

# Ultrasound Overlay Videos: Testing its Effectiveness for Teaching L2 Cantonese Sound Contrasts



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## Introduction

- **Ultrasound technology** can be used to **image** hidden speech articulators, such as **the tongue**
  - Effective as biofeedback tool in **L2 pronunciation training** (Gick et al., 2008)
- **Ultrasound overlay videos** are a way to get around technological limitations
  - More widely accessible
  - Easier to understand
- **Potential advantages** for usage of overlay videos in **learning pronunciation**
  - Student survey data: helpful for novel phonetic contrasts (Yamane et al., 2015)
  - Pilot experimental data: improved Cantonese vowel contrast production (Bliss et al., 2016)
- The current study builds on pilot study with improved methods and larger sample size.

## Research Question

Do Cantonese-learning students who interact with ultrasound overlay videos improve in distinguishing Cantonese sound contrasts in **(i) production** and **(ii) perception**?

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- (i) Can they produce a larger contrast between the sounds?
- (ii) Can they perceive the sounds and their contrast more accurately?

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## Methods

Participants: **30 students** enrolled in Introductory Cantonese

Materials: 2 Training Websites with either ultrasound overlay videos or audio

Variables:

| Sound Contrasts |                                  |  |  |
|-----------------|----------------------------------|--|--|
| i)              | Low central vowels               |  |  |
|                 | - aa [a] vs. a [e]               |  |  |
| ii)             | Final unreleased stop consonants |  |  |
|                 | - p [p̚] vs. t [t̚] vs. k [k̚]   |  |  |

Training Words for Vowel and Stop Contrast

| Vowel   | Set 1        | Set 2          |
|---------|--------------|----------------|
| a [e]   | 心 <i>sām</i> | 行 <i>hàhng</i> |
| aa [a]  | 三 <i>sām</i> | 行 <i>hàhng</i> |
| Stop    | Set 3        | Set 4          |
| -p [p̚] | 汁 <i>jāp</i> | 插 <i>chaap</i> |
| -t [t̚] | 質 <i>jāt</i> | 擦 <i>chaat</i> |
| -k [k̚] | 側 <i>jāk</i> | 拆 <i>chaak</i> |

## Evaluations

- a) Production Recordings
  - numerals, vocab
- b) Perception Quiz
  - yes/no, same/different, 123

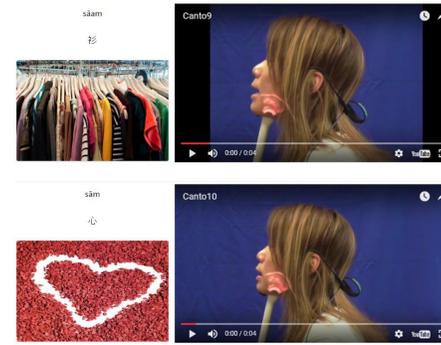
Perception Quiz Question Types

- Yes/No** Can identify if vowel/stop is the correct sound
- Same/Different** Can discriminate correctly between two sounds
- 1-2-3 (or ABX)** Can discriminate between two sounds and identify the odd one out

## Training Conditions

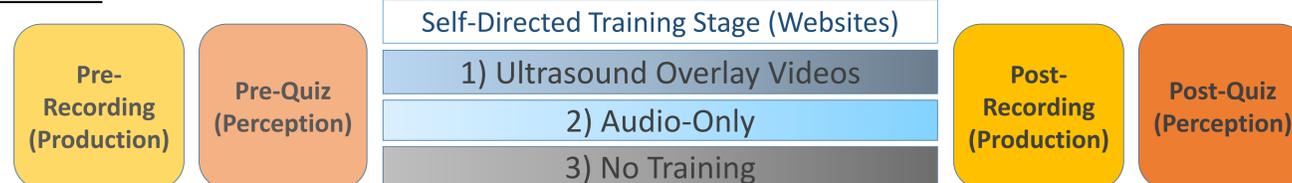
- 1) Ultrasound Overlay Video (n= 11)
- 2) Audio-only (n=9)
- 3) No Training\* (n=10)
  - \*Self-selected group

Training Website - Ultrasound Overlay Videos



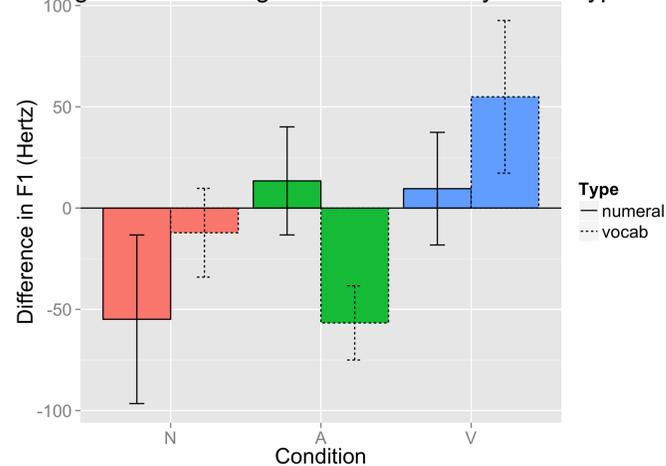
<http://blogs.ubc.ca/cantonesepronunciation/>

Procedure:

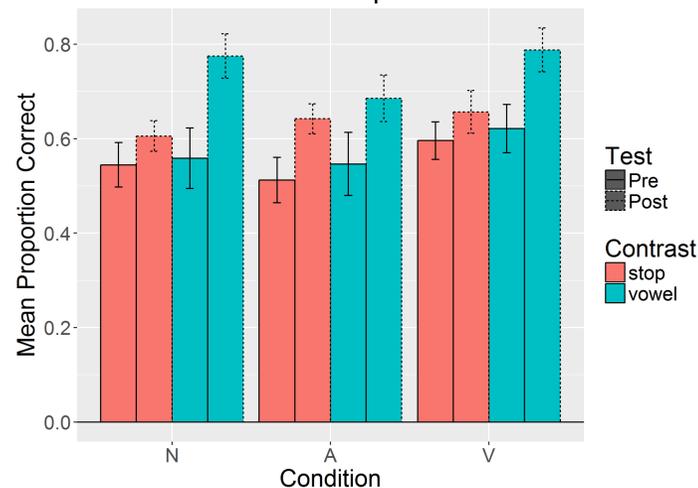


## Results

Change in Vowel Height Differentiation by Word Type



Scores on Perception Quiz



## Discussion

### Production

- Trend of vowel production improvement in *Ultrasound Overlay Video* training condition
- Largest increase from pre- to post-recording in vowel height (F1 value) differentiation between *a* and *aa*

### Perception

- No significant differences in perception between training conditions or different question types
- All groups had improved scores for vowel and stop questions in the post-quiz

## Conclusion

- Corroborates pilot study data in showing improved vowel contrast production
- No apparent benefits for perception of vowel or consonant contrasts

## Future Directions

- Analyze stop consonant production data
- Gather nativeness rating data as second measure of productive abilities
- Test benefits of videos when more explicit instruction

## References

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