

COMPARING THE IMPACTS OF
AUDIO-ONLY AND AUDIOVISUAL
TRAINING ON THE PERCEPTION
OF KOREAN VOWELS

청각과 시청각 훈련의 한국어 모음 지각 향상
비교

Na Young Ryu

Penn State University

Aug 20, 2021

The Acoustical Society of Korea

ACQUISITION OF KOREAN VOWELS

- Ryu (2017, 2018): L2 learners of Korean have particular difficulty perceiving Korean vowels /o, u, ʌ/
- English listeners with a larger vowel inventory have higher identification accuracy scores for Korean vowels than Mandarin listeners with a small vowel inventory

ACROSS-LANGUAGE ACOUSTIC COMPARISON OF VOWELS

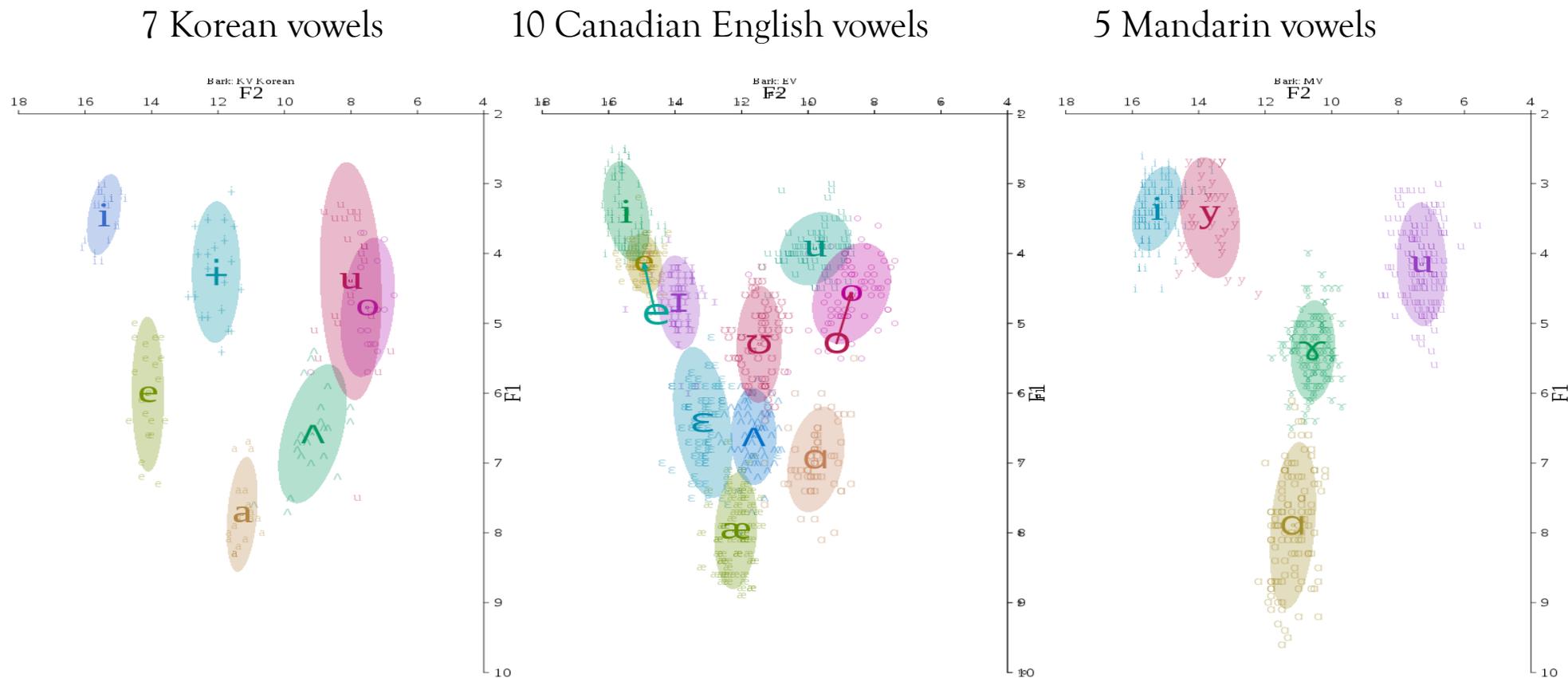


Figure 1. First formant (F1) and second formant (F2) (bark) plots of Korean, English and Mandarin vowels

PRODUCTION OF KOREAN VOWELS

- Korean [a, e, i] produced by English and Mandarin speakers have similar F2 values to L1 Korean.
- Korean [o, u, ʌ] produced by English and Mandarin speakers have relatively lower F1 values than L1 Korean.

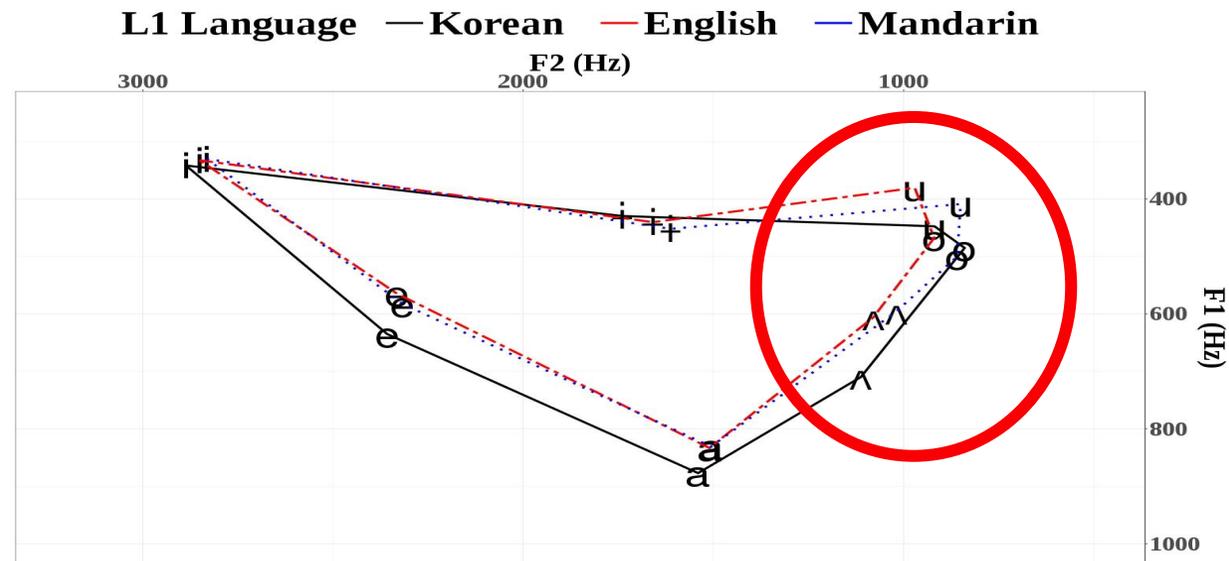


Figure 2. Comparison of Korean vowels produced by native speakers of Korean, English and Mandarin

EFFECTS OF PERCEPTUAL TRAINING ON L2 SPEECH PERCEPTION

- To improve L2 learners' perception accuracy of non-native sounds, a variety of perceptual training programs have been proposed.
 - **Audio-only perception training** (Aliaga-García & Mora, 2009; Barriuso & Hayes-Harb, 2018, Bradlow, Pisoni, Akahane-Yamada, & Tohkura, 1997; Hardison, 2018, Iverson & Evans, 2007; Lively, Yamada, Tohkura, & Pisoni, 1994 ; Lopez-Soto & Kewley-Port, 2009; Rato, 2013; Sakai & Moorman, 2017; Strange & Dittmann, 1984; Thomson 2011 among many others)
 - **Audiovisual perception training** (Hardison 2003, Hazan et al, 2005, Richie and Kewley-Port 2008, Kawase et al 2009, Lynne et al 2013)

AUDIOVISUAL SPEECH TRAINING

- **Cole et al (1996):** Vowels contribute more information to overall auditory speech intelligibility than consonants.
- **Lynne et al (2013):** The audiovisual trained group was significantly more accurate than the only audio trained group.
- **Irwin et al (2014):** Clinical populations (individuals with an autism spectrum disorder, developmental language disorder, or hearing loss) may benefit from specific intervention that includes training on visual speech to support heard speech, because of difficulties processing the unimodal (auditory or visual) signals or because of weak integration.

GOALS OF THE STUDY

- To develop mobile-based auditory-only (AO) and audiovisual (AV) training programs to assess their effectiveness with second language (L2) learners
- To clarify whether bimodal audio-visual training can facilitate the perceptual learning more than monomodal speech training or not
- To investigate how audiovisual training might benefit or impede auditory perceptual learning of L2 Korean vowels

PARTICIPANTS

- A total of 40 learners of Korean participated in this study (Mandarin 35, American 25, mean age = 21 years old)
- They were enrolled in a beginner-level Korean language course at the university level at the time of the study.
- Participants were assigned into two groups: OA training group ($n = 20$ subjects), AV 1 training group ($n = 20$ subjects)

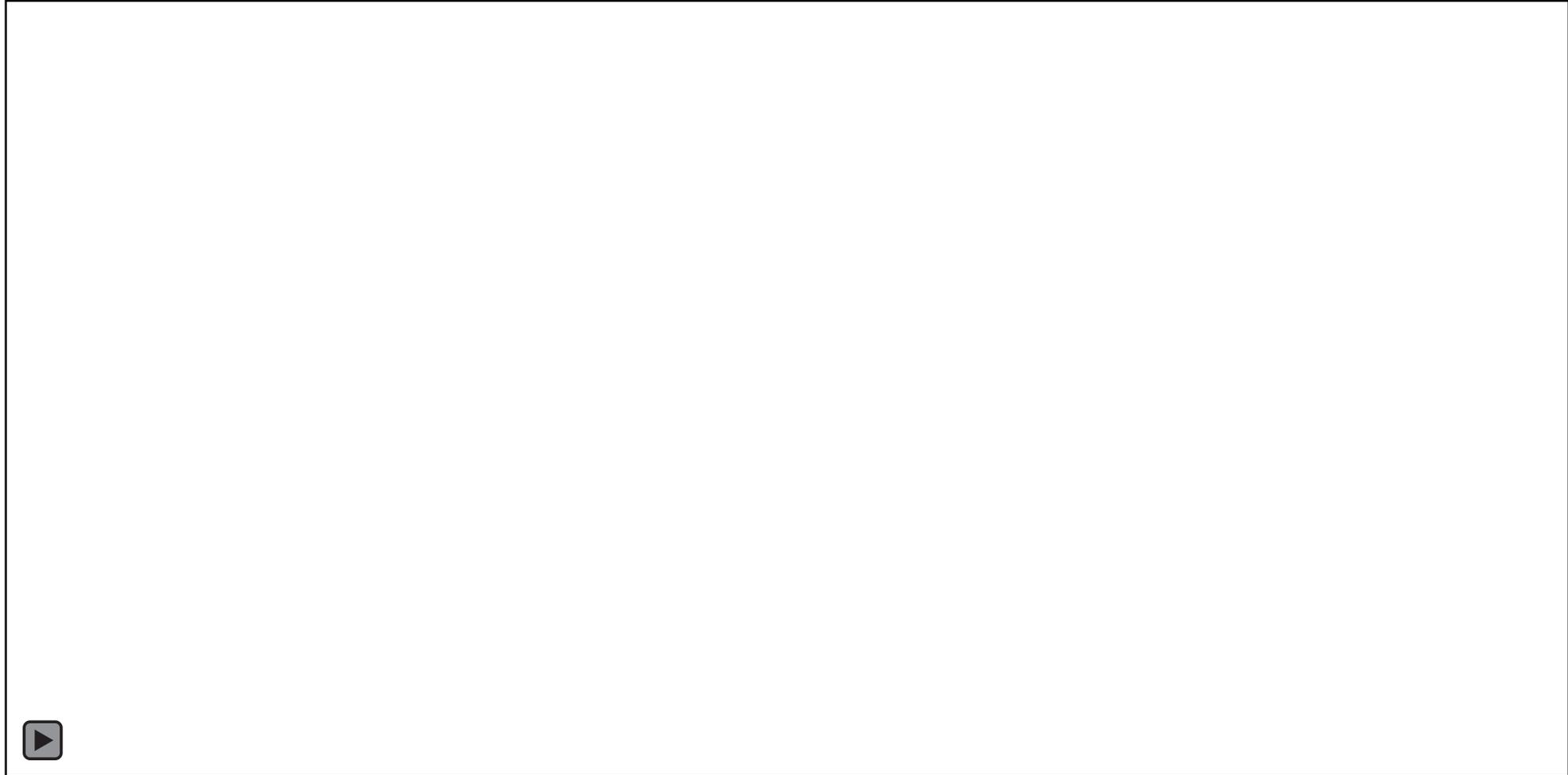
SPEECH MATERIALS

- The stimuli of pre-, post-tests and training consisted of a total number of 196 monosyllabic words including 7 Korean vowels /a, e, i, o, u, ɪ, ʌ/
- The token was recorded by two native Korean speakers (1 male, 1 female)
- During training sessions, the AV group trained with audiovisual speech such that in addition to auditory speech, they were visually provided with lip and articulation information for each speech sound. In contrast, the AO group received analogically the same training but with only auditory speech (voice alone).

PROCEDURE

- All groups completed online identification tasks at pre- and post-test.
 - Identification task: participants heard a sound and were asked to choose the corresponding word. No feedback was provided at pre-and post-test.
- The experimental groups took part in three training session held over a period of approximately 1 week
 - Each session lasts about 20 minutes.
 - Immediate feedback was provided during training

AUDIO PERCEPTIONAL TRAINING



AUDIOVISUAL PERCEPTION TRAINING

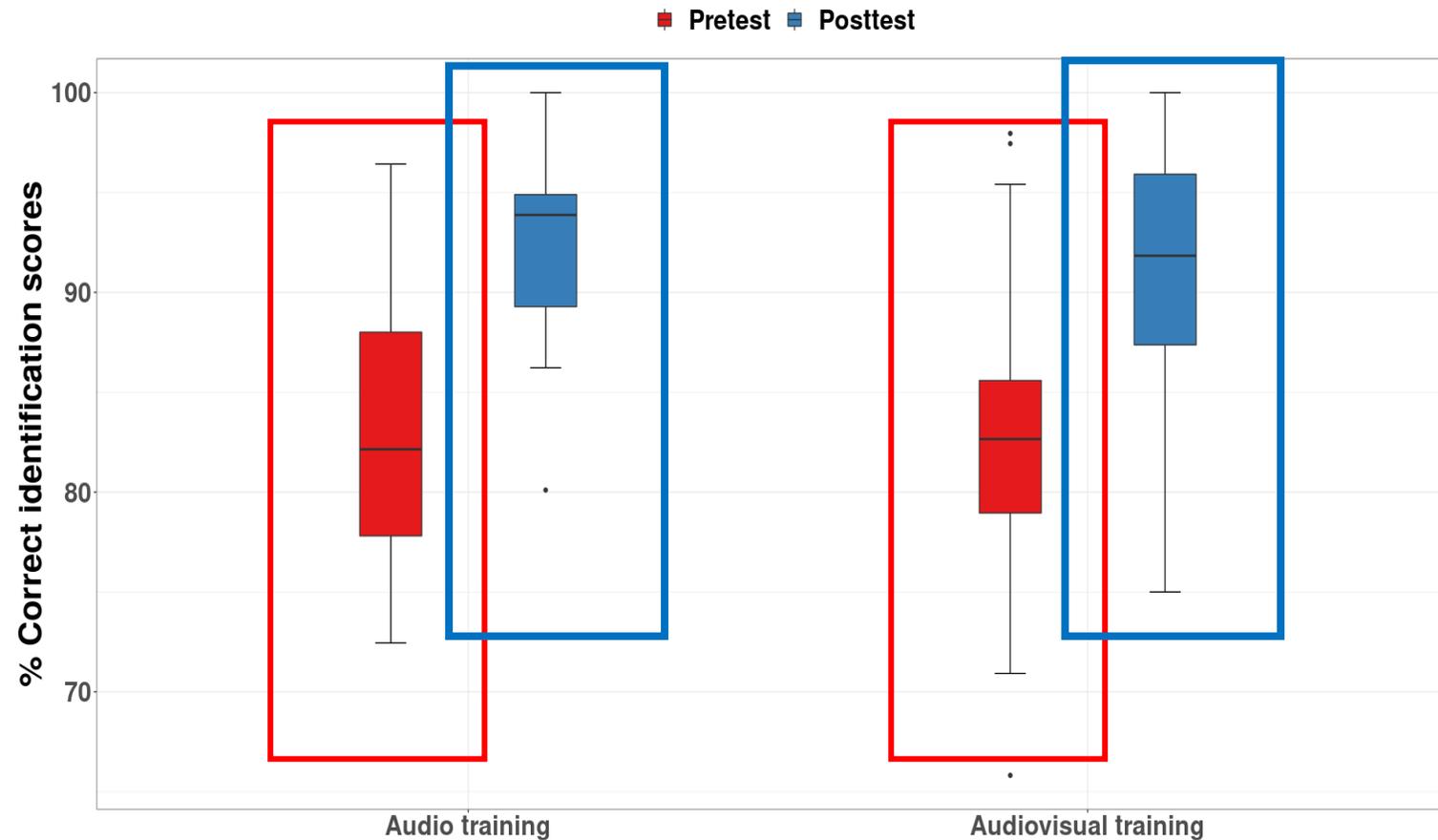


STATISTICAL ANALYSIS

- Mixed effects logistic regression model with *lme4* package in R (R Core Team, 2021)
- Dependent variable
 - Response (correct, incorrect)
- Fixed-effect predictors
 - Test (pre-, post-test)
 - Training type (only-audio, audiovisual training)
- Random effect predictors
 - Intercepts for subjects and items

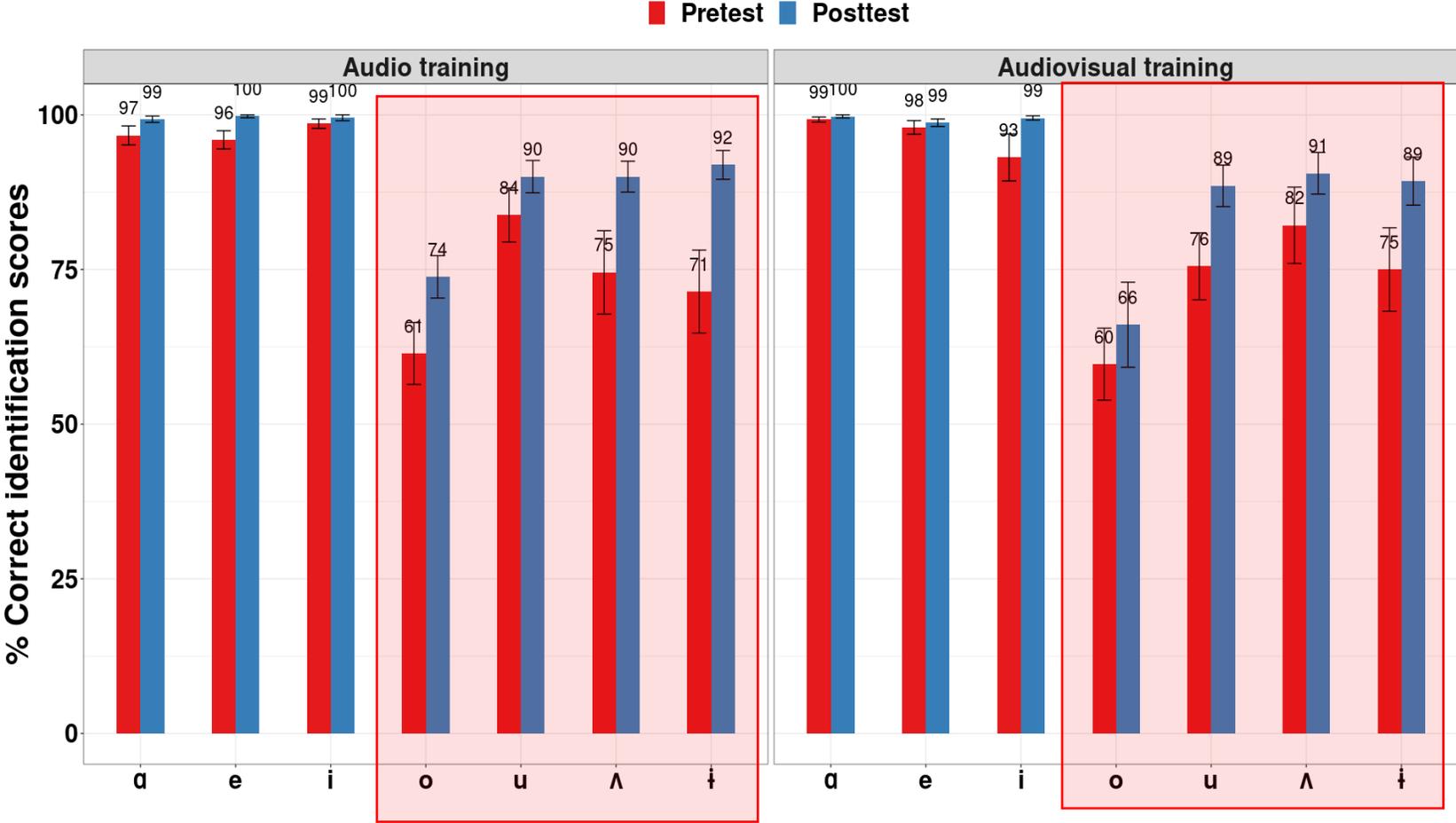
RESULTS: PERCEPTION ACCURACY AFTER TRAINING

- The results indicated that perceptual performance on Korean vowels in the AO- and AV- trained groups significantly increased after training ($p < 0.05$)



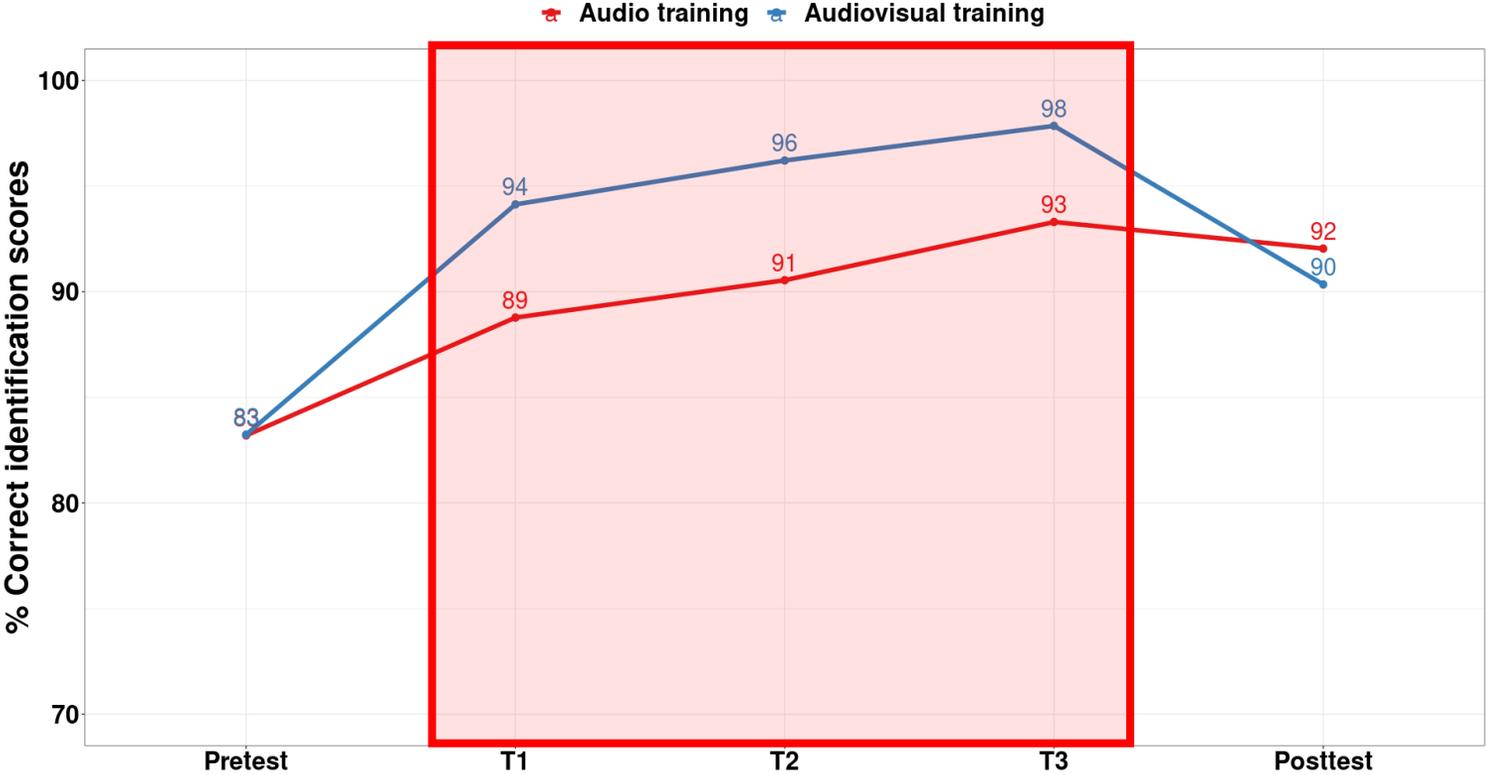
IMPROVEMENT OF PERCEPTION ACCURACY OF INDIVIDUAL KOREAN VOWELS

- Perception accuracy of all Korean vowels in training improved.



DEVELOPMENT OF VOWEL PERCEPTION DURING TRAINING SESSIONS

- During training sessions, audiovisual-trained group was better at identifying Korean vowels than the only audio-trained group.



CONCLUSIONS

- Perceptual performance on Korean vowels in the AO- and AV- trained groups significantly increased after training
 - This finding suggests that perceptual learning of L2 speech can be enhanced by both auditory and audiovisual training.
- During training, the AV trained group outperformed the OA-trained group.
 - This finding demonstrated that AO training is reliably more effective than AV training in improving the perception of L2 vowels.

QUESTIONS AND SUGGESTIONS



nmr5569@psu.edu