

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**?

- (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

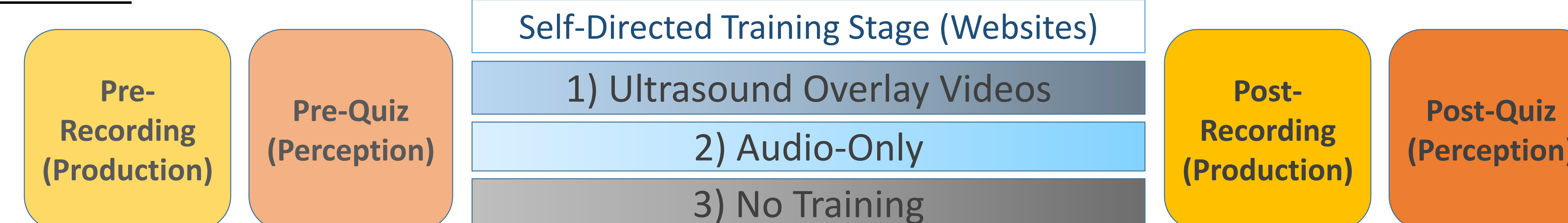
Training Conditions

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

Training Website - Ultrasound Overlay Videos

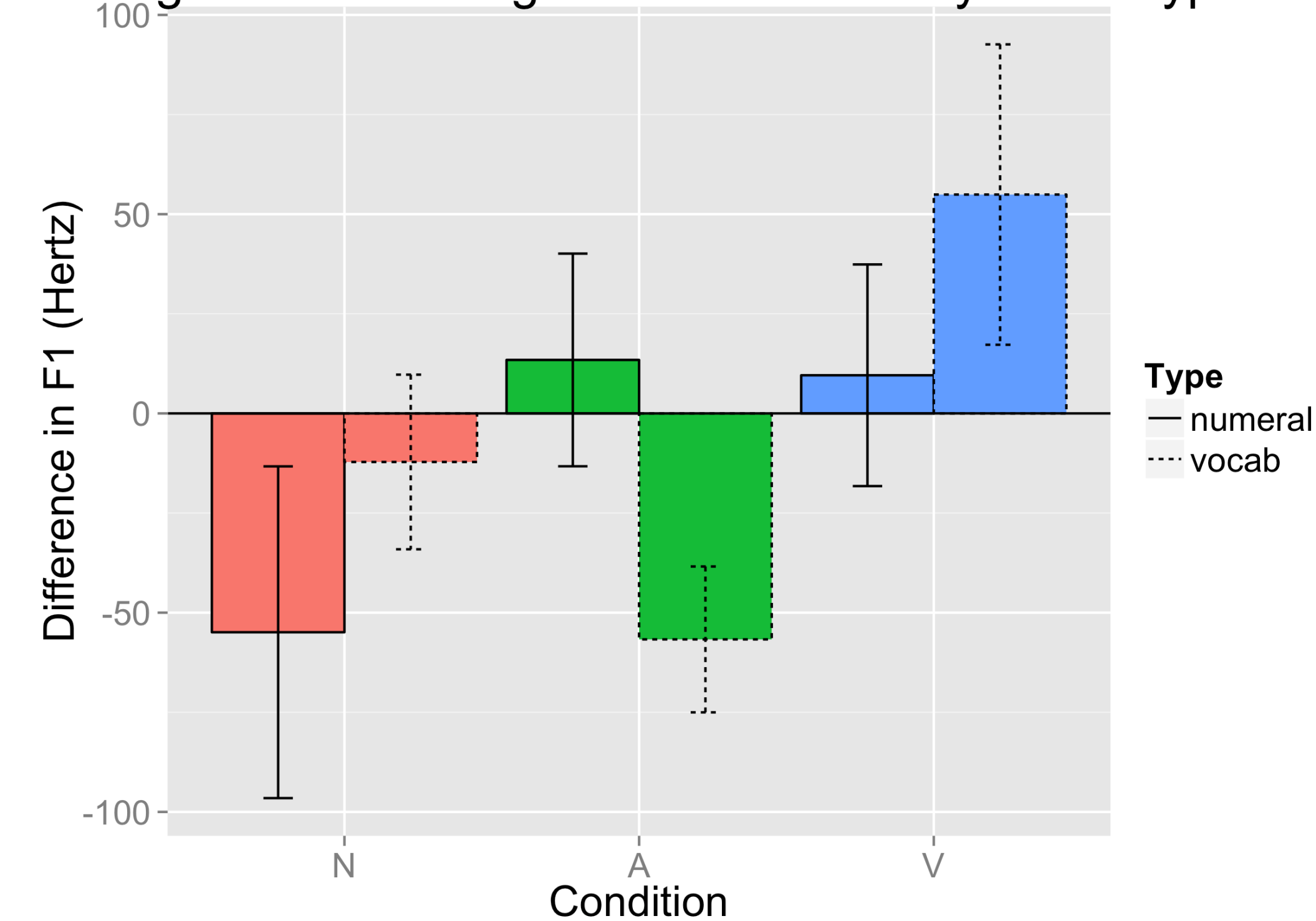


Procedure:

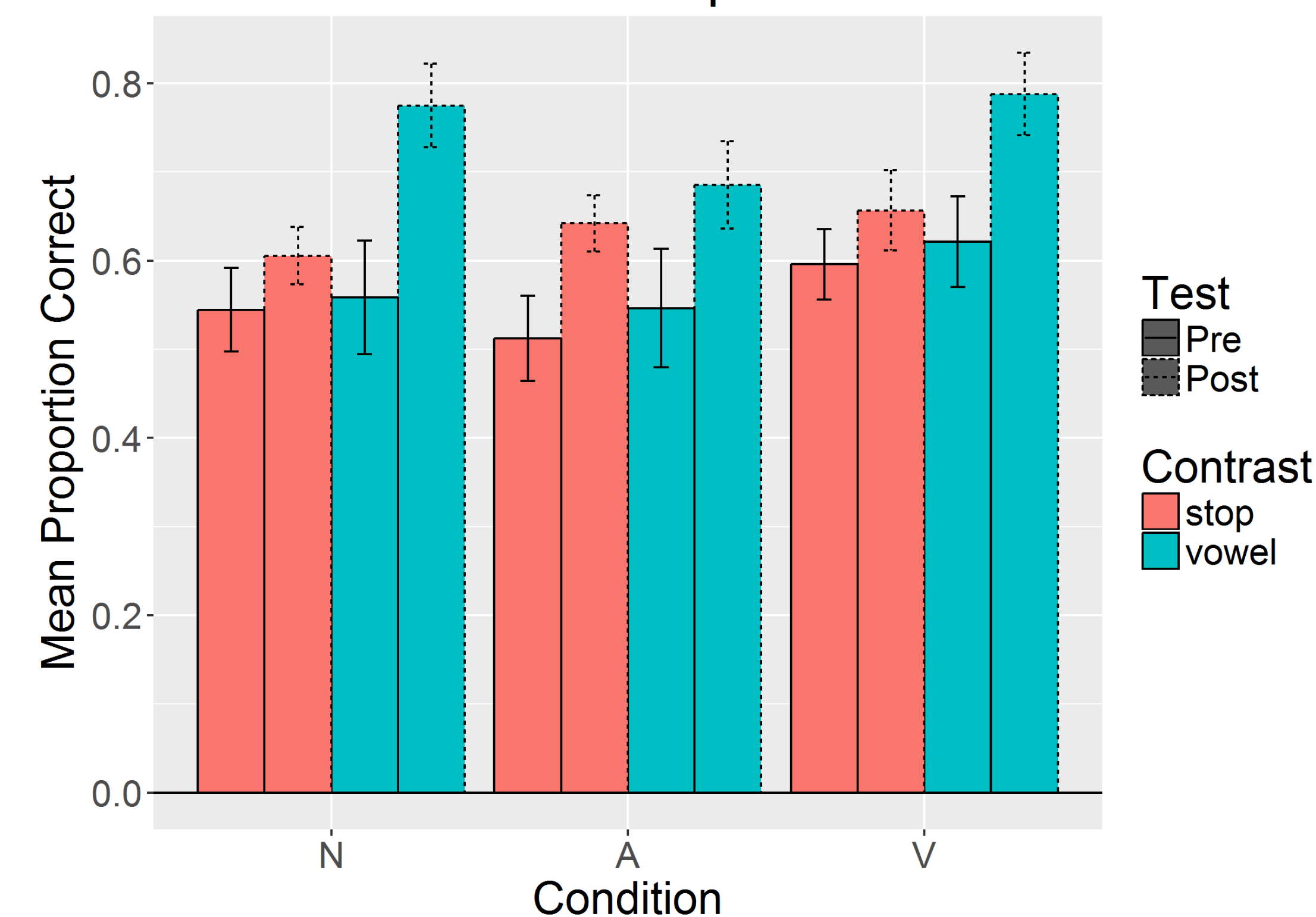


Results

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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