1. Introduction

1) Studies of Chinese EFL Learners’ intonation are available in recent years, focusing on intonation-phrasing, boundary tones, accent distribution, word stress, intonation unit, intonation acquisition and tonality.

2) Limitation: all based on Halliday’s intonation theory;

3) The present study uses Pierrehumbert’s English intonation grammar to analyze the pitch configuration of a declarative question.

2. English intonation grammar

Figure 1: The finite-state grammar of English intonational phrase in Pierrehumbert (1980)

Figure 1 shows:
1) seven pitch accents, two boundary tones and two phrase accents made of H and L;
2) a well-formed IP tune = one or more pitch accents + an edge tone, which means:
   a) all their possible combinations are legal;
   b) no constituent structure within an English tune.
3) the starred tone – the strongest syllable of the metrical feet.
4) the various tonal targets are mapped to F0 contour through two tone mapping rules: metrical-context-sensitive rule and the tone-context-sensitive rule.

3. Methodology

1) Participants: 30 university English majors
   Target sentence: “You mean you are not confident that you can pass them?” clipped from a dialogue recorded

2) Data processing
   a. Identification of nuclei and nuclear tones of the objects
   b. use “praat” to check the results
   c. 12 objects become the core of our study because of their high quality of recording and similar nuclei and nuclear tones to the native speakers’
   d. labelling: by a college English teacher majoring in phonetics and phonology in her postgraduate study and teaching English pronunciation and English phonetics for 12 years. Revision has been done over and over again for correctness.

   a) Labelling of the metrical feet of the target sentence (starred = stressed marked as “s”, unstarred = unstressed as “w”)

   It shows that the more a syllable is controlled by “s”, the stronger it is.
   b) Two examples labelled with “H” and “L” on the basis of Pierrehumbert’s English tonal inventory according to the waveform and pitch tiers of each object from “praat”.

   Figure 3: The waveform, pitch tiers and pitch labeling graph of “You mean you are not confident that you can pass them?” read aloud by NS1

   c) The labelling of the tonal events read by 4 native speakers and 12 Learners:

   Table 1. The labeling of the tonal events of the 4 objects read aloud by the NSs

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pitch Accents</th>
<th>Phrase Accents</th>
<th>Greater Tones</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS1</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>NS2</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>NS3</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>NS4</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
</tbody>
</table>

   Table 2. The labeling of the tonal events of the 12 objects read aloud by the Learners

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pitch Accents</th>
<th>Phrase Accents</th>
<th>Greater Tones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner 1</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 2</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 3</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 4</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 5</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 6</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 7</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 8</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 9</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 10</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 11</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
<tr>
<td>Learner 12</td>
<td>H’</td>
<td>2</td>
<td>L</td>
</tr>
</tbody>
</table>

4. Results

1) The objects of the native speakers:
   A. All tonal events are legal;
   B. The combination of the tonal targets is in line with the metrical-context-sensitive rule as well as the tonal-context-sensitive rule.
   C. The pitch transitions (esp. the rightward spreading) are managed properly.

2) The objects of the Learners:
   A. Tonal events
      a. most of them are legal except the three underlined in Table 2.
      b. Some objects have more pitch accents than expected
      c. Learners employ more non-monotonies and wide-pitch-ranged tones than NSs.
   B. The organization of the tonal targets:
      none conforms to the metrical-context-sensitive rule.
   C. The pitch transitions:
      a. The interpolation between H*s and L*s are in line with the interpolation rule.
      b. The rightward spreading in most objects is illegal.

5. Discussion

1) The indication of the findings:
   a. Learners’ correct placement of sentence stresses and employment of legal tonal events, but overuse of non-monotonies;
   b. most objects’ confirming to the interpolation rule do not necessarily means that Learners master the interpolation management;
   c. Learners’ lack of the awareness of tone scaling and proper combination of tonal events

2) Reasons of Learners’ tonal behaviors
   a. From the perspective of contrastive linguistics:
      Learners’ non-monotonies are similar to the Chinese lexical tones; their wide-pitch-range edge tones probably result from the negative transfer from Chinese intonation;
   b. In Interlanguage perspective, Learners’ lack of the information for pitch contour management lead to their borrowing of Chinese tone system to English intonation;
   c. from the perspective of second language acquisition, Learners’ little knowledge of the rules of the combination of tonal events for a well-formed pitch contour leads to random errors.

Acknowledgement

Gratitude is expressed to the committee of TAL2012 for this opportunity, the reviewers for their precious comments on her paper, her husband and daughter for their support and care during the course of thesis writing.