

USING INNOVATIVE AUDITORY AND AUDIOVISUAL PERCEPTUAL TRAINING IN THE VIRTUAL AGE:

EVIDENCE OF IMPROVED L2 KOREAN
SOUND ACQUISITION

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MOTIVATION FOR THE STUDY

- Since mask-wearing is the new reality due to COVID-19, it is important to know whether the use of masks impedes accuracy for learners acquiring L2 sounds.
- When language instructors teach with a mask on in the classroom, students are not able to see important cues for articulation, which might affect acquisition of L2 sounds.

SPEECH PERCEPTION

- Visual gestures support speech perception (Ross 2007, Sumbly & Pollack 1954, Zion Golumbic et al 2013)
 - Sumbly & Pollack (1954): In face-to-face conversation, speech perception is influenced by the **actual sound of speech** as well as **facial and lip movements of speakers**
- Infants can match **speech sounds** and **lip movements** at just a few months old (Dodd 1979, Kuhl & Meltzoff 1982, Lewkowicz & Hansen 2012)
- Children from 6 to 10 years are still **less sensitive to visual speech cues than adults** (Massaro et al 1986, McGurk & MacDonald 1976, Ross et al 2011, Sekiyama & Burnham 2008)

AUDITORY AND AUDIOVISUAL TRAINING IN L2 SPEECH

- Most of the **auditory-only (AO)** and **audiovisual (AV) perceptual training** studies have investigated **problematic L2 consonants** and have found **conflicting results**
 - **Audiovisual speech** is more helpful in training L2 phonological skills and pronunciation than **auditory speech only** (Hardison, 2003, Hazan et al 2005, Hirata & Kelly, 2010 Kawase et al 2008, Lidestam et al 2014, Richie & Kewley-Port, 2008)
 - There were **no significant differences** in the perception of French nasal vowels between the L2 American English **AV** and **AO** groups. However, the pronunciation accuracy of the **AV** training group improved significantly compared to the **AO** training group, suggesting that seeing facial gestures is helpful to improve L2 pronunciation (Inceoglu 2016)
- To date, there are no studies of online **AO** and **AV** perceptual training on the perception of Korean vowels

PURPOSE OF THIS STUDY

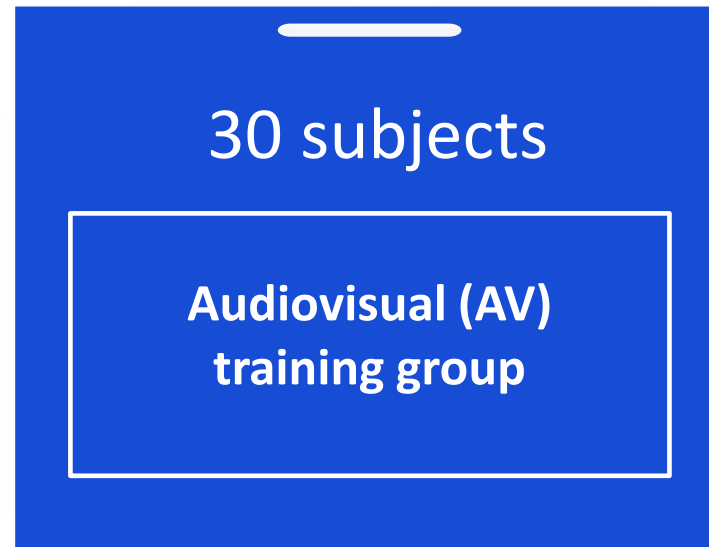
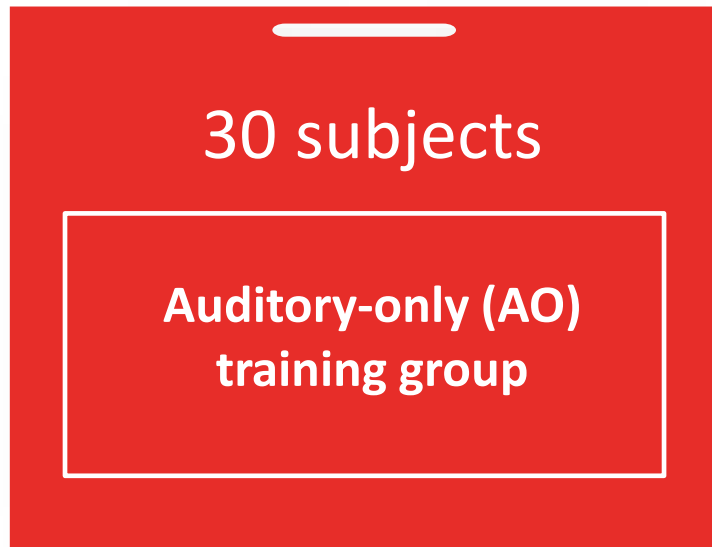
- Develop web-based AO and AV training programs to help L2 learners of Korean improve their perception and pronunciation of Korean vowels
- Assess the effects of AO and AV perceptual training on the perception of Korean vowels by L2 learners
 - Understand whether L2 learners can benefit from online training to make better use of phonetic information in the perception of Korean vowels with and without access to visual speechreading cues

RESEARCH QUESTIONS

- (1) Does **Auditory-only (AO)** and **Audiovisual (AV)** perceptual training improve L2 learners' perception of Korean vowels?
- (2) Does **AV** perceptual training lead to greater improvement in the perception of Korean vowels than **AO** perceptual training?

PARTICIPANTS

- 60 undergraduate students enrolled in the beginning Korean course at the Penn State University, USA.
- Assigned to **two groups** of 30 each.



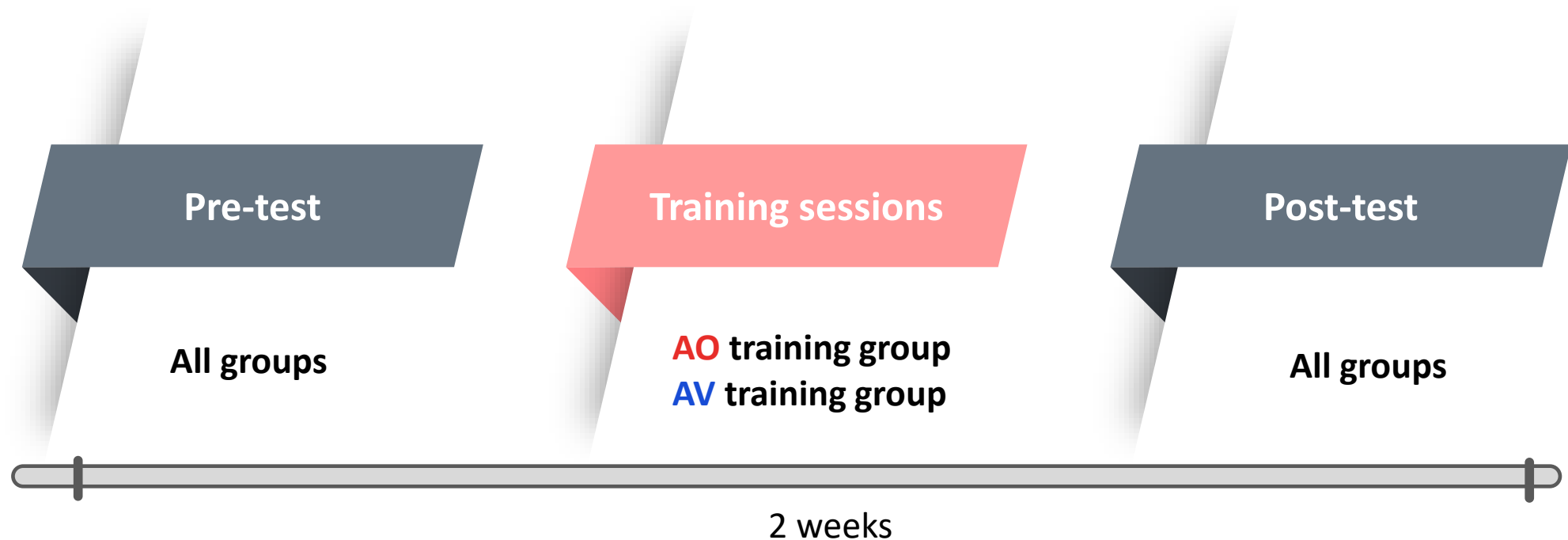
ONLINE PERCEPTUAL TRAINING

- Online auditory and audiovisual perceptual training programs are developed using **jsPsych**
- Learners access **a training website** using their devices, such as computers, laptops, iPads and cellphones anytime and anywhere



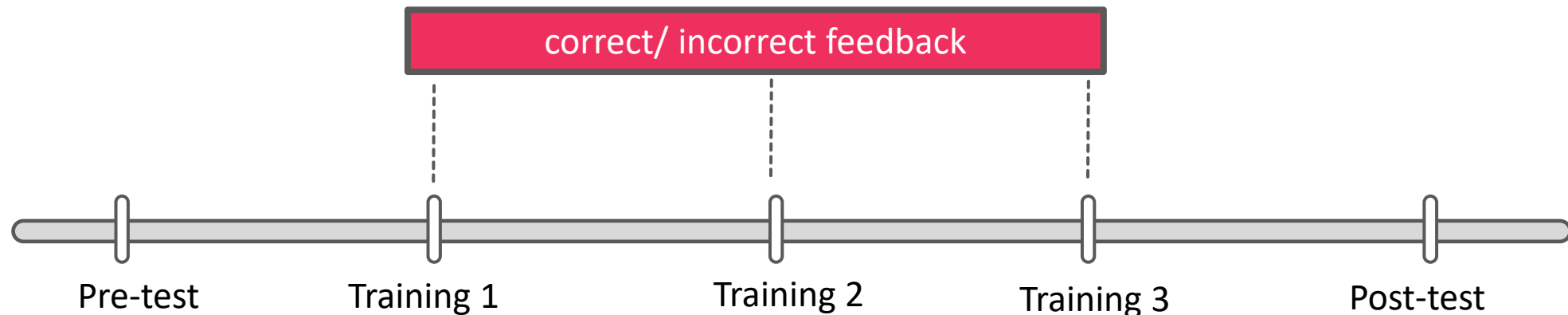
PROCEDURE

- All groups completed **identification tasks** using their devices for the pre-test, three online training sessions and post-test.



IDENTIFICATION TASK

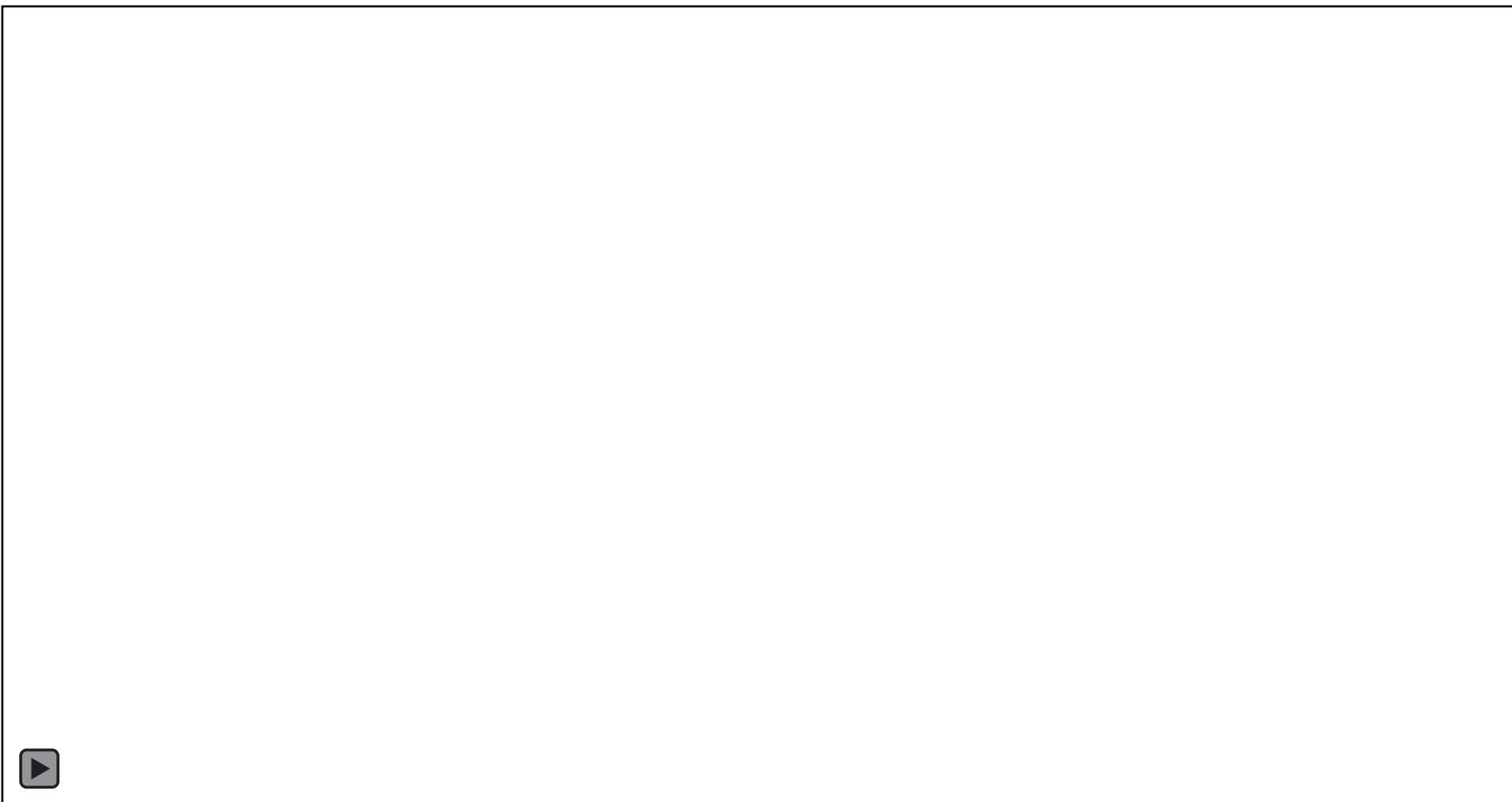
- Learners heard a sound and were asked to click the corresponding vowel on their screen during the pre-test, training and post-test.
- **Immediate feedback** was provided only in training sessions.



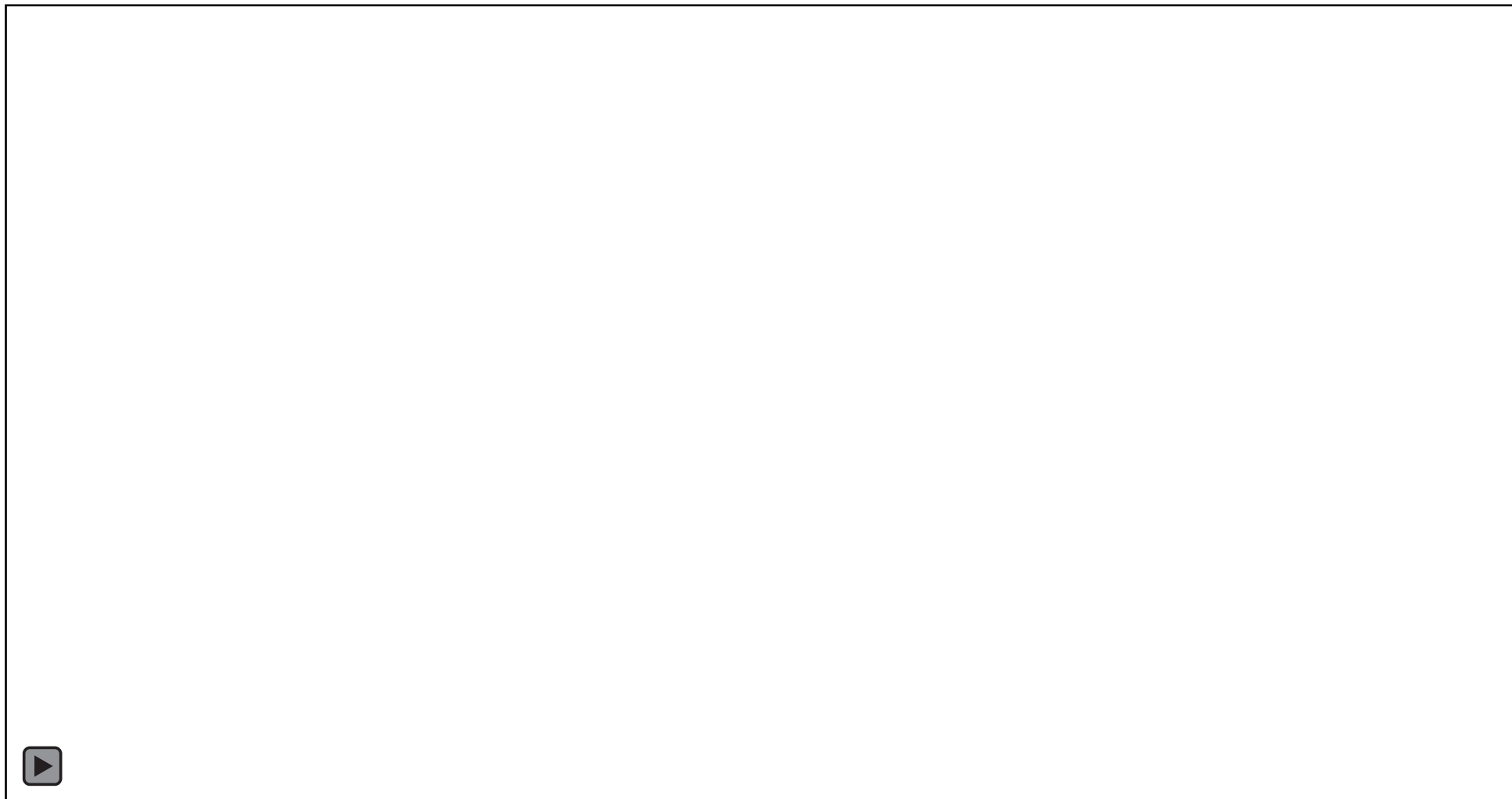
SPEECH MATERIALS

- The stimuli of pre-test, online training sessions, and post-test each consisted of 196 tokens.
 - 98 CV words (7 vowels * 14 consonants) * 2 speakers
 - All stimuli were recorded by native Korean speakers.

AUDITORY-ONLY (AO) TRAINING FOR KOREAN VOWELS



AUDIOVISUAL (AV) TRAINING FOR KOREAN VOWELS



STATISTICAL ANALYSIS

- A mixed-effects logistic regression model in R (Baayen 2008; R CoreTeam 2017)
 - The package *lme4* (Bates et al 2011)
 - Dependent variable: Response (correct vs. incorrect)
 - Fixed effects: Test (pre-test vs. post-test), training group (AO training group vs. AV training group), and their interactions
 - Random effects: Subject, item

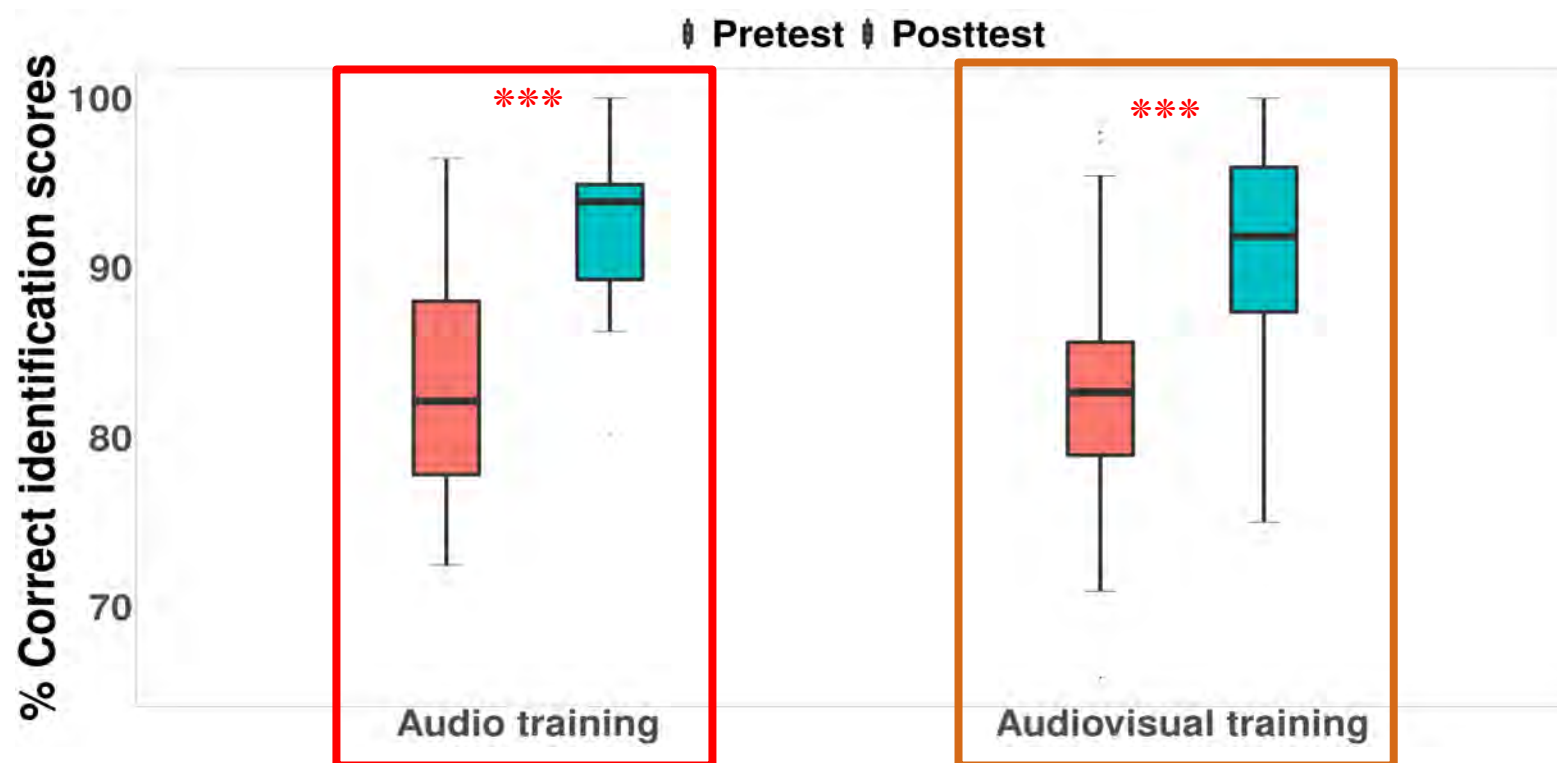
$$\frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

$$dS \geq 0$$

$$\frac{df}{dt} = \lim_{h \rightarrow 0} \frac{f}{h}$$

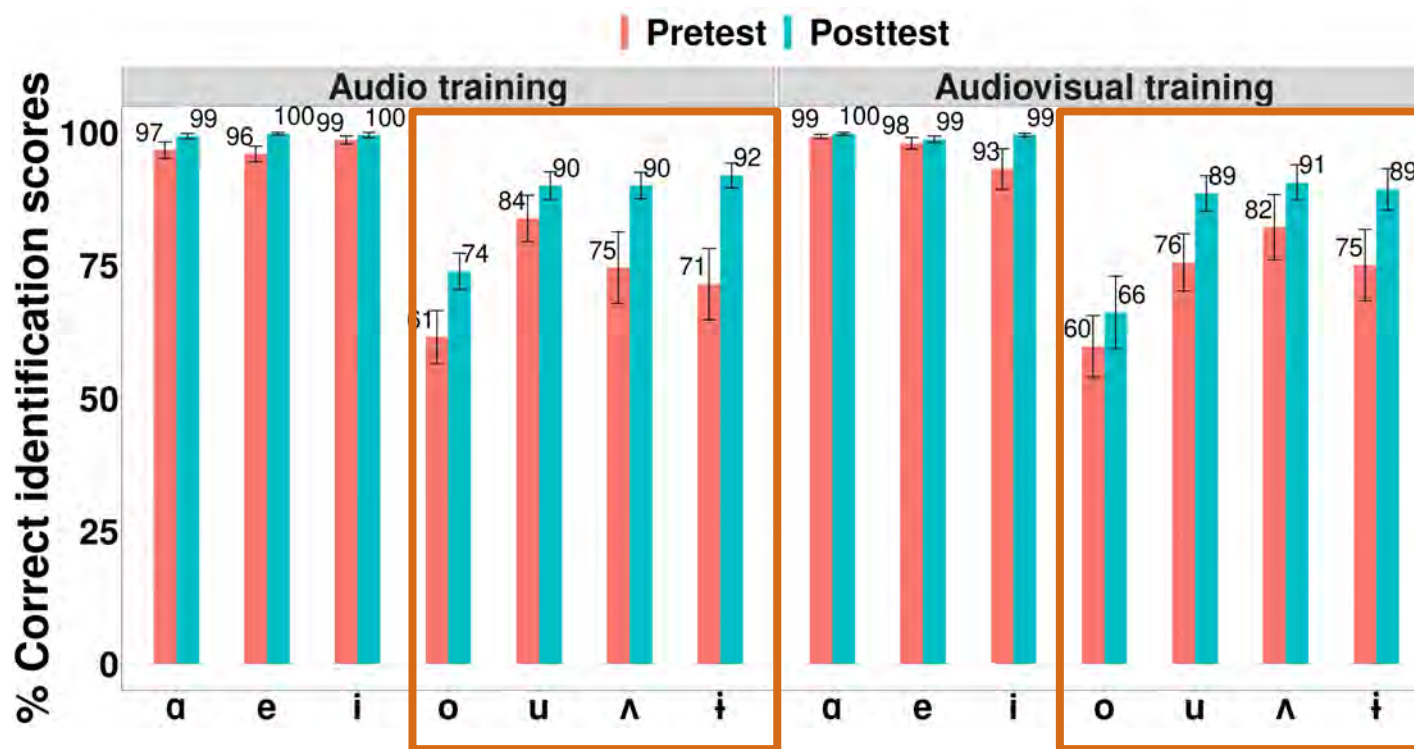
RESULT1: EFFECTS OF AUDITORY & AUDIOVISUAL TRAINING

- Both groups in **AO** and **AV** training showed significant improvement in the perception of Korean vowels.

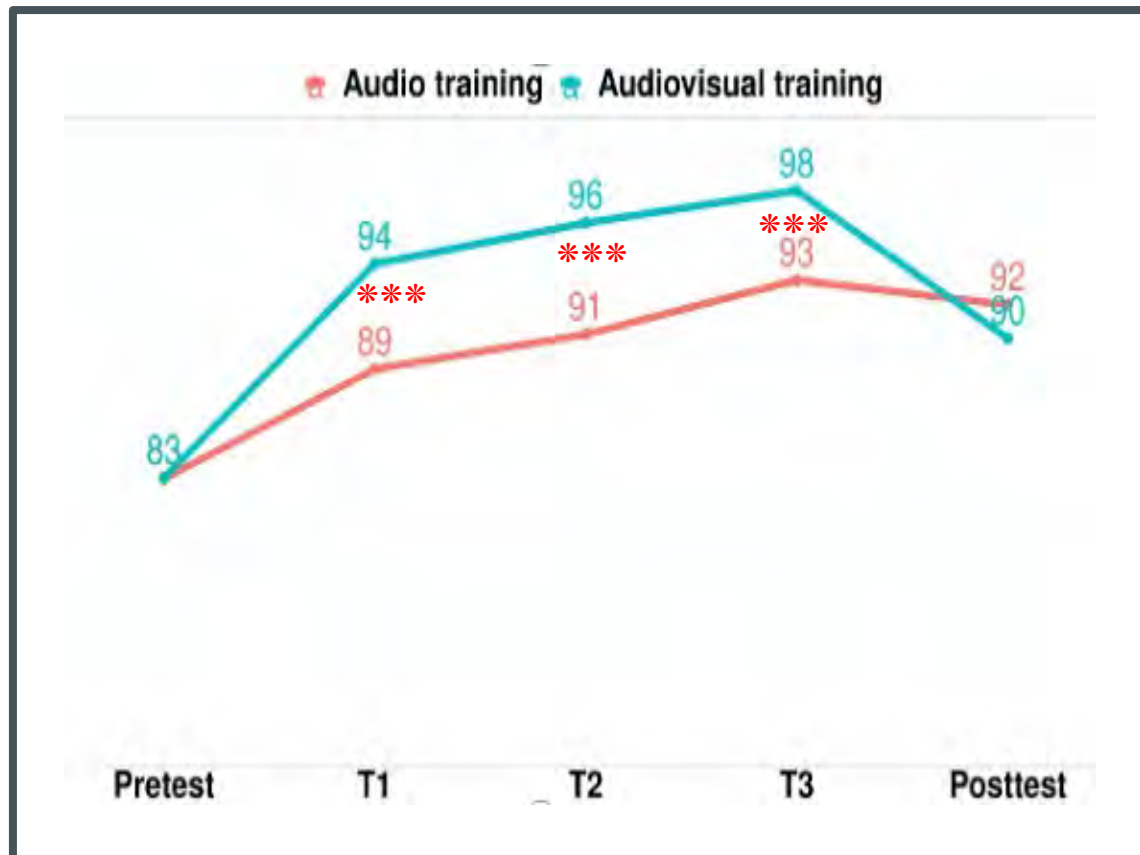


RESULT 2: PERCEPTUAL ACCURACY OF INDIVIDUAL KOREAN VOWELS AT PRE-TEST AND POST-TEST

- The difficulty of Korean vowel perception in both groups: /o, u, ʌ, ɨ / > /a, e, i/
- The perception of all Korean vowels improved after training.



RESULT 3: PERCEPTUAL DEVELOPMENT OF L2 VOWELS



- **Pre-test:** There was **no significant difference** between the **AO** and **AV** training groups.
- **Training sessions:** There were **significant differences** between the groups in all sessions.
 - **AV** training is more effective in the perception of Korean vowels than the **AO** training in the training period.
- **Post-test:** There was no significant difference between the two groups.
 - The perceptual knowledge achieved during training did not remain at post-test

WHAT HAPPENED TO THE AUDIOVISUAL TRAINING GROUP DURING TRAINING SESSIONS?

Possibility 1: The **AV training group** *just* memorized the relation between the image and the sound during the training sessions so that they showed high perceptual accuracy during training sessions, *but they lost sensitivity to visual cues at the post-test*, which did not provide any visual articulation information



P1



S1

Next step: Provide acoustic and visual cues at pre- and post-test

WHAT HAPPENED TO THE AUDIOVISUAL TRAINING GROUP DURING TRAINING SESSIONS?

Possibility 2: The **AV training** with visual cues might reinforce the learners' phonological representations during training sessions, but the perceptual learning does not remain without the visual information



P2



S2

Next step: More training sessions might be needed so that learners can deepen their understanding of how to identify target sounds along with liprounding images

FINDINGS

- This study examined the effects of **AO** and **AV perceptual training** on the perception of Korean vowels by L2 learners.



Both training groups significantly improved their perceptual accuracy of Korean vowels.

- ✓ **Perceptual learning of L2 vowels can be enhanced by both methods of online training.**



There was no significant difference between the two training groups at post-test.

- ✓ **Perceptual training with AV tokens does not lead to greater improvement in the perception of L2 vowels than training with AO tokens.**

PEDAGOGICAL IMPLICATIONS

Implication 1

Learners can improve their perception of L2 sounds **whether visual cues are present or not.**

Implication 2

Innovative pedagogical tools such as online **AV** and **AO perceptual training programs** can be freely used by L2 learners both inside and outside of the classroom to enhance L2 learning in the virtual age.

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