Generalization in the absence of variation within lexical retuning

Scott Nelson
Michigan State University
nelso672@msu.edu

Department of Linguistics and Germanic, Slavic, Asian, and African Languages
MICHIGAN STATE UNIVERSITY

Introduction

- The way that the perceptual systems interprets ambiguous input has been tested using two different methods:
  - Lexical retuning (Norris et al. 2003).
  - Audiovisual re-calibration (Bertelson et al. 2003).
- Van Linden and Vroomen (2007) argue that these elicit the same type of perceptual effect.
- Despite this claim, the two paradigms have varied in their ability to allow for generalization.
- Stimulus variation within each paradigm may explain this difference.
  - Audio-visual recalibration presents the same string (typically VCV) continuously while lexical retuning presents multiple, unique words during the LDT.
- What would happen if you removed the within-experiment stimulus variation found in lexical retuning experiments?

Background

Lexical Retuning (Norris et al. 2003)

- [f] ~ [s] continuum.
- LDT followed by phonetic categorization.
  - LDT contains non-minimal pair words containing /f/ or /s/ replaced by [$?_{fs}$].
- Listeners identification function shifted depending on which segment contained [$?_{fs}$].

Audio-Visual Recalibration (Bertelson et al. 2003)

- [b] ~ [d] continuum.
- Audio-visual presentation of stimuli followed by phonetic categorization.
  - Audio presentation was an /ɑCɑ/ string with the consonant segments replaced by [$?_{bd}$].
  - Visual presentation was either /ɑbɑ/ or /ɑdɑ/.
- Listeners identification function shifted depending on which visual cue they were presented during training.

Comparison of the two paradigms

- Van Linden and Vroomen (2007) ran a series of 5 experiments directly comparing lexical retuning and audio-visual recalibration and showed that the two performed identical in all scenartios.
- However there's some evidence that the two paradigms are different:
  - Lexical retuning supports generalization across syllabic position (Jesse and McQueen 2011).
  - Audio-visual recalibration is strongly contextually bound (Reinisch et al. 2014).

General Experiment Design

- Phonetic Categorization → Lexical Decision Task → Phonetic Categorization
- A 14-step continuum of the blended fricative portions of [fɑ] and [sɑ] tokens was created.
- Ambiguous midpoint used as [$?_{fs}$] in /f/ words for lexical decision task identified through separate pre-test.

Experiment 1

- Lexical decision task:
  - 150 words total.
  - 34 total training words containing /f/ or /s/ (17 of each segment; non-minimal pairs).
  - All training words were positioned next to [i] or [ɪ] (13 onset; e.g. - "fiend" & "seek")
  - Remaining 116 words were filler (75 phonotactically licit English nonce words; no instances of /f s v z/)
- 41 native English speakers participated (1 removed from analysis).
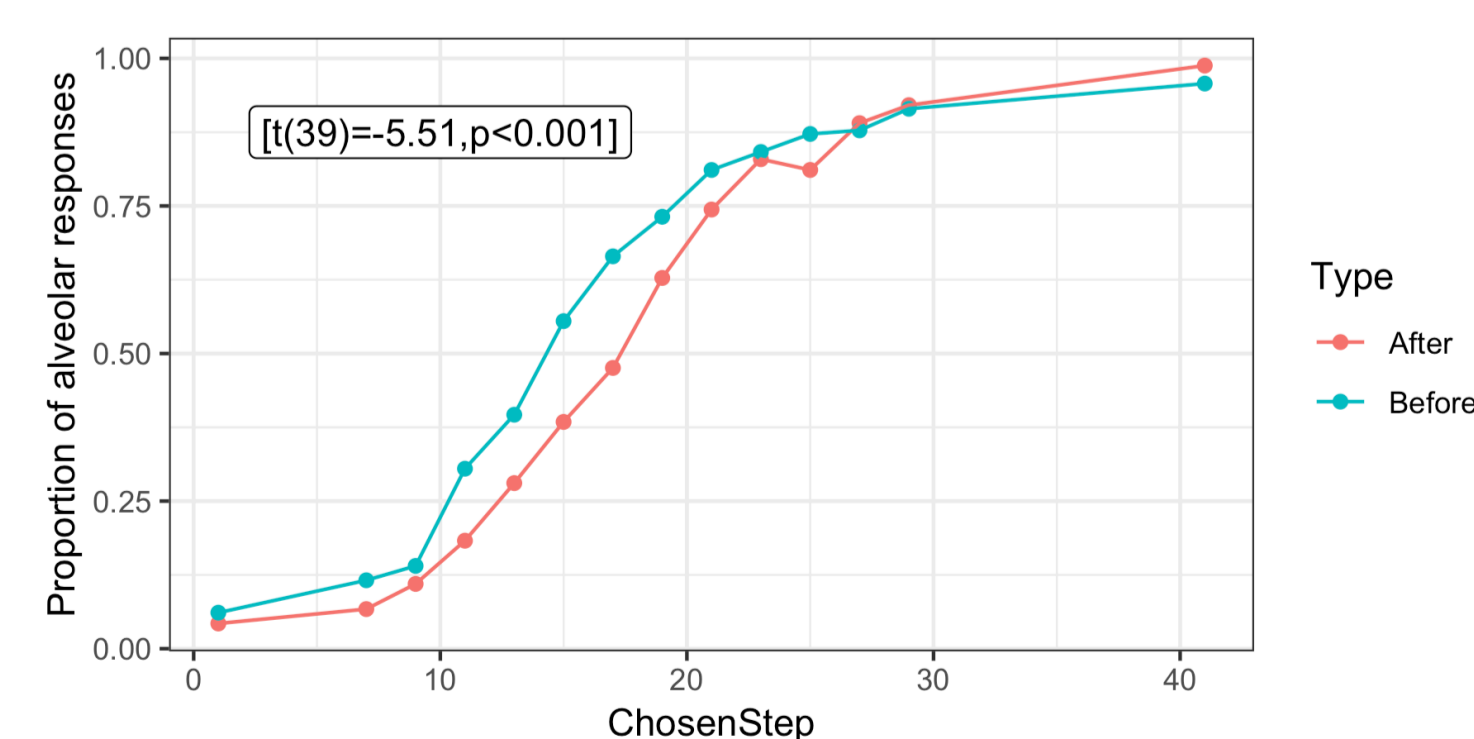- 7.3% reduction of alveolar ("s") responses from before to after.

Figure 1: Experiment 1 Results

Experiment 2

- Lexical decision task:
  - 8 words total (sampled from previous experiment's LDT).
  - Repeated each word 17 times.
  - Only two training words (one of each segment)
    * "female" & "seated"
    * Therefore no stimulus variation for /f/ or /s/.
  - Remaining 6 words were filler (4 phonotactically licit English nonce words; no instances of /f s v z/)
  - 37 native English speakers participated (2 removed from analysis).
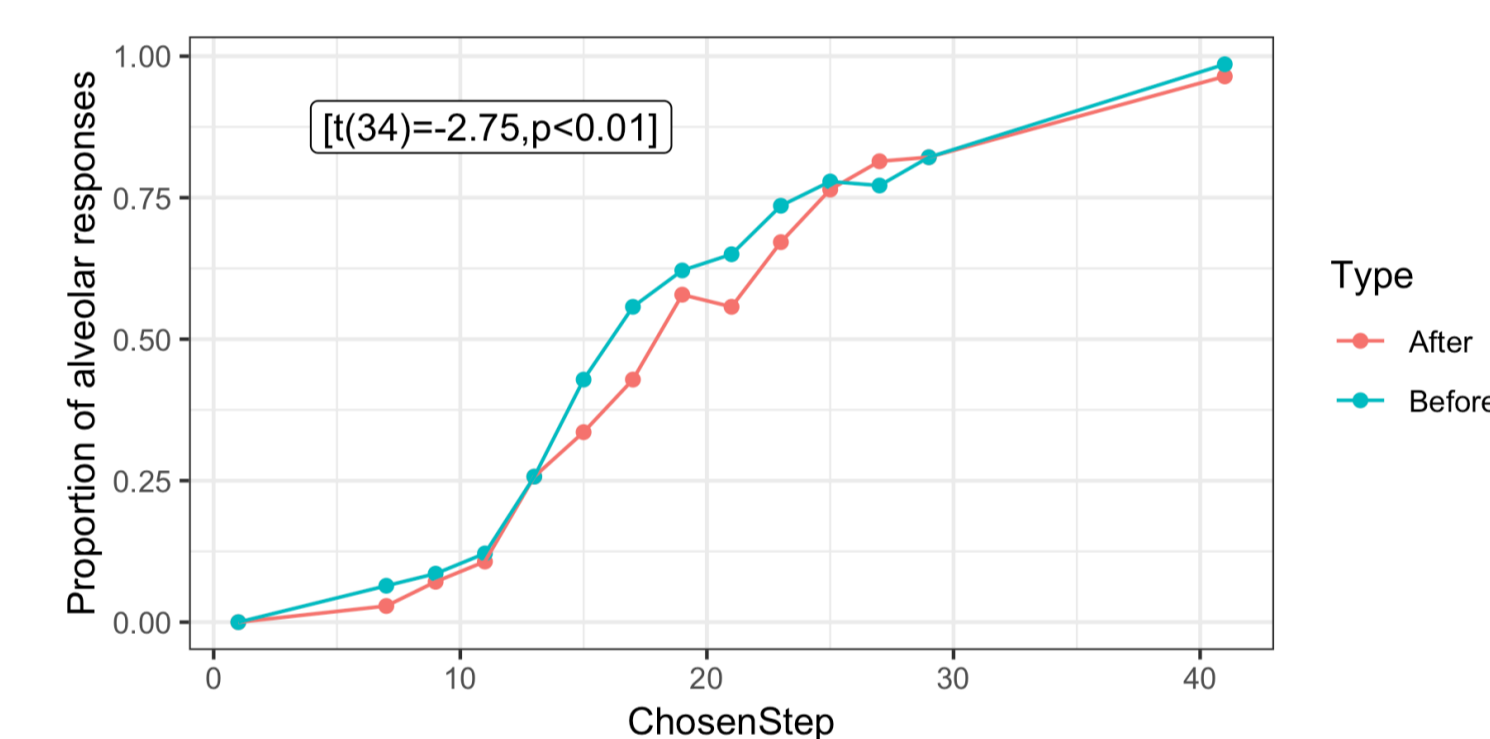 - 3.4% reduction of alveolar ("s") responses from before to after.

Figure 2: Experiment 2 Results

- However, the magnitude of the effect in Experiment 2 was smaller than in Experiment 1 [t(67.06)=2.27,p=0.027].
- Experiment 2 was also run on a control group that heard regular versions of the /f/ and /s/ words to ensure the shift wasn't just an experiment artifact.
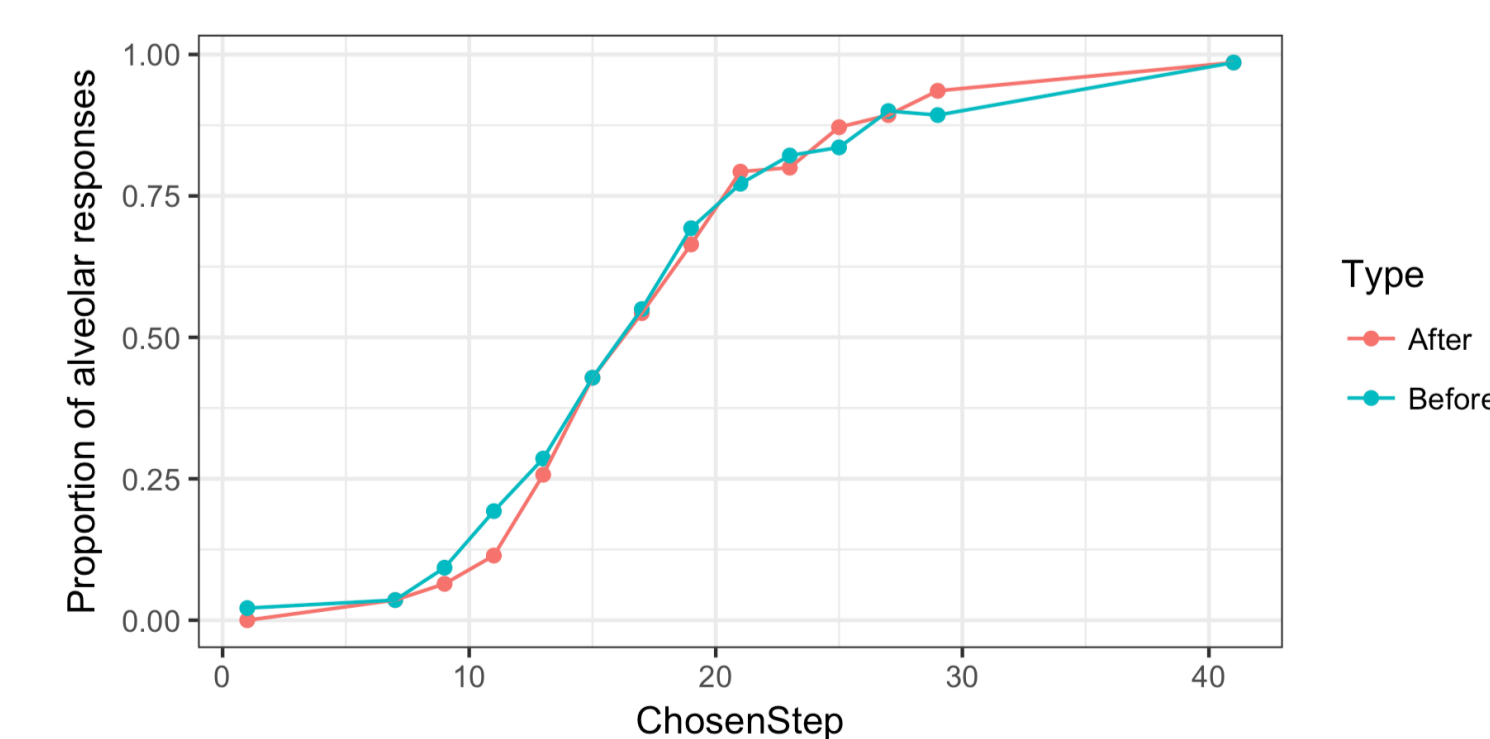

Figure 3: Experiment 2B Results

Conclusions

- Results from Experiment 1 suggest lexical retuning allows for generalization across phonological environments and challenges previous findings in the literature (Reinisch et al. 2014; Van Linden and Vroomen 2007).
- Results from Experiment 2 suggest that the number of unique stimuli used in the training set may play a role in the ability to generalize, but is not required. This aspect of the difference between lexical retuning and audiovisual recalibration has been under explored to the best of my knowledge.
- Lexical retuning has shown the ability to generalize time and again:
  - Features (Durvasula and Nelson 2018; Kraljic and Samuel 2006)
  - Syllabic Position (Jesse and McQueen 2011)
- It is misleading to label lexical retuning and audio-visual recalibration as parts of the same general speech perception mechanism.
  - Presence/Absence of generalization cannot simply be reduced to presence/absence of variability within the training stimuli.
  - Making general claims about pre-lexical processing using audiovisual re-calibration should be avoided.

References

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