DRR & ILD cue weighting in auditory distance perception

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Exercise
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Background: Distance Cues

- Multiple cues (for a review, see Zahorik et al., 2005)
- Intensity cue often dominant, but requires familiarity (Warren, 1999)
- Main intensity-independent cues are Inter-aural level difference (ILD) and Direct-to-reverberant energy ratio (DRR) (Kopčo et al., 2012)



Which cue is more important?

Background: Distance Cues





ILD + DRR

Cue weighting in auditory distance perception

Goal: To identify the contribution of the intensity-independent cues (ILD & DRR) to auditory distance perception for nearby sounds in reverberation.

Behavioral experiment with varying cue availability and congruency was conducted for:

- 1. Measuring the sensitivity to the cues
- 2. Measuring distance discrimination performance when cues oppose each other

Methods: Cue Manipulation

Cue availability



A single set of non-individualized binaural room impulse responses (BRIR) are used.

Methods: Cue Manipulation

Cue congruency



Methods: Experimental set up



A single set of nonindividualized binaural room impulse responses (BRIR) are used.

В

Α



Task:

Which of the sounds is closer to the listener?

*Subjects were instructed to ignore the intensity cue and level was roved.

Methods: Modelling



Where: Pc – Percentage of correct performance $d_N' = |\ln s_1 - \ln s_2| / \sigma$, s_1 and s_2 are distances σ subject's estimate

larger d_N' = better performance

 $d_{ILD} = (\ln s_1 - \ln s_2) / \sigma$, Positive values indicate ILD is followed. Negative values indicate that DRR is followed

(Durlach & Braid

(Durlach & Braida, 1969; N. Kopco et al., 2012)

Results: Distance sensitivity



Results: Comparison of incongruent conditions



The two ways of creating the incongruent-cue stimuli are highly correlated

Results: Comparison of incongruent & individual cue weighting



There is a separation between the two groups of subjects in both measures - DRR sensitive and ILD sensitive group

Conclusions & discussion

- Subjects performed better when cues varied with distance congruently distance percepts are based on both ILD and DRR.
- On average, the subjects were more sensitive to ILD than DRR ILD is a dominant cue.
- Between-subject differences were preserved even when the cues were pitched against each other in the incongruent condition. - large variation in the cue weighting.

Conclusions & discussion

- Our results are not consistent with those of Kopčo & Shinn-Cunningham (2011) -Listeners change the cue weighting dependent on the current context and cue availability.
- How the cues are combined and adapt to the context and environment needs to be further examined.

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