Effects of Mandarin Tones on the Production of English Boundary Tones

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11/27/2019

Introduction



Prosodic properties (e.g., intonation, stress and rhythm) are often seen as "the final hurdle, which a vast majority of speakers of English as a foreign language never manage to cross" (Banjo, 1979)

Fundamental Frequency & F0 profiles

 Fundamental frequency (F0) relates to vocal cord function and reflects the rate of vocal cord vibration during phonation (pitch) and formant. (Yavas, 2011)

F0 profiles

- Nuclear Pitch Accent (NPA) is the last pitch accent in a phrase
- Phrase accent (PA) is an additional tone after the NPA
- Boundary tone (BT) is a rise or fall in pitch at the end of the intonational phrases or sentences. High BT causes a rising pitch contour, signaling the question

Literature Review

- Keating and Kuo (2012) compared speaking F0 profiles of English and Mandarin.
 - Mandarin speakers have a higher pitch level (F0) than native English speakers
 - But these differences depended on the particular speech samples
- Ding, Hoffmann and Hirst (2016) compared the F0 patterns of continuous speech from English speakers and Mandarin EFL learners
 - Mandarin EFL learners have a wider pitch range than native English speakers
 - But only in the single-word level
- Only a few studies compared F0 profiles of the two languages in sentence level

- Viger (2007) investigated differences in yes-no questions between the English and Mandarin **utterance-level** prosodic contours produced by Taiwanese & English speakers
 - Both participant groups exhibited a considerably narrower F0 range overall in their L2 than in their L1

Points need attention of Viger's (2007) research

- Only female subjects
- Voice data was from Taiwanese
- No data about Tone-3 (no reason was given)
- The last version of the subject's voice was recorded rather than repetition

- RQ1: How the pitch range of Mandarin EFL learners and native English speakers differ in producing English yes-no questions and declarative sentences?
- RQ2: Do bilingual (Mandarin and English) and trilingual (Mandarin, English, and Japanese) speakers exhibit different pitch range in producing English yes-no questions and declarative sentences?

Methodology

Participants

7

- 6 males + 6 females = 12 American native speakers (ANS)
- 6 males + 6 females = 12 Mandarin bilingual speakers (TOEFL iBT > 80; MB)
- 6 males + 6 females = 12 Mandarin trilingual speakers (TOEFL iBT > 80; JLPT N1; MT)

Materials & Stimuli

- 6 English yes-no questions & declarative sentences (9 & 8 syllables), three repetitions
- with English words: fan, pin, lawyer, money, foreigner & millionaire at the end

Methodology

Examples of voice recording materials

- Did Ann go to see a new lawyer?
- Yes. Ann went to see a new lawyer.
- Really? Ann went to see a new lawyer?

Procedures

- 1. Participants read a description of the experiment
- 2. Fill language background questionnaire & read the experimental instructions
- 3. Voice recording
- 4. Praat & MANOVA

Results – Yes-No Questions FAN & PIN



| | Multivariate | Post Hoc Tests - Nationality - Tukey | | | | | | | | |
|--------------|----------------------------------|--------------------------------------|---------------|--------------------|-----------------------|-----------------------|--|--|--|--|
| Stimuli | Tests - Pillai's Trace - Sig. | Depend | lent Variable | e Nationality | Nationality | Mean Difference | | | | |
| FAN | | npa | Tukey | American | Chinese Bilinguals | -43.1594^{*} | | | | |
| | | | | | Chinese Trilinguals | -44.8753 [*] | | | | |
| | 027 | | | Chinese Bilingual | s Chinese Trilinguals | -1.7158 | | | | |
| | .027 | bt | Tukey | American | Chinese Bilinguals | -63.9667* | | | | |
| | | | | | Chinese Trilinguals | -45.0214^{*} | | | | |
| | | | | Chinese Bilingual | 18.9453 | | | | | |
| | | | | | | | | | | |
| PIN | n | ра | Tukey | American | Chinese Bilinguals | -35.3325* | | | | |
| | | | | | Chinese Trilinguals | -43.2561* | | | | |
| | 000 - | | | Chinese Bilinguals | Chinese Trilinguals | -7.9236 | | | | |
| | .000 b | ot | Tukey | American | Chinese Bilinguals | -40.9350^{*} | | | | |
| | | | | | Chinese Trilinguals | -36.0606* | | | | |
| | | | | Chinese Bilinguals | Chinese Trilinguals | 4.8744 | | | | |
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The descriptive statistics & MANOVA results of pitch range from NPA to BT of the three groups on stimuli "FAN" & "PIN"

Statistically significant differences between ANS and Mandarin groups

Results – Yes-No Questions LAWYER & MONEY



10

Results – Yes-No Questions FOREIGNER & MILLIONAIRE



The descriptive statistics & MANOVA results of pitch range from NPA to BT of the three groups

11

Statistically significant differences between ANS and Mandarin groups

Results – Declarative Sentences



The descriptive statistics of pitch range from NPA to BT of the three groups

12

Results – Declarative Sentences

| FAN | Pillai's Trace - Sig | Dependent Variable | National | National | Mean | P IN | Pillai's Trace - Sig | Dependent Variable | National | National | Mean |
|-----------|-------------------------|-----------------------|----------|----------|------------------------------|-------------|-------------------------|-----------------------|----------|----------|-----------------------|
| | .002 | npa | ANS | M B | -11.6108 | | .004 | npa | ANS | M B | -42.3908 [*] |
| | | | | ΜT | 2.8278 | | | | | ΜT | -22.0042 |
| | | | MB | ΜT | 14.4386 | | | | MB | ΜT | 20.3867 |
| | | bt | ANS | MB | -22.5506 | | | bt | ANS | MB | -40.0492* |
| | | | | МТ | 1.4669 | | | | | ΜT | -24.6747 |
| | | | MВ | ΜT | 24.0175 [*] | | | | MB | ΜT | 15.3744 |
| LAWYER | .001 | npa | ANS | MB | -20.944 | MONEY | .002 | npa | ANS | MB | -45.3767 [*] |
| | | | | ΜT | -38.7937* | | | | | ΜT | -38.0408* |
| | | | MB | ΜT | -17.8497 | | | | MB | ΜT | 7.3358 |
| | | ра | ANS | MB | -1.7145 | | | ра | ANS | MB | -29.2636* |
| | | | | ΜT | -0.5436 | | | | | ΜT | -26.1603 [*] |
| | | | MB | ΜT | 1.1708 | | | | MВ | ΜT | 3.1033 |
| | | bt | ANS | MB | -5.9771 | | | bt | ANS | MB | -17.9978 |
| | | | | ΜT | -8.5507 | | | | | ΜT | -18.3311 |
| | | | MВ | MT | -2.5736 | | | | MB | ΜT | -0.3333 |
| FOREIGNER | .002 | npa | ANS | MB | -25.3119 [*] | MILLIONAIRE | .000 | npa | ANS | MB | -26.8175 [*] |
| | | | | ΜT | -30.3967* | | | | | ΜT | -35.7064* |
| | | | MB | ΜT | -5.0847 | | | | МВ | ΜT | -8.8889 |
| | | ра | ANS | MB | -22.3689 | | | ра | ANS | MB | -36.5039* |
| | | | | ΜT | -11.0756 | | | | | ΜT | -27.9925 * |
| | | | MB | ΜT | 11.2933 | | | | МВ | ΜT | 8.5114 |
| | | bt | ANS | MB | -27.3011 [*] | | | bt | ANS | MB | -36.1822 [*] |
| | | | | ΜT | -5.4075 | | | | | ΜT | -22.1061 |
| | | | MB | MT | 21.8936 | | | | MB | MT | 14.0761 |

The MANOVA results of the three groups in declarative sentences **The results of declarative sentences is not conclusive**

Discussion & Conclusion

RQ1: How the pitch range of Mandarin EFL learners and native English speakers differ in producing English yes-no questions and declarative sentences?

- All speakers showed clear pitch rising in English yes-no questions clear pitch falling in English declarative sentences
- Mandarin groups exhibited a higher pitch level than American group in YNQ

RQ2: Do bilingual and trilingual speakers exhibit different pitch range in producing English yes-no questions and declarative sentences?

- There was no significant difference between MB & MT groups in YNQ
- The results of DS were inconclusive

Thank you for your attention!

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