Linguistically-guided adaptation to foreign-accented speech

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Introduction

Background
- Adaptation to ambiguous or distorted speech is facilitated by a variety of sources of linguistic and non-linguistic information [1].
- Considerable research has focused on lexical information as a source of disambiguating information (e.g., [2, 3])
- Relatively little work investigating the efficacy of other levels of linguistic structure in guiding adaptation

Which dimensions of linguistic information are leveraged during adaptation?

The current study
- Examined extent to which externally-provided feedback needs to match the accent profile in guiding adaptation by manipulating the degree of match on different linguistic dimensions (e.g., sub-lexical, lexical, supra-lexical)
- "Pop-out" paradigm [4]: 1) transcribed accent target sentence (in noise), 2) received feedback (in clear), 3) repetition of target sentence (in noise)
- English feedback produced by a native talker matched target at:
  - All linguistic levels (Lexical Match)
  - Syntactic and sub-lexical levels with real words (Lexical Mismatch)
  - Syntactic and sub-lexical levels with non-words (Jabberwocky)

Predictions:
- Accented target and feedback trials that overlap on a greater number of linguistic dimensions (Lexical Match) should yield greater adaptation relative to conditions with less overlap (Lexical Mismatch/Jabberwocky)
- Alternatively, a sufficient amount of linguistically-relevant overlap (sharing of English features) between target and feedback trials will promote adaptation, predicting that all English conditions (A-C) should yield greater learning than Language and No Feedback Control conditions

Methods

Participants
- 100 American English listeners with less than 5 hours of exposure to another language before age 11

Procedure
- Target (1-5y SRM)
- Feedback (clear)
- Target Repetition (<1 dB SKR)

Foreign-accented

Native-accented or Korean

Foreign-accented

2 blocks of trials
- 13 unique sentence sets in each block
- Sentences in Blocks 1 and 2 counterbalanced across subjects

Analysis:
- Strict keyword accuracy scores for the transcribed sentences compared for Rep 1 between Blocks 1 and 2.
- Logistic mixed effects regression: Helmert contrast-coded fixed effects of Condition and Block, random intercept for subject and keyword, random slopes for Condition by keyword and Block by subject.

Stimuli
- Target and target repetition trials produced by a male, medium-intelligibility Mandarin-accented talker
- 26 declarative, mono-clausal English sentences
- Feedback produced by either a 1) male, native-accented American English talker or 2) male, native Korean speaker

Condition
- Feedback
- No feedback provided

Language Control
- 26 declarative, mono-clausal Korean sentences

Jabberwocky
- 26 English jabberwocky sentences (same syntactic structure and phonemic content as Lexical Mismatch sentence)

Lexical Mismatch
- 26 declarative, mono-clausal English sentences, different from target

Lexical Match
- 26 declarative, mono-clausal English sentences, identical to target

Results

Block 1 to Block 2 Improvement Gains

No Feedback Control

Language Control

Lexical Mismatch

Lexical Match

Magnitude of improvement from Block 1 to 2 significantly larger in Jabberwocky, Lexical Mismatch and Lexical Match relative to No Feedback Control and marginally larger than Language Control.

No significant difference in improvement gains between English feedback conditions.

Discussion & Conclusions

- Enhanced adaptation in English feedback conditions (Lexical Match, Lexical Mismatch and Jabberwocky) relative to Language Control and No Feedback Control conditions.
- Feedback did not need to match target for facilitated adaptation
  - Suggests that matches on other non-lexical linguistic dimensions can guide listeners’ adjustments
- Overlap on a greater number of linguistic dimensions did not yield greater adaptation

Future work will determine whether a benefit for greater overlap emerges in lower intelligibility conditions (which may require listeners to leverage as many sources of information as possible)

References

Appendices
- "Enhanced adaptation in English feedback conditions (Lexical Match, Lexical Mismatch and Jabberwocky) relative to Language Control and No Feedback Control conditions.
- "Enhanced adaptation in English feedback conditions (Lexical Match, Lexical Mismatch and Jabberwocky) relative to Language Control and No Feedback Control conditions.
- "Enhanced adaptation in English feedback conditions (Lexical Match, Lexical Mismatch and Jabberwocky) relative to Language Control and No Feedback Control conditions.

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