The Examination of the Relationship between Perception and Production of Mandarin Tone of Kazak Students

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1.Backgrounds

- **Second language acquisition phonetics(L2)：**

Relationship between perception and production

(one of the long-standing issues)

- **Some of the debate：**

- **A**: No correlations between perception and production;
- **B**: Modest / high correlations between perception and production**;**
- **C**: The accuracy with which non-native sounds are produced is limited by how accurately they are perceived **;**
- **D**: Accurate perception does not necessarily precede accurate production**;**

- **Some most salient factors**: ***difficult for a non-native speaker to acquire the tones associated with Mandarin***
  - **Native language;**
  - **Ages ;**
  - **Syllable structure ;**
  - **Segment & suprasegment;**
- **Current studies more focus on:**
  - Subjects: the adult L2 learners;
  - segment > suprasegment;
  - the relation between the two languages is more distant:

EX: English vs Chinese; English vs Japanese……

- **the aim of the present study：** ***the relationship between perception and production***
  - **Subjects**: the Kazak minor learners (10-11 years old)；
  - **native language**: non-tone language;
  - **context:** Kazak & Chinese:
  - **research method**: perceptual training

2.Experiment

Subjects：

- 11 native speakers of **Kazak (non-tone language)**;
- 10-11 years old;
- from Xinjiang Yili Kazak Autonomous Regions;
- learn Chinese from nursery school;

Stimuli:

- 458 real monosyllabic Mandarin words;
- 115 (tone 1), 95 (tone 2), 124 (tone 3), 124 (tone 4);
- Random disruption for grouping in both pretest and posttest;
- Perception training: 1v2, 1v3, 1v4, 2v3, 2v4, and 3v4;

Procedure： the pretest / perceptual training / post-test；

Test (pre- and post-test):

- the stimuli was divided to 5 groups through a PC to play out over loudspeaker box；
- the stimuli was randomly disrupted in pre- and post-test;
- to identify and write down on a sheet of paper with label 1, 2, 3, or 4;

Production (pre- and post-test):

- 176 stimuli at a normal speaking rate；
- The stimuli from the Chinese textbooks in the first and second grade, dedicating for the Kazak students;
- Evaluated by native speakers of Mandarin Chinese;

Training:

- 8 days for perceptual training course;
- 90 minutes a day, the first 20 minutes for small tests, the outstanding trainee would earn small rewards; in the remaining time the trainees would be asked to read after listening the stimuli;
- a female as a guide teacher being good at Mandarin Chinese with Putonghua Level B

Table 1. *The perceptual training signal consisted of total of syllables and each tone pair ratio for the eight day perceptual training course.*

total syllables	Tone pair			
First day (240)	1V1	2V2	3V3	4V4
	25%	25%	25%	25%
Second day (480)	1V1	1V2	1V3	1V4
	10%	50%	10%	30%
Third day (472)	2V1	2V2	2V3	2V4
	35%	10%	35%	20%
Fourth day (472)	3V1	3V2	3V3	3V4
	20%	50%	10%	20%
Fifth day (472)	4V1	4V2	4V3	4V4
	40%	40%	10%	10%
Sixth day (472)	1V2	2V1	2V3	3V2
	20%	20%	30%	30%
Seven day (472)	2V3	1V2	1V4	3V2
	20%	30%	30%	20%
Eighth day (472)	3V2	2V1	4V1	2V3
	20%	30%	30%	20%

3.Results and Discussion: Improvement in perception

Table 2. *Confusion matrix for the Kazak trainees' tone identifications in the pre- and post-test phases (Correct responses are shown in bold).*

Perceived as	Stimulus (%)			
	Tone 1	Tone 2	Tone 3	Tone 4
Pretest				
Tone 1	**36.8**	36.5	15.6	10.8
Tone 2	13.4	**46.9**	31.2	8.4
Tone 3	4.8	12.0	**78.8**	4.4
Tone 4	6.6	16.8	5.8	**70.8**
Post-test				
Tone 1	**66.2**	23.6	1.3	8.9
Tone 2	19.6	**68.7**	6.2	5.5
Tone 3	1.2	2.6	**96.0**	0.1
Tone 4	2.6	3.6	0.6	**93.2**

- An improvement in identification scores from the pre- to post-test for each tone;
- Tone 1 was more incorrectly perceived as tone 2 than the reverse;
- Tone 2 was more incorrectly perceived as tone 3 and vice reverse;
- Tone 4 was more incorrectly perceived as tone 2;
- The correct rate of tone perception ranking for both pre- and post-test was the same:

  tone 3 > tone 4 > tone 2 > tone 1

Improvement in production

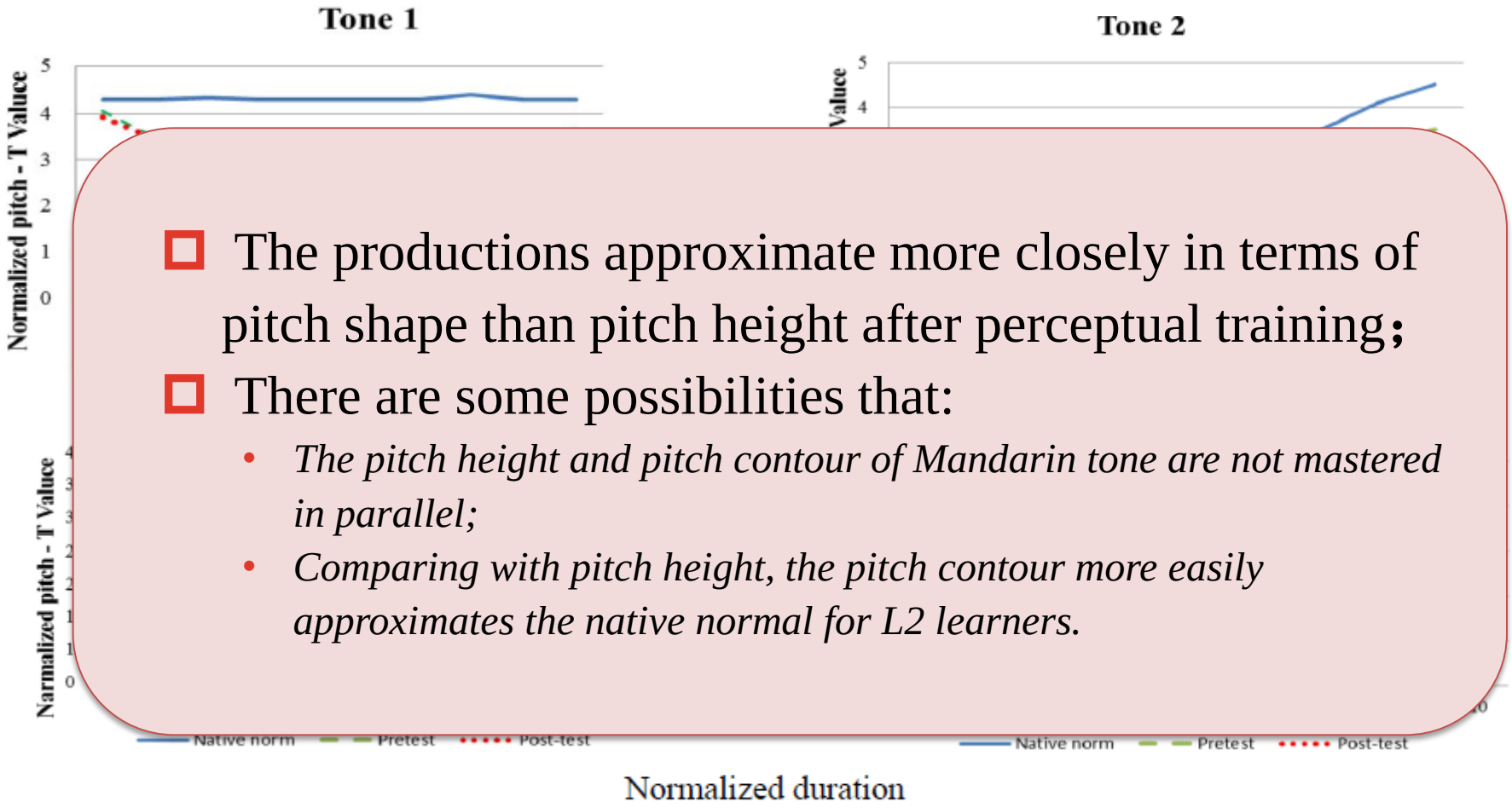
Table 3. *Confusion matrix for the Kazak trainees' tone productions (as judged by native Mandarin Chinese listeners) in the pre- and post-test phases. Correct responses are shown in bold.*

Produced as	Stimulus (%)			
	Tone 1	Tone 2	Tone 3	Tone 4
Pretest				
Tone 1	**83.4**	11.5	3.4	1.7
Tone 2	27.5	**62.7**	6.4	3.4
Tone 3	18.1	22.7	**55.7**	3.5
Tone 4	16.1	8.2	2.3	**73.4**
Post-test				
Tone 1	**83.3**	12.6	2.8	1.3
Tone 2	20.2	**74.6**	4.1	1.1
Tone 3	12.7	18.5	**67.8**	0.9
Tone 4	10.3	3.9	0.7	**85.0**

- An improvement in production scores from the pre- to post-test for tone 2, 3,and 4**;**
- There was nearly no improvement for tone 1(above 80% for both pre- and post-test);
- Tone 2 was more incorrectly produced as tone 1 and vice reverse;
- Tone 3 was more incorrectly produced as tone 2 than the reverse;
- Tone 4 was more incorrectly perceived as tone 1;
- The correct rate of tone production ranking for both pre- and post-test was the same**:**

tone 1 > tone 4 > tone 2 > tone 3

Acoustic analysis on production



- The productions approximate more closely in terms of pitch shape than pitch height after perceptual training;
- There are some possibilities that:
  - *The pitch height and pitch contour of Mandarin tone are not mastered in parallel;*
  - *Comparing with pitch height, the pitch contour more easily approximates the native normal for L2 learners.*

Relationship between production and perception

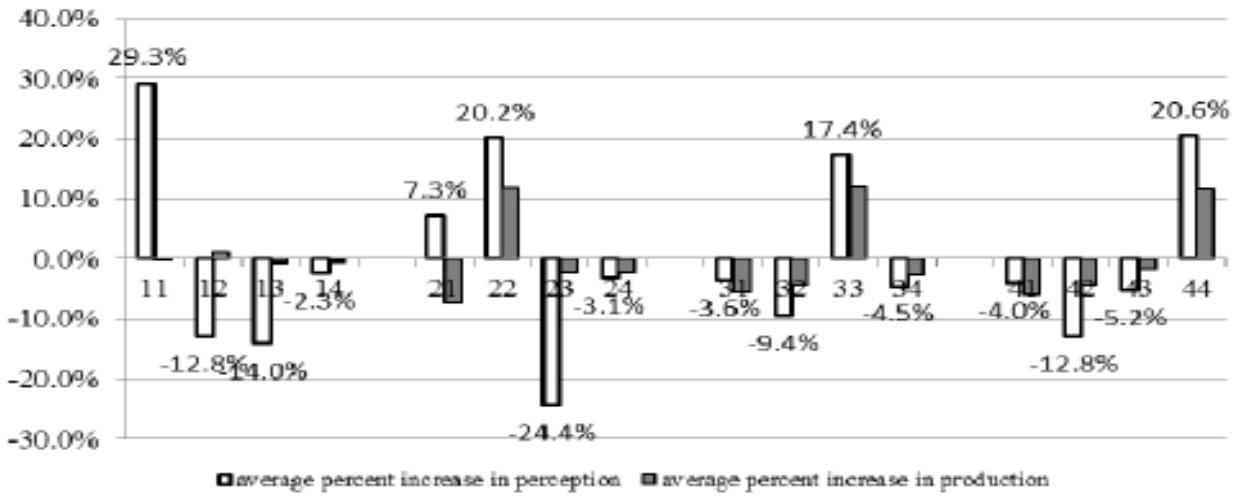


Figure 4: *Kazak trainees' mean percent-confusion data increase of identifications and productions for each tone at pretest and post-test (tone pair "11" means tone 1 is perceived or produced as tone 1, so does the other tone pair).*

- An improvement both in perception and production;
- The increase of perception is higher than that of production;
- However, for tone 1, there was nearly no changes in production after perceptual training;

Table 4. *Tone pair confusion patterns for perception and production at pretest and post-test, in terms of percent errors for each tone pair.*

	Pre-test errors (%)		Post-test errors (%)	
	perception	production	perception	production
Tone1vTone2	**49.6**	**39.0**	**44.1**	**32.8**
Tone2vTone3	42.3	28.1	8.5	22.6
Tone2vTone4	25.3	26.3	9.4	5
Tone1vTone3	20.0	21.5	2.4	15.5
Tone1vTone4	18.1	17.8	11.8	11.6
Tone3vTone4	10.4	5.8	0.7	1.6

- The rank order had some changes after perceptual training for both perception and production;
- Tone pair 1 and 2 is the most confusing tone pair for both perception and production;
- Tone 2 and 3 for perception decrease a lot to the fourth in rank order, but for production is still the second in rank order at post-test;

Table 5. *Confusion patterns for tone pair 1 and 2, tone pair 2 and 3 at pretest and post-test, in terms of percent errors of the total number of stimuli, showing the difference between perception and production in terms of confusion direction.*

	Pre-test errors (%)		Post-test errors (%)	
	perception	production	perception	production
Tone1asTon2	**36.5**	**11.5**	**23.6**	**12.6**
Tone2asTon1	13.4	27.5	19.6	20.2
Tone2asTon3	31.2	6.4	6.3	4.1
Tone3asTon2	12.0	22.7	2.6	18.5

- The confusion patterns in terms of confusion direction for tone pair at pre- and post-test, revealing the difference between perception and production;
- Tone 1 is more frequently incorrectly perceived as tone 2 than the reverse;
- Tone 2 is more frequently incorrectly produced as tone 1 and vice versa;
- The same situation happens to the tone pair 2 and 3 in perception and production.

Discussion and Conclusion

The native language: Kazak (non-tone language):

- No rich experience of kinds of pitch height in perception;
- Having a lot of opportunities to communicate with Chinese;
- The teenager group's language learning mechanism is high active and they can capture more sensitive language information during learning;

The tone type:

- Tone 1 is difficult to identify but is easy to produce;
- Comparing with the pitch height, the pitch shape more easily approximates the native normal;
- The confusion direction of tone pair is different;
- The Mandarin tone type may has some uncertain effects on the relationship between the perception and production.

The trainees' overall tone perception and production are correlated to some extent, but differences do exist.

Thank You !