

4pSC. Perceptual Adaptation to a Spoken Passage's Long Term Spectral Average

Jingyuan Huang & Lori L. Holt

Psychology Dept., Carnegie Mellon University
Center for the Neural Basis of Cognition

Andrew J. Lotto

1 Background

Accent normalization

Listeners can adapt to the accented speech quickly both at phonetic level (e.g. Clarke & Garrett, 2004) and lexical level (e.g. Maye, Aslin & Tanenhaus, 2008). However, the mechanism of the normalization is largely unknown.

Potential mechanisms

Perceptual Learning Effect (e.g. Maye, Aslin & Tanenhaus, 2008)

- The shift is due to specific phonetic remapping of the affected vowels

General Auditory Effect (e.g. Holt, 2005)

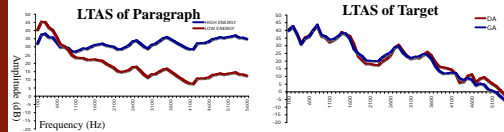
- The shift is due to changes in overall long-term average spectrum (LTAS)

Current Study:

Examine potential mechanisms underlying accent adaptation:

- Replicate the previous adaptation data
- Test the general auditory account directly

3 Experiment 2: Pilot Data



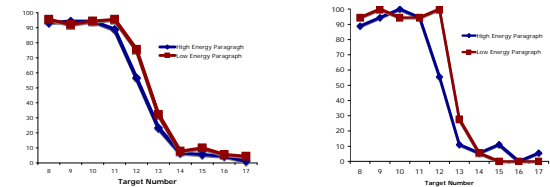
Paragraph Stimuli:

Two versions of the native English passage from Exp 1 were created by shifting the tilt of the general spectra: high energy level (no tilt) and low energy level (tilt) from Praat.

- No speaker identity or intelligibility changes.
- Phoneme category information is constant.

Target Stimuli: English /da-ga/ series

The stimuli were derived from morphed natural speech, created by linear predictive coding analysis (Stephens & Holt, in preparation)



Procedure:

- Participants passively listened to one level of the *Harry Potter* paragraphs; and do the /da-ga/ categorization task. And then did the other level after a short rest.

Result:

- Listeners are sensitive to the LTAS of the story.
- They categorize more ambiguous items as /ga/ after hearing high-energy passage; and more as /da/ after the low-energy passage.
- This result is consistent with spectral contrastive account: low-energy passage predict more high energy target; and high-energy context predict more low-energy target.

2 Experiment 1

Paragraph Stimuli:

- The first 21 sentences from *Harry Potter and the Sorcerer's Stone* (Rowling, 1998)
- The stimuli were derived from two speakers: one native English speaker and one native Italian speaker who learned English as an adult.

Target Stimuli:

- English /i/ - /I/ series
- Italian speaker's /i/ and /I/ are essentially overlapping in acoustic mapping

Procedure:

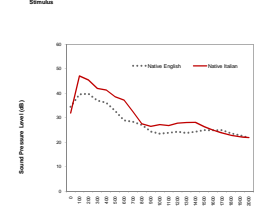
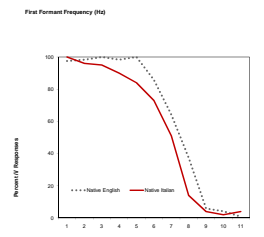
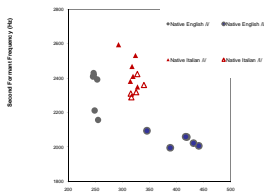
- Participants passively listened to one level of the *Harry Potter* paragraphs; and do the /i/ - /I/ categorization task.

Result:

- Listeners retune their perception according to the story: they categorize more ambiguous items as /i/ after hearing native English passage; and more as /I/ after Italian accented passage.

Discussion:

- It is unclear whether listeners use lexical information to retune the /I/ category to the Italian accented story; or rely on the acoustics information.
- In addition, LTAS from Italian speakers differs from native English speakers with higher energy in F1 area
- The influence of passage is spectrally contrastive: more /i/ response followed low-energy passage; and vice versa.



4 Discussion

1. Listeners are sensitive to the LTAS across the 2-minute story

In both Experiment 1 and Experiment 2 Pilots, listeners' perception quickly adapts to the preceding *Harry Potter* story.

2. The influence of context is spectrally contrastive

In both experiments, the low-energy passage leads to low spectral energy responses (/I/ and /ga/), whereas the high-energy passage leads to higher energy responses (/i/ and /da/).

3. General auditory mechanisms, rather than perceptual learning effects, drive the context effects in current study

Two versions of the *Harry Potter* passage in the Experiment 2 Pilot carry no difference in phoneme mapping, or speaker identities. The only potential source of difference for current data is the high vs. low energy levels.

References

- Clarke, C. & Garrett, M. (2004). "Rapid adaptation to foreign-accented English," *J. Acoust. Soc. Am.* 116(6), 3647-3658
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- Maye, J., Aslin, R. & Tanenhaus, M (2008) "The Weckud Wetch of the West Lexical Adaptation to a Novel Accent," *Cog. Sci.* 32, 543-562.
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