Web-based high variability phonetic training on L2 vowel and coda identification

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Introduction

- The acquisition of Korean vowels /o, ʌ, u/ and codas /k, ŋ/ appears to be difficult for beginner Mandarin learners of Korean (Ryu 2019).

Mandarin	Korean
5 monophthongs /i, y, ə, u, ɑ/	7 monophthongs /a, e, i, o, u, ɨ, ʌ /
2 coda consonants /n, ŋ/	7 coda consonants /p, t, k, n, m, ŋ ,l/

- To date, there are no studies of training effects on the perception of Korean vowels and codas by L2 learners.

- There are few studies of web-based computer-assisted pronunciation teaching (Thomson 2011, 2014).

Web-based perceptual training program

Web server

Develop online training programs

jspsych

Learners

Research questions

Question 1	Does **web-based high variability perceptual training** enhance Mandarin L2 learners' perception of Korean vowels and codas?
Question 2	Does **explicit training** lead to greater improvement in the perception of Korean vowels and codas than **implicit training**?
Question 3	Can the training effect be **transferred** to sounds in new phonetic contexts?

Explicit vs. implicit training

Explicit training

Learners **attend to target sounds** and **they have conscious awareness of what is being learned** during perceptual training.

Implicit training

Learners **are passively exposed to target sounds** so that **they do not know what is being learned** during perceptual training.

Participants

- 45 native Mandarin listeners who are enrolled in beginner-level Korean courses at universities in Toronto, Canada.

- Randomly assigned to three groups of 15 each.

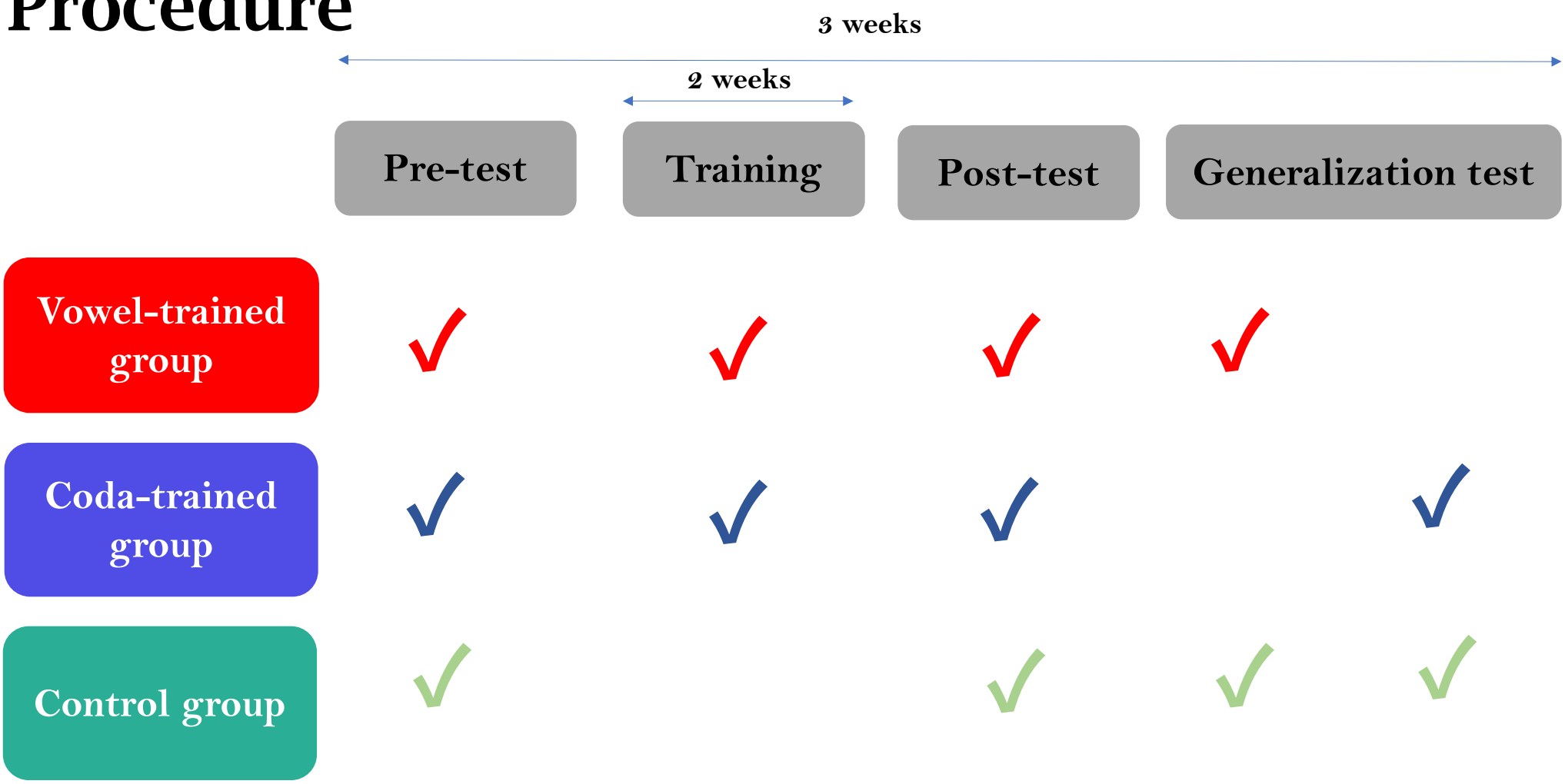
15 subjects	15 subjects	15 subjects
Vowel-trained group	Coda-trained group	Control group

Stimuli

- 98 monosyllabic Korean words including seven target vowels and codas were naturally produced by 6 native Korean speakers.

<table>
<tr><th>Phase</th><th>Stimuli</th><th>Number of native Korean speakers</th><th>Number of stimuli</th></tr>
<tr><td>Training</td><td rowspan="3">49 words
/hVC/</td><td>4 speakers</td><td>196 tokens</td></tr>
<tr><td>Pre-test</td><td rowspan="3">2 speakers</td><td rowspan="3">98 tokens</td></tr>
<tr><td>Post-test</td></tr>
<tr><td>Generalization test</td><td>49 words
/kVC/</td></tr>
</table>

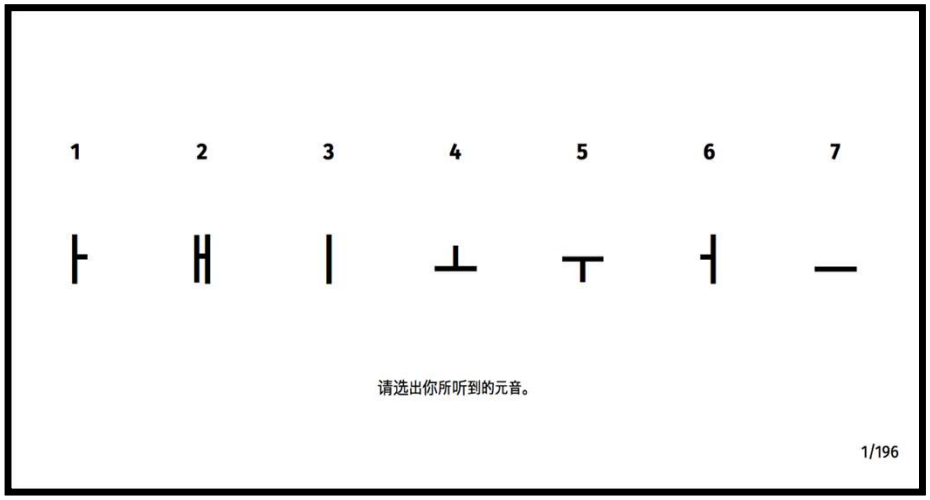
Procedure


3 weeks
2 weeks
Pre-test
Training
Post-test
Generalization test
Vowel-trained group
Coda-trained group
Control group

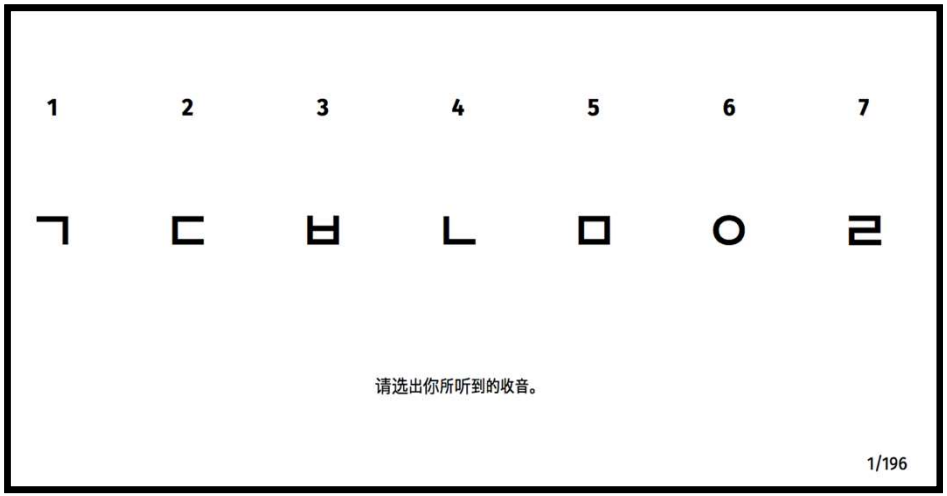
Web-based perceptual training

- 8 identification training sessions in a quiet place.
- Immediate feedback.
- Two training groups were **exposed to the same stimuli**, but focused on **different target segments**.

Vowel-trained group



Coda-trained group



Statistical analysis

- A mixed-effects logistic model in R (Baayen 2008; R CoreTeam 2017)
  - The package *lme4* (Bates et al 2011)
  - Dependent variable: Learners' response (correct:1, incorrect:0)
  - Fixed effects: Test (pre-test, post-test, generalization test),
    group (vowel-trained, coda-trained and control group),
    and their interactions
  - Random effects: Subject, item

Effects of explicit vs. implicit training on L2 perception

- **Explicit training**: Significant improvement for both vowels and codas.
- **Implicit training**: Significant improvement for vowels, not codas.

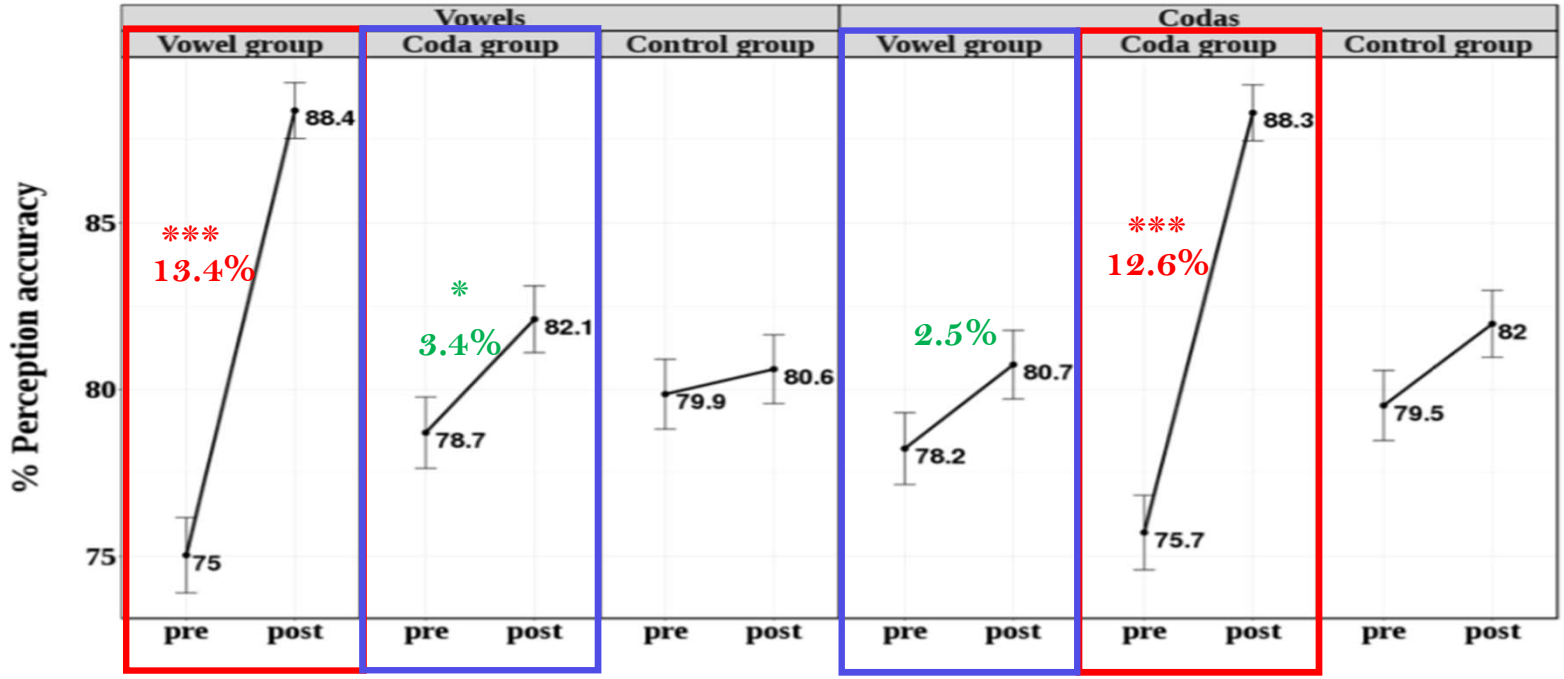


Figure 1. Identification accuracy for Korean vowels and codas across groups at pre-and post-test

Perception accuracy of Korean vowels and codas

- The hierarchy of difficulty of Korean vowel perception: **o > ʌ > u > e > a, > ɨ > i**
- The hierarchy of difficulty of Korean coda perception: **k > ŋ > t> n > p> m> l**

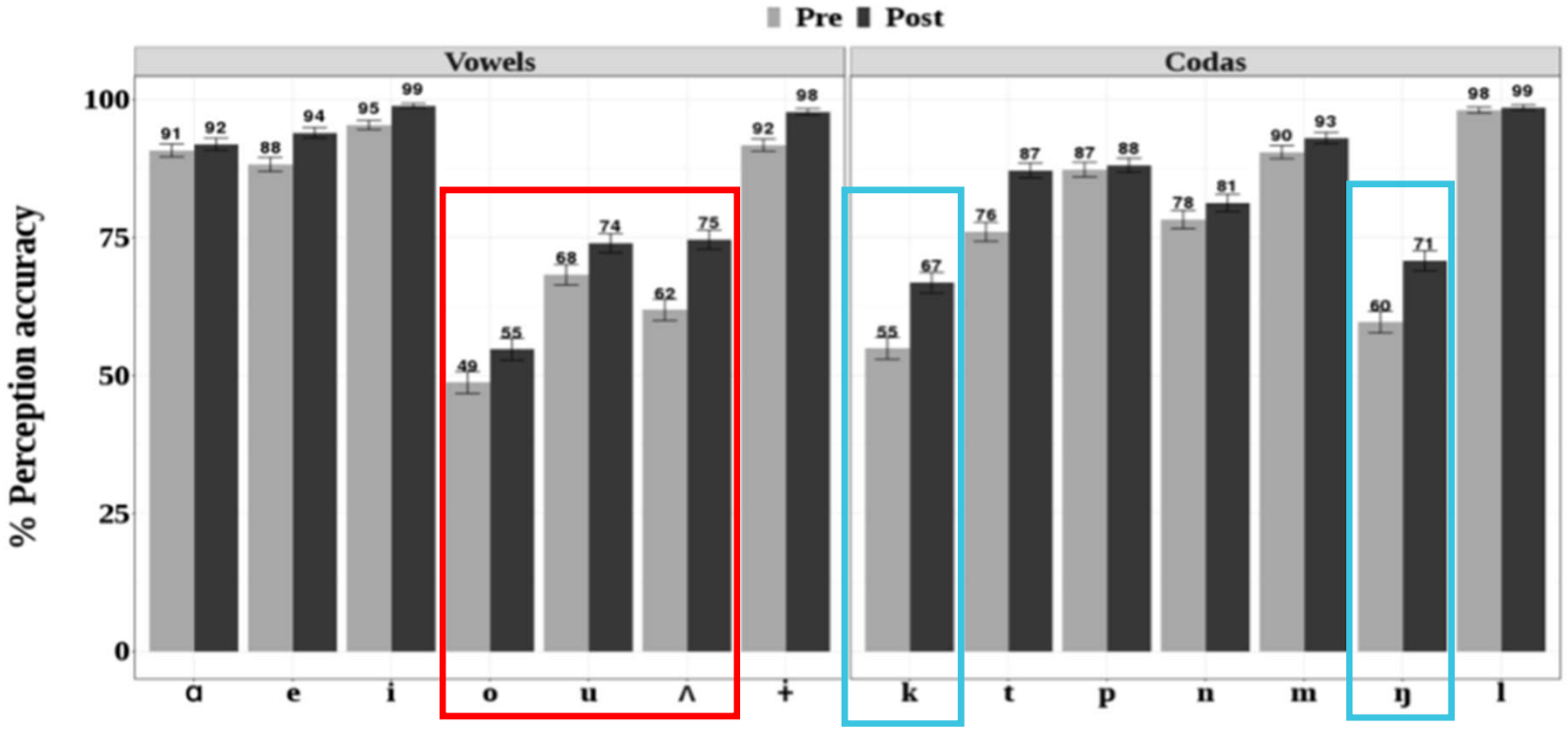


Figure 2. All groups' identification accuracy of individual Korean vowels and codas at pre-test and post-test

Perceptual improvement of individual Korean vowels

- **Explicit training**: Perception of **all Korean vowels** significantly improved.
- **Implicit training**: Perception of **vowels /ɨ, ʌ/** significantly improved.

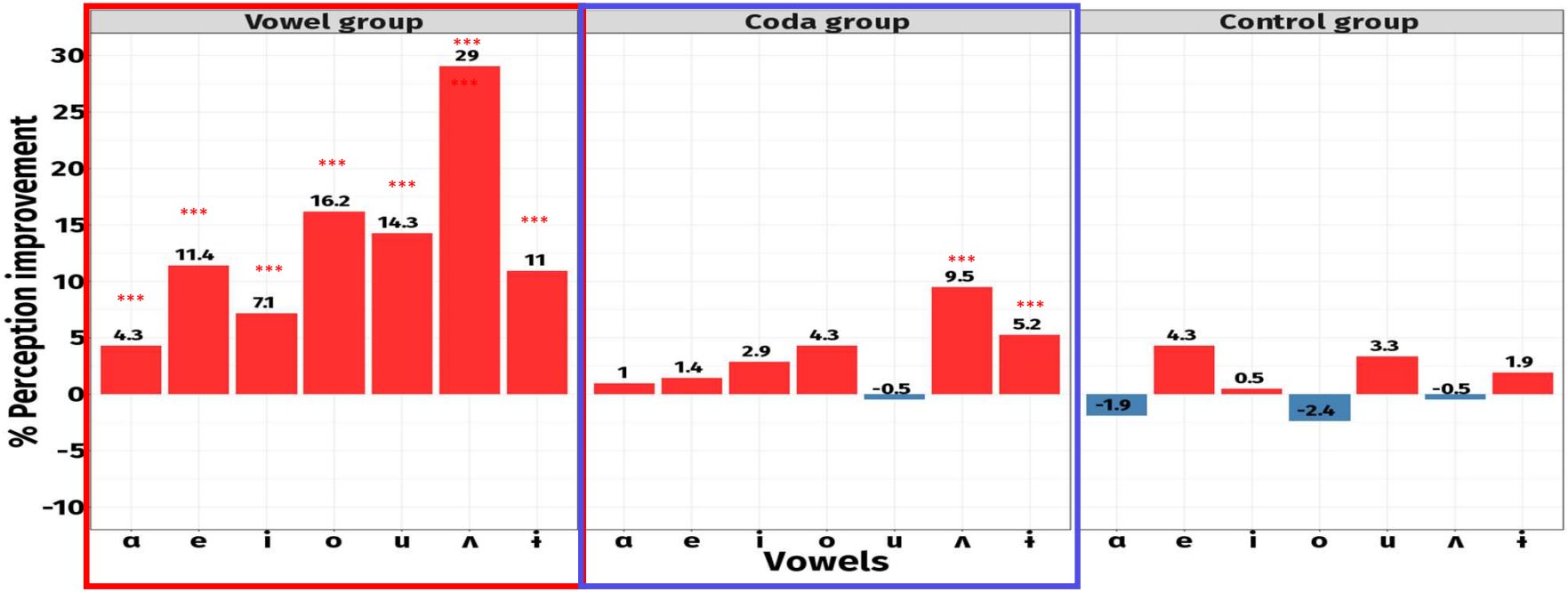


Figure 3. Perception improvement of individual vowels by group

Perceptual improvement of individual Korean codas

- **Explicit training**: Perception of Korean codas /k, t, ŋ, m/ significantly improved.
- **Implicit training**: Perception of Korean coda /n/ significantly improved.

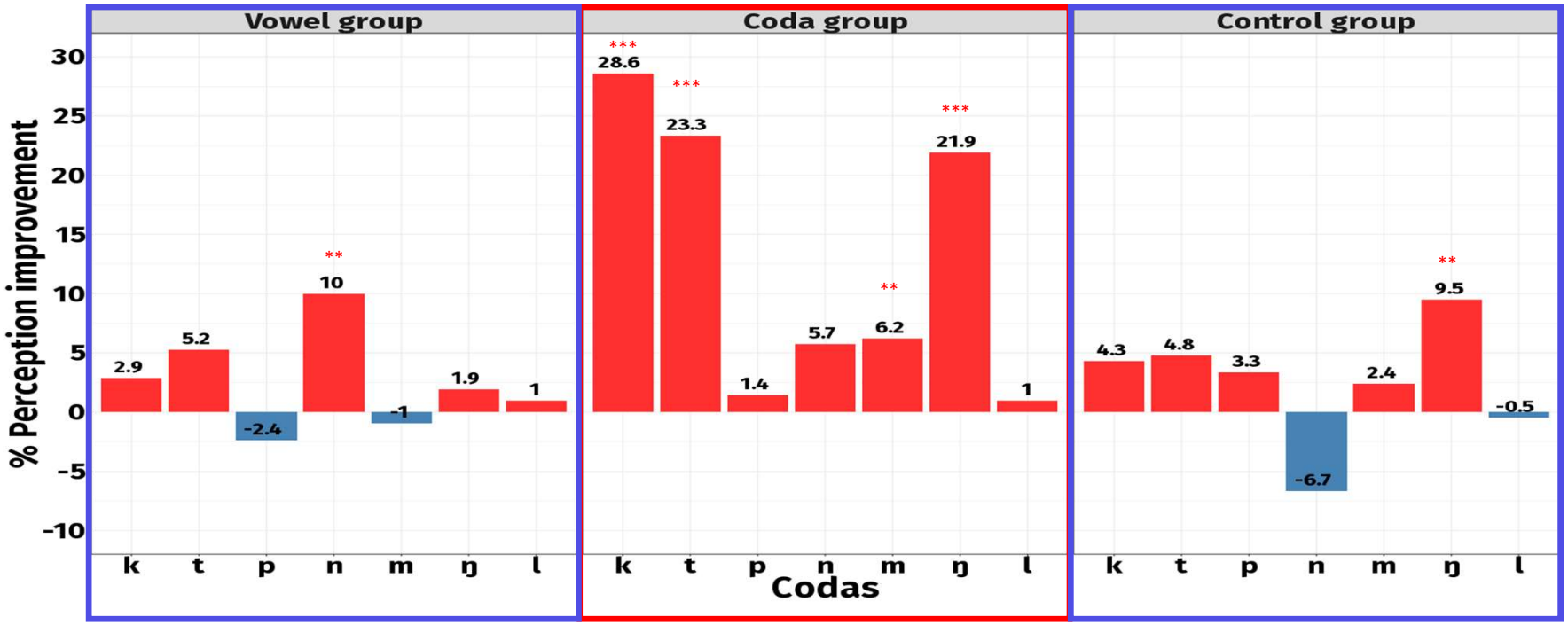


Figure 4. Perception improvement of individual codas by group

Generalization effects of training

- Both explicit training groups maintained their increase in accuracy with novel stimuli.

Table 1. Mean accuracy scores for Korean vowels and codas at pre-test, post-test and generalization test

	Korean vowels			Korean codas		
	Pre-test	Post-test	Generalization test	Pre-test	Post-test	Generalization test
Vowel-trained group	75.03 (43.30)	88.37 (32.07)	88.64 (31.74)			
Coda-trained group				75.71 (42.90)	88.30 (32.15)	87.28 (33.33)
Control group	79.86 (40.12)	80.61 (39.55)	85.58 (35.14)	79.52 (40.37)	81.97 (38.45)	81.02 (39.23)

13%

13%

Conclusions

1. Effects of web-based high variability phonetic training

- Two training groups enhanced their perception of the target sounds.

2. Effects of implicit vs. explicit training

- **Asymmetrical perceptual improvements in training**

  (1) Explicit training is beneficial for the perception of both L2 vowels and L2 codas.

  (2) Implicit training is effective for the perception of L2 vowels, but not L2 codas.

  - Acoustic salience of Korean codas which are obligately unreleased.
  - Stimuli-position effect: Learners likely attend to sounds before a target sounds but not after.

3. Generalization effect of training

- Learners can generalize their learning from training to new phonetic contexts.

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