How “light” are “light tones” 轻声”?
– The case of Rugao neutral tones

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What makes a syllable ‘heavy’ or ‘light’?

• English: stress accent
  – Lehiste (1970): pitch (f0), length (duration), and loudness (intensity)
  – Since pitch of a stress accent is variable, length and loudness of a syllable play an important role (Cf. Beckman 1986, Hyman 2006)

[Cf. in Japanese, a pitch accent language, where an invariant H tone indicates the accent, loudness and length play a lesser role if any at all.]
What makes a Chinese syllable heavy or light?

- Beijing:
  - Underlyingly toneless syllables:
    - xīnde ‘new’; pútao ‘grape’; zhěntou ‘pillow’; kùzi ‘pants’
  - Some lexical items with accent contrasts
    - dōngxī ‘east west’ versus dōngxi ‘things, stuff’
- Phonetic properties of a light tone in Beijing (Cf. Lin & Yan 1980; Lin 1983; Iwata 2001)
  - Mid and falling pitch contour (Wang, 1992; Chen & Xu, 2006)
  - Lower intensity
  - Shorter duration
  - Consonant lenition
  - Vowel centralization
What makes a Chinese syllable heavy or light?-2

• Iwata (2001 and other related papers) describes neutral tones in some varieties of Mandarin as “不轻不短的轻声”
  – The neutral tone takes on a fixed pitch contour (independent of phonetic environments), different from any lexical tone

• In Rugaohua 如皋话 (a southern Mandarin variety), phonetic pitch of neutral tones, regardless of their phonological tone specification, completely depends on the preceding tone.
  – What are the phonetic features of these neutral tones?
light tone 轻声 – a working definition

• a syllable with an acquired surface phonetic pitch under the influence of the neighboring (in this case, preceding) lexical tone
What syllables are “light toned” in Rugao?

Rugaohua has light toned syllables at different levels:

— toneless suffixes (n. 子, 头; adj./adv. 的/地; aspectual了)
  • /tɕi⁴¹.tɕi⁰/ 鸡子‘chicken’, /hɔŋ³⁵.ti⁰/ 红的‘red’, /hao³²³.lao⁰/ 好了‘done’,
    /kuŋ⁵⁵.tʰɛj⁰/ 罐头‘canned food’ (/jì³⁵.tsi⁰/ 叶子 ‘leaf’, /kwə⁵⁵.tʰɛj⁰/ 骨头 ‘bone’)

— 2nd morphemes in lexicalized items > light toned
  • /ça³⁵.sə⁴¹/ 学生 ‘student’, /cao³²³.ca³⁵/ 小学 ‘primary school’

— light toned morphemes in trisyllabic compounds and phrases
  • [y⁰] in /la⁴³⁵.y³⁲³.tʰɪ⁴¹/ 落雨天‘rainy day’ (Cf. [la⁴³⁵.y³⁲³] ‘to rain’); [tʰɛj⁰]
    in /tʃʰə⁵⁵.tʰɛj⁴¹.taN⁴¹/ 赤豆汤‘red bean soup’ (Cf. [tʃʰə⁵⁵.tʰɛj⁴¹])
  • /pao⁴¹.tˢʰɿ.lɛ/ 包起来‘wrap it up’, /na³⁵.tˢʰɿ.lɛ/ 拿‘pick it up’
    • /pao⁴¹.tˢʰɿ.lɛ.lao/ ‘wrapped up’, /na³⁵.tˢʰɿ.lɛ.lao/ ‘picked up’
Lexical Tones in Rugao

• Rugaohua 如皋话 has four phonemic tones (Huang 2011):

  – Ia 阴平: **T41** (merged with IIb 阳上 & IIIb 阳去)
    • Phonetically *unstable pitch height*, susceptible to downstep
  – Ib 阳平: **T35** (IVb 阳入: short T35)
    • Phonetically *unstable pitch contour* which tends to peak in the following H-toned syllable
  – IIa 阴上: **T323**
    • Sometimes also described as 212, a mostly flat tone in the speaker’s mid to low pitch range
  – IIIa 阴去: **T55** (IVa 阴入: short T55)
    • Pitch level may be *lower* than the high offset of the rising tone
Pitch tracks of Rugao tones (dashed tracks show checked tones)

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-- Huang: light tones in Rugaohua
Phonetic pitch values of ‘light tones’ in Rugao (Cf. Ting 1999 & Huang 2011)

• After Ia 阴平 T41: the light tone sounds low
  – How is it different from a downstepped T41 in this environment, which is also low (Huang 2011)? Or is there any tangible difference?

• After Ib 阳平 (＆IVb阳入) T35 and IIIa阴去 (＆IVa阴入) T55, it sounds high
  – [1]Is there any difference in these two phonetic Hs on the light toned syllable? And [2] how is it different from a full high tone T55?

• After IIa 阴上 T323, it sounds mid
  – How is [T323.T0] different from phonetic realization of a /T323.T323/ sequence (because Rugao doesn’t have the Beijing style 3rd tone sandhi)?
methodology

• **Recording items**
  – Disyllabic pairs, one of which has a light-toned 2\textsuperscript{nd} syllable:
    
    \[ /kɛj^{41}.saŋ^{41}(>0)/ \] 街上 ‘on the street’ vs. \[ /kao^{41}.saŋ^{41}/ \] 高尚 ‘lofty’;
    
    \[ /swaŋ^{35}.saŋ^{41}(>0)/ \] 床上 ‘on the bed’ vs. \[ /veŋ^{35}.tsaŋ^{55}/ \] 蚊帐 ‘mosquito net’; etc.

• **Semi-randomized list**

• **Phonetic properties examined:**
  
Preliminary results – vowel and consonant reduction

• V quality & V duration: not always reliable
  – V reduction doesn’t happen often
  – high Vs sometimes devoice in light-toned syllables

• Consonant lenition: not totally reliable, either
  – Pervasive intervocalic C lenition/assimilation, even in full-toned 2\textsuperscript{nd} syllables!
Preliminary results – preceding tone = T41

[T41.T0] similar to surface form of /T41.T41/

– Phonetic pitch of light tone: low and falling

– No obvious f0 peak reset for light tone, which simply completes the fall of T41
  • As mentioned in Huang (2011), even full-toned T41 gets downstepped by a preceding T41, although there seems to be a slight f0 reset.

– Slightly lower intensity in light tone

– V of light toned syllable may be slightly shorter
Examples of light tone vs. full tone after T41: (left) light tone completes the T41 fall, while (right) /saN⁴¹/ slightly resets with higher intensity.
Preliminary results – preceding tone = T35

[T35.T0] similar to surface form of /T35.T55/

– Phonetic value of light tone: (rising up to) high
  – So that the rising contour of the preceding T35 is stretched over both syllables
    Cf.  f0 reset and steady f0 level for the full T55

– Slightly lower intensity peak in light tone

– Light tone may be shorter, too
Examples of light tone vs. full tone after T35:

(left) light-tone completes rising contour of /uN³⁵/, while (right) full-tone is a steady high.
Examples of light tone vs. full tone after short T35: 
*left* light-tone completes rising contour of /saoq\textsuperscript{35}/, while *right* full-tone is a steady high
light tone after T323: (left) T323 in citation /sej^323/ ‘hand’; (right) /sej^323+/saN/ (41>0) ‘on the hand’, with the 323 contour stretched over both syllables.
Preliminary results – preceding tone = T323

[T323.T0] similar to surface form of /T323.T323/

– Phonetic value of light tone: mid (may even be slightly higher than the preceding T323)
  – so that the preceding T323 contour seems stretched over both syllables
  – On the other hand, the 2nd full T323 is downstepped and lower in pitch than the preceding T323 (Huang 2011)

– light tone may have slightly higher intensity, probably due to its higher pitch

– The full toned 2nd syllable is longer than the light tone
Examples of light tone and T323 after T323: (left) /sej^{323}/+/saN/ (41>0) ‘on the hand’; (right) /se^{323}.tsaN^{323}/ where the 2nd T323 is downstepped (Huang 2011).
Preliminary results – preceding tone = T55

[T55.T0] similar to surface form of /T55.T55/

– Phonetic value of light tone: H
  – No difference in pitch height from the full tone, although the latter seems to maintain a steadier pitch level

– Intensity in light tone: comparable to the full T55

– Duration of light tone is noticeably shorter
Examples of light tone and T55 after T55: (left) /uN⁵⁵.lao⁰/ ‘It’s dark’; (right) /pao⁵⁵.tao⁵⁵/ where the 2nd T55 is steady H and also longer in duration

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Examples of light tone and T55 after short T55: (left) /tɕiʔ55.saN/ ‘on the knot’; (right) /tɕiʔ55.tsaN/ where the 2\textsuperscript{nd} T55 is longer
<table>
<thead>
<tr>
<th>Light tone</th>
<th>Comparable full tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>T41 _</td>
<td>T41: downstepped, f0 reset</td>
</tr>
<tr>
<td>low falling</td>
<td></td>
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<tr>
<td>shorter</td>
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<tr>
<td>lower intensity</td>
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<tr>
<td>T35 _</td>
<td>T55: steady H with f0 reset</td>
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<tr>
<td>rising up to H</td>
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<tr>
<td>(shorter)</td>
<td></td>
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<tr>
<td>(lower intensity)</td>
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</tr>
<tr>
<td>T323 _</td>
<td>T323: downstepped, lower</td>
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<tr>
<td>mid (and rising)</td>
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<tr>
<td>shorter</td>
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<td>(higher intensity)</td>
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<tr>
<td>T55 _</td>
<td>T55: steady H, longer</td>
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<tr>
<td>high</td>
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<tr>
<td>shorter</td>
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<td>similar intensity level</td>
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What to do next?

• Measure f0 differentials and duration ratios
  – Decrease in F0/intensity from 1\textsuperscript{st} syllable to the 2\textsuperscript{nd}:
    \[ \Delta f_0(h.l) \text{ vs. } \Delta f_0(h.h); \quad \Delta Int(h.l) \text{ vs. } \Delta Int(h.h) \]
    (h=heavy, l=light)
  – Ratio of 2\textsuperscript{nd} syllable duration to that of the 1\textsuperscript{st} syllable in the two types of disyllabics:
    \[ \text{dur}(h.l) \text{ vs. } \text{dur}(h.h) \]

• Record and analyze more speakers’ speech
  – **Individual differences** have been noticed in implementation of all sorts of phonetic cues cross linguistically.

• Expand study to include trisyllabic and quadrisyllabic sequences – for more reliable duration measurement.

• A perceptual study to explore native speakers’ preference of acoustic cues
Selected references:


林焘 (1983)。探讨北京话轻音性质的初步实验。《语言学论丛》第十辑。北京：商务印书馆。


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