Motivation

- Chen’s (2000) acoustic study: Mandarin non-back vowels tend to become backed when followed by the back nasal /ŋ/; e.g., /ŋaŋ/ → /ŋn/ & /ŋaŋ/ → /ŋaŋ/.
- Li’s (2008) acoustic study: /ŋ/ → [ŋ].
- Lin’s (2007) phonological account: Mandarin tones agree in backness → the same backness constraint.
- Gick & Wilson’s (2006) gestural account: Gestural compromise and schwa-insertion are the two ways of solving gestural conflict. The production of /ŋ/ as [ŋ] may be explained by the gestural conflict account.

Research questions

- What is the spatial relationship between the tongue positions for a given vowel and the nasal final?
- How is the tongue position for the vowel and the nasal coordinated in terms of timing?
- Can ultrasound results support the acoustic findings and the phonological and gestural based accounts mentioned above?

Predicted Production

Based on the above studies, the production of Mandarin /GN/ syllables is predicted as follows:

<table>
<thead>
<tr>
<th>Vowel context</th>
<th>Mandarin</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>/a/</td>
<td>H=a</td>
<td>O=D</td>
<td>A=Angle</td>
<td>H=O/sim A</td>
</tr>
<tr>
<td>/i/</td>
<td>/ia/ → [in]</td>
<td>/ia/ → [jin]</td>
<td>/ia/ → [in]</td>
<td></td>
</tr>
</tbody>
</table>

H = Hypotome, O = Opposite, A = Angle, H = O / sim A

The top point on the tongue surface was plotted in an articulatory space based on the associated A and H values. Then the top points across vowels and nasals were compared.

Discussion of results

- Mandarin /GN/ same backness constraint: Clearly shown in Speaker 1’s production.
- Chen’s (2000) and Li’s (2008) acoustic results: Both supported. /ŋ/ /-[ŋ]/ or [ŋ].
- The productions of /ŋ/ did not all turn out to be [ŋ] as predicted; e.g., there is almost no lowering of /i/ in the production of Speakers 2 and 3 and their tongue movement from /i/ to /ŋ/ is very brief, both suggesting that there is no schwa-like transition in these speakers’ production of /ŋ/.
- Speaker 2: her tongue body just slides along the palate from /i/ to /ŋ/ and her /ŋ/ is fronted.
- Speaker 3: similar to /ŋ/ (not shown here).

Implications for phonological and gestural based accounts

- New finding: To avoid gestural conflict, the nasal /ŋ/ can be compromised instead of the vowel.
- Gestures can be compromised by schwa-insertion or undershoot.

References


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