The Role of Rhythmic and Intonational Cues in Language and Dialect Discrimination

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Background

- Using rhythmic cues - Adults and infants can distinguish two non-native languages.
  - Newborns can only discriminate languages from different rhythm classes (Mehler et al. 1988).
  - French adults discriminate between two unfamiliar languages - English and Japanese using rhythm (Ramus & Mehler 1999).
    • Synthesized ‘sasasa’ speech (intonation and rhythmic cues)
    • ‘flat sasasa’ speech (rhythmic cues only)
    • But not ‘aaaa’ speech (intonation cues only)

- Intonational cues can also be used to discriminate languages, but only when one is native.
  - English adults discriminated between English and Dutch using intonational cues (Willem 1982; de Piper 1983)

- Newborns can only discriminate languages from different rhythm classes (Mehler et al. 1988).

Results

• Intonational cues can also be used to discriminate languages, but only when one is native.
  - English adults discriminated between English and Dutch using intonational cues (Willem 1982; de Piper 1983)

• Can adults discriminate their native language/dialect from a foreign language/dialect:
  - Using intonational cues?
  - Using rhythmic cues?

Present Study

Several experiments examining the ability of adults to use rhythmic and intonational cues in discriminating:

- American English and Australian English
- American English and German

Methods

Stimuli –
- Recorded by 8 American Southern Californian female speakers and 8 Australian female speakers.
- Translated into German; recorded by 8 German female speakers.
- Stimuli was modified in different ways for each experiment.
  • Experiment 1 – Low-pass Filtered Speech
    - Sentences were low-pass filtered in Praat at 400 Hz (with 50 Hz smoothing).
    - Full rhythmic and intonational cues, impoverished segmental cues available.
  • Experiment 2 – Rhythm + Intonation speech
    - New synthesized ?a?a?a speech sentences created to match recorded sentences share rhythm and intonation.
    - Obstruents in original sentence replaced with silence (/?/); sonorants replaced with /a/.
    - Full rhythmic and intonational cues available. No segmental cues.
  • Experiment 3 – Rhythm only
    - Intonation stripped from synthesized Flat ?a?a?a Speech sentences from Exp. 2 and replaced with flat 200 Hz pitch.
    - Only rhythmic cues available.

Task –
- Tested in a between-subjects design:
  • American English vs. Australian English (3 experiments)
  • American English vs. German (3 experiments)
  - Sentences played to subjects one at a time.
  - Subjects asked to choose label: “American English” or “Other”

Subjects –
- Between 12-15 native American English listeners for each exp.

Comparison of Languages

Rhythm -
• English and German are both “stress-timed”.
• Rhythm of each language and dialect was measured as in (Ramus, Nespor & Mehler 1999).
  • American English and German are significantly different on all 3 dimensions
  • American and Australian are significantly different in sd S and sd O, but not %S.

Intonation -
• English and German are very similar intonationally:
  • Similar ToBI inventories (Grice et al. 2005).
  • Similar contours, differ in pitch accent timing (Atterer & Ladd 2004).
• American and Australian English use the same ToBI system (Fletcher et al. 2005).

Future Work

- We plan to confirm the importance of intonation by testing discrimination with a scrambled version of Experiment 2, for both Australian and German.
- Infants can discriminate their native language from a foreign language within the same rhythm class, and from a foreign dialect by 5-months (Nazzi, Jusczyk & Johnson 2000).
  • English vs. Dutch
  • American English vs. British English
  • But not German vs. Dutch
- Currently testing 5- and 7-month-old infants to determine the age at which infants can use native language intonation in language/dialect discrimination.

Analysis

• Results analyzed two ways:
  • A-prime (A’) scores (ANOVA, t-tests)
  • Proportion of subjects above chance (Chi-square)
  • Calculated from A’ scores
  • Above chance at greater than 95% confidence level.

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