

Short-term adaptation of auditory distance perception in a reverberant room

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Abstract:

In regular rooms, sounds are received at the ears along with their reflections. The amount of reflections provides a cue for judging auditory distance, usually characterized by measuring the direct-to-reverberant energy ratio, D/R. Since the amount of reflections varies from room to room, listeners must adapt to the D/R cue whenever they enter a new room. Previous experiments showed that when the reverberant environment simulated in a virtual space is inconsistent, listeners tend to ignore the D/R cue [Kopčo et al. (2004) Learning to Judge Distance of Nearby Sounds in Reverberant and Anechoic Environments. In: Proc. Joint congress CFA/DAGA '04]. Here, an experiment was performed in which subjects judged distance of a broadband noise stimulus presented from speakers placed directly in front of the listener at distances from 0.15-2m in a small rectangular classroom. Two stimulus conditions were used: either sound was presented at a fixed presentation level (F runs), or sounds were presented at a level that was equalized at the listener's ears and roved by 12dB (R runs). Each subject participated in a session consisting of 4 F runs interleaved with 4 R runs. Subjects were divided into two groups, differing only by the order of conditions (FRFRFRFR or RFRFRFRF). Listeners were instructed to ignore the overall level cue in the R runs, and only listeners who followed this instruction were included in the analysis. Results showed that the order in which the listeners were exposed to the two conditions had a strong effect. Listeners who started in the F condition had constant correlations between actual distance and response distance in both conditions. On the other hand, listeners who started in the R condition immediately improved their F-run correlations and gradually improved their R-run correlations during whole one-hour-long experiment. The results suggest that the process of adaptation to room reverberation is dramatically influenced by the characteristics of the initial exposure to sounds in a given room, resulting in differences in the listener's ability to correctly interpret and optimally use the overall level and reverberation cues.

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