINING METHODS TO INDUCE REWEIGHTING OF BINAURAL LOCALIZATION CUES

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Background: Adaptation to altered sound localization cues has been extensively studied, highlighting the plasticity of the auditory system. This adaptation can either be a result of the establishment of a new spatial map of the altered cues or a stronger relative weighting of unaltered compared to altered cues, referred to as reweighting. However, evidence for selective reweighting of the binaural cues interaural time difference (ITD) and interaural level difference (ILD) has so far been lacking. We seek to fill this gap and to explore different training methods to induce ITD/ILD reweighting.

Methods: We conducted two experiments, for which a localization task in an audio-visual, virtual reality (VR) environment served as a pre- and posttest to measure the ITD/ILD weights before and after training. Participants' task was to lateralize a narrow-band noise (one octave bandwidth, centered at 2.8 kHz) containing various combinations of spatially inconsistent ITD and ILD. In the first experiment, 20 normal-hearing participants, assigned to two groups, completed a seven-day training phase in the VR environment. Depending on the group, either ITDs or ILDs were reinforced through visual feedback. A follow-up experiment was conducted to investigate, whether similar effects can be achieved outside of VR and by limiting the responses to left and right. A relative and an absolute discrimination task were compared by training 8 participants per task for three days on a 2 down 1 up adaptive procedure providing trial-by-trial feedback based on the ILD location.

Results: In the first experiment, the target cue weights increased significantly from pre- to posttest for both groups. Preliminary results of the second experiment show a trend for increasing ILD weights for the absolute, but no effect for the relative task group.

Conclusion: We observed that ITD/ILD reweighting can be achieved with a localization training in VR. This has interesting implications, e. g., for making ITD information better usable by bilateral cochlear-implant listeners. Preliminary results with the discrimination task, however, are still inconclusive and further testing is needed. If a simple, but effective training method outside of VR can be developed, training might be more accessible for a wide range of listeners.