Visually-guided perceptual recalibration is phoneme-, cue-, and context-specific

Eva Reinisch[1,2], David R. Wozny[2], Holger Mitterer[3] & Lori L. Holt[2]

[1]LMU Munich, [2]Carnegie Mellon University, [3]University of Malta

Listeners use lipread information to interpret ambiguous sounds (McGurk & McDonald, 1976):

Repeatedly exposed to an ambiguous sound in unambiguous visual context, e.g., a sound ambiguous between /b/ and /d/ with a speaker closing his/her lips

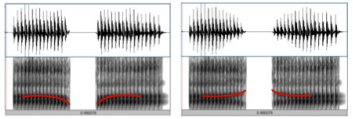
→ Listeners interpret the sound alone in line with the previous visual context (here as /b/, Bertelson et al. 2003).

This has been termed "Visually-guided perceptual recalibration".

What are listeners recalibrating? How specific is recalibration?

Questions addressed by testing different types of generalization of perceptual recalibration

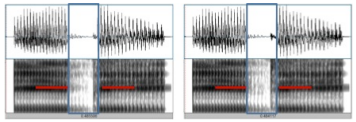
Basic condition:
"aba"- "ada"
formant cues



GENERALIZATION CONDITIONS

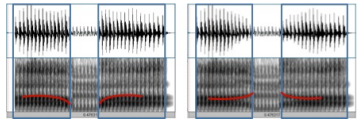
1) To the **same** phoneme contrast cued by **different** acoustic cues in a different acoustic context

"ibi"- "idi"
noise cues



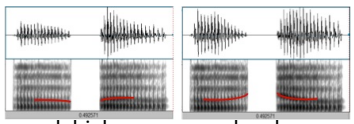
2) To a **different** phoneme contrast cued by the **same** acoustic cues in the same acoustic context

"ama"- "ana"
formant cues,
Nasals ambiguous



3) To the **same** phoneme contrast cued by the **same** acoustic cues in a different acoustic context

"ubu"- "udu"
formant cues



labial alveolar

Method

Exposure-test paradigm, 20 blocks

8 exposure trials

2x 3 test trials

[a?-1a] [a?a] [a?+1a]

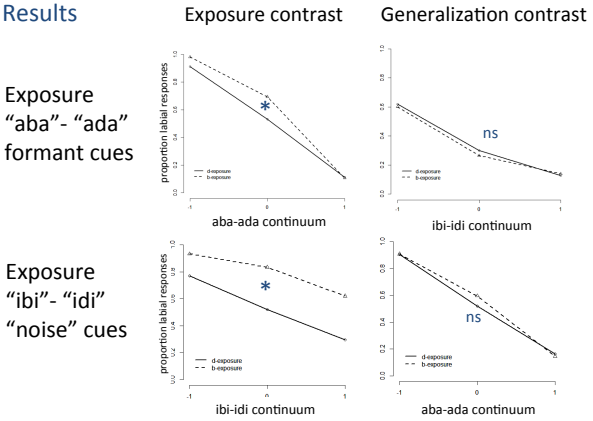
Exposure: Each participant's most ambiguous sound along a /b/-/d/ continuum paired with the video of a speaker articulating either /b/ (lip closure) or /d/ (no lip closure)

Test: Most ambiguous plus adjacent sounds on continuum
Half of the test blocks are the same contrast as exposure, half are from a generalization continuum

Experiment 1

Same phoneme, different cues, same context

Results



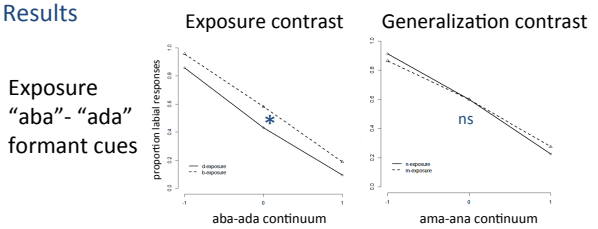
- Robust recalibration for the exposed contrast
- No generalization to other acoustic contexts of the same phoneme contrast.

-> Recalibration is cue specific

Experiment 2

Different phoneme, same cues, same context

Results



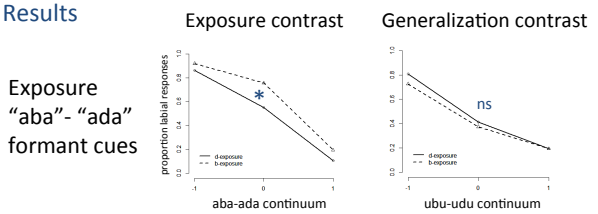
Again, robust recalibration but no generalization,
Same if exposure to "ama" – "ana" (not displayed here)

-> Recalibration is phoneme specific

Experiment 3

Same phoneme, same cues, different context

Results



Again, robust recalibration but no generalization
Same if exposure to "ubu" – "udu" (not displayed here)

-> Recalibration is context specific

- Listeners recalibrate perception of the exposure contrast; for stops and nasals involving various cues
- Visually-guided perceptual recalibration is specific to the exposure phonemes, cues, and context
- This is in contrast with findings using lexically-guided recalibration that do show generalization, e.g., across the lexicon, place of articulation, and position