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# Production of Japanese geminates by native English speakers: Durational accuracy and native speaker evaluation

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# Background

- Native English speakers learning Japanese have problems producing Japanese consonant length (C) and vowel length (V) distinctions.
  - /kako/ ‘past’ versus /kak:o/ ‘parenthesis’
  - /kake/ ‘gambling’ versus /kake:/ ‘family accounting’
- For C production,
  - Beginning learners improve in the first year (Masuda and Hayes-Harb, 2005).
  - Beginning learners improve more readily in V than C production (Toda, 1997).
  - Advanced learners did not reach the native-speaker level in C production, even after a year or more living in Japan (Han, 1992).

# Questions

## 1. Focus on intermediate learners: Improve or not?

To what extent does their ability to produce length distinctions improve over the first several months in Japan? Do they improve without focused production training?

## 2. Types of length distinctions?

Do intermediate learners improve less in C distinction than in V distinction at the intermediate level, following the beginning learners' trend in Toda (1997)?

### → Analysis of produced duration measures

(Compare with native speaker data; Hirata, 2004; Hirata & Whiton, 2005)

### → Analysis of accuracy and degree of foreign accent evaluated by native Japanese (NJ) listeners

# Method

## **Participants**

- Seven students (ages: 19-21) who were native speakers of American English and had taken two years of Japanese language classes, totaling 300 hours, at Colgate University.
- All students participated in a study abroad program in Japan for four months.
- None of them received special production or perception training on length distinctions during this longitudinal experiment.

# Method

## Stimuli

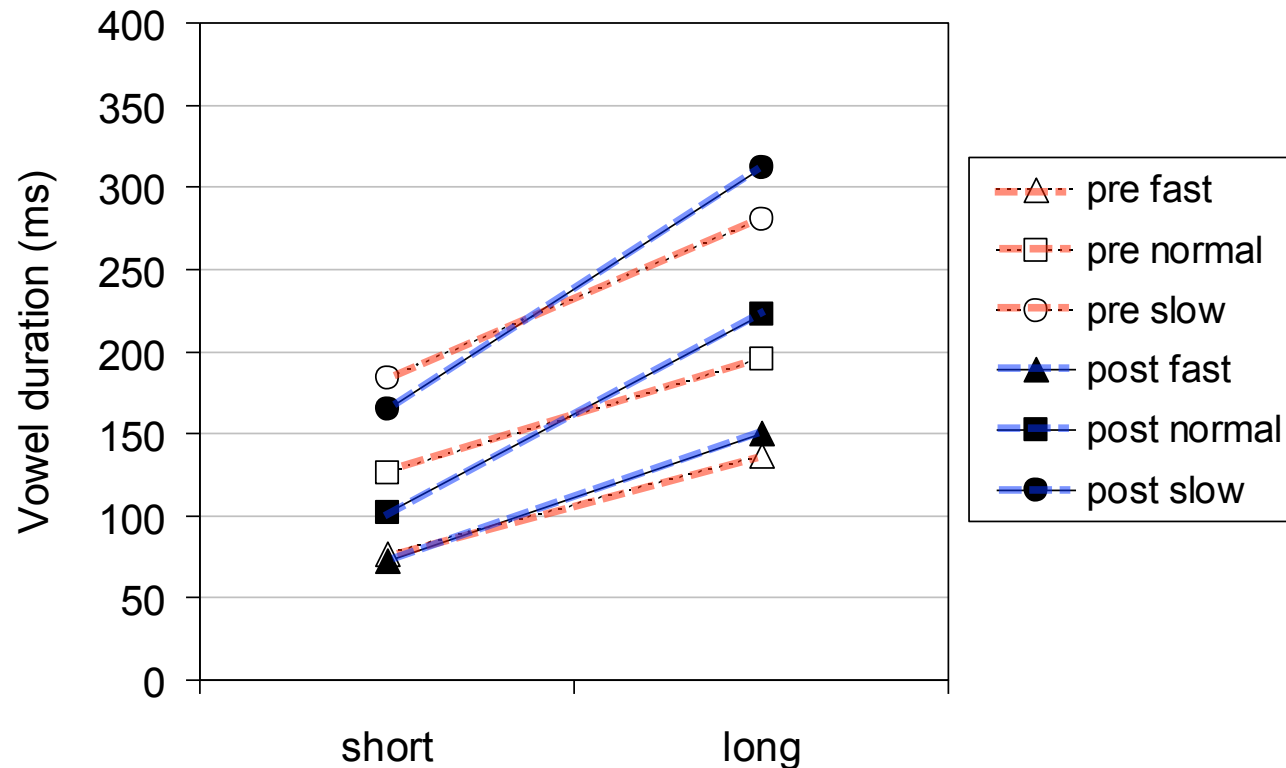
- C-pair: /kako/ ‘past’ (2 moras) vs /kak:o/ ‘parenthesis’ (3 moras)
- V-pair: /rika/ ‘science’ (2 moras) vs /rika:/ ‘liquor’ (3 moras)
- Participants read these words (among others) in a carrier sentence /soko wa \_\_\_\_ to jomimasu/ at three speaking rates, each repeated three times.
- Identical materials were recorded before and after their study in Japan.

# Results

Duration of contrasting vowels and consonants

# Learners' results

## Vowel duration in rika(:) pair



- The Quantity x Time interaction was marginally significant ( $p = 0.057$ ).
- A greater durational difference between the short and long vowels at post-Japan.

### Long/short ratios

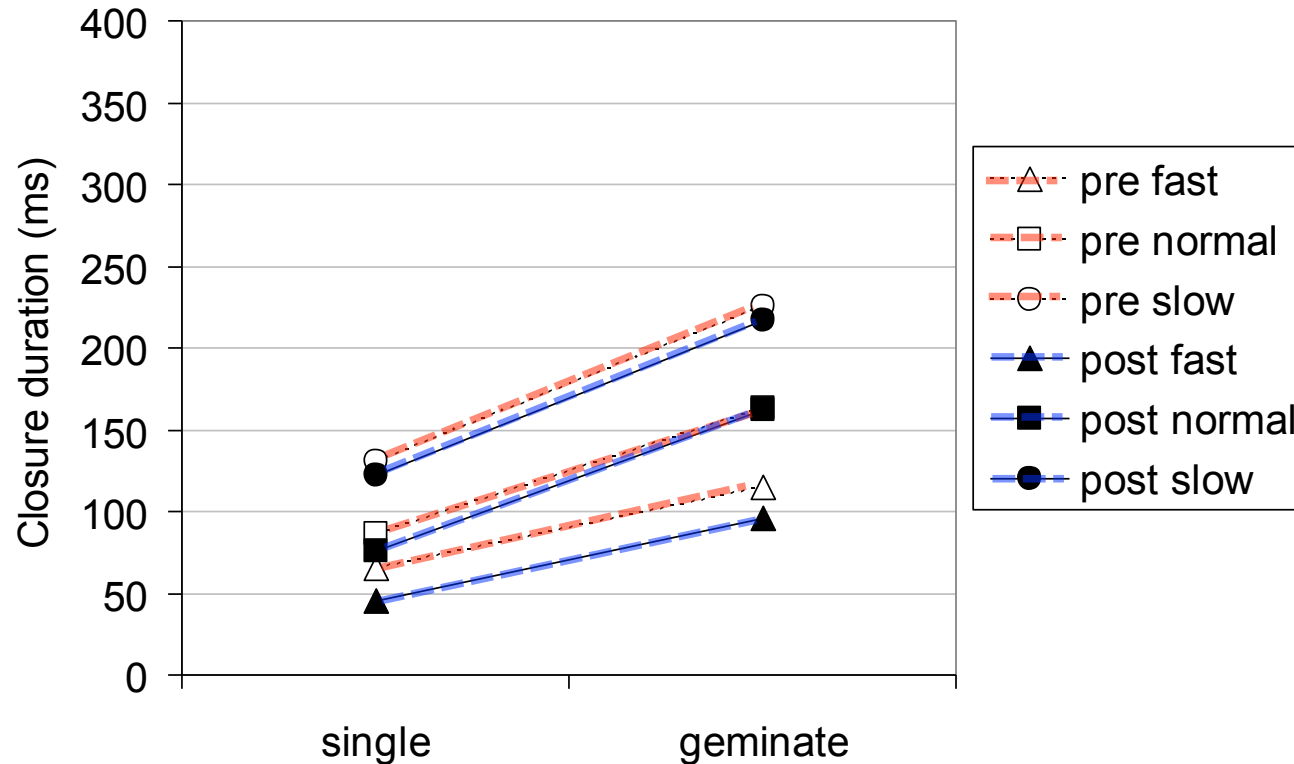
NJs: 2.22 (Hirata, 2004)

Learners: Pre-Japan 1.81 → Post-Japan 2.24

→ Improvement found for V-pair

# Learners' results

## Consonant duration in kak(:)o pair



- No significant Quantity x Time interaction

→ No improvement for C-pair

### Geminate/single ratios

NJs: 3.06-3.18 (Hirata & Whiton, 2005)

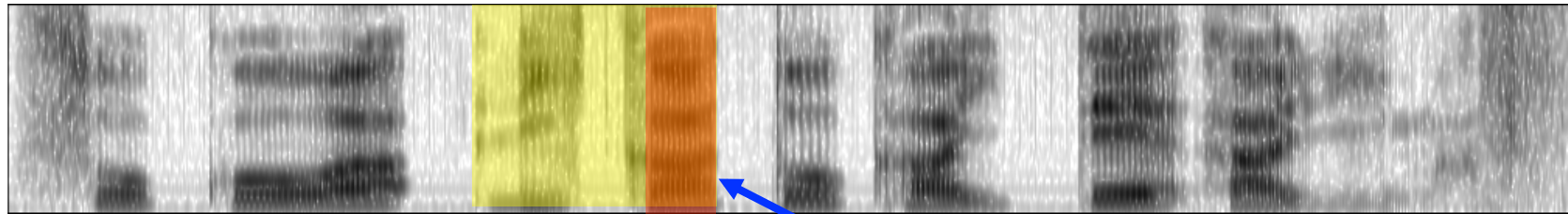
Learners: Pre-Japan 1.97 → Post-Japan 2.11



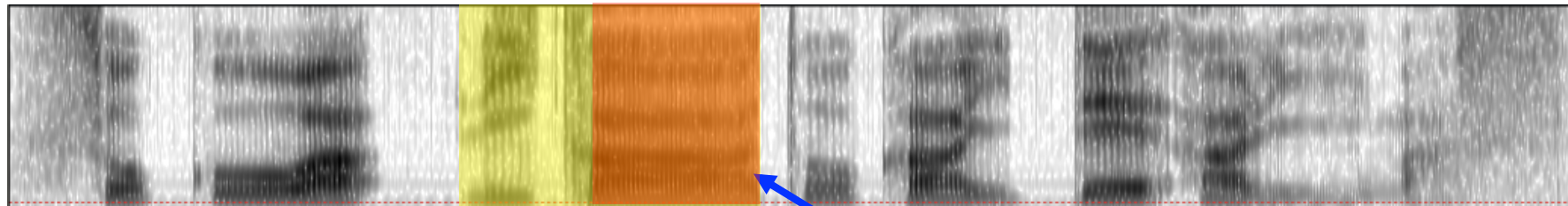
# Vowel-to-word ratio & consonant-to-word ratio

# Vowel-to-Word (V/W) ratio by NJs

SLOW SPEECH

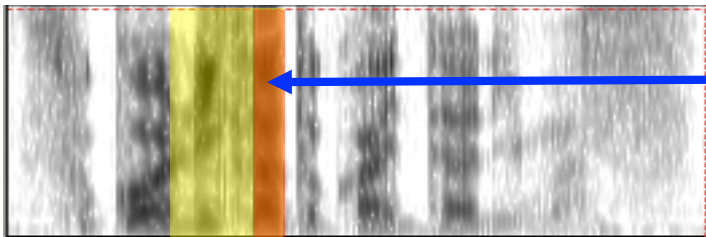


r i k a Short vowel

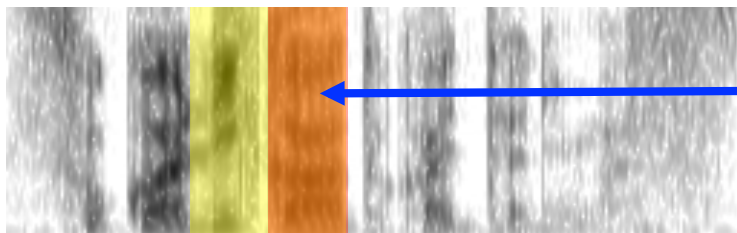


r i k a a Long vowel

FAST SPEECH

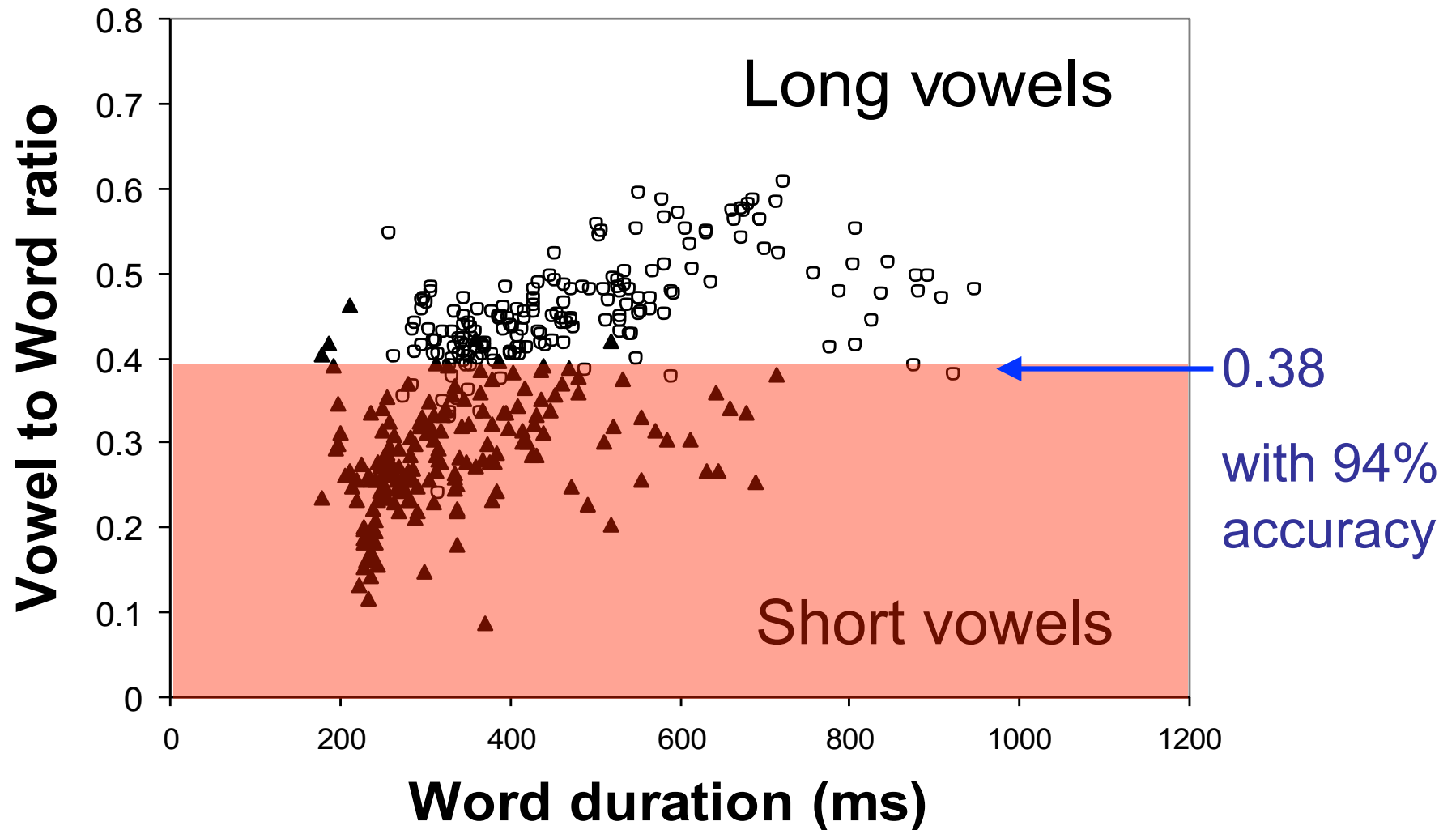


Short vowel



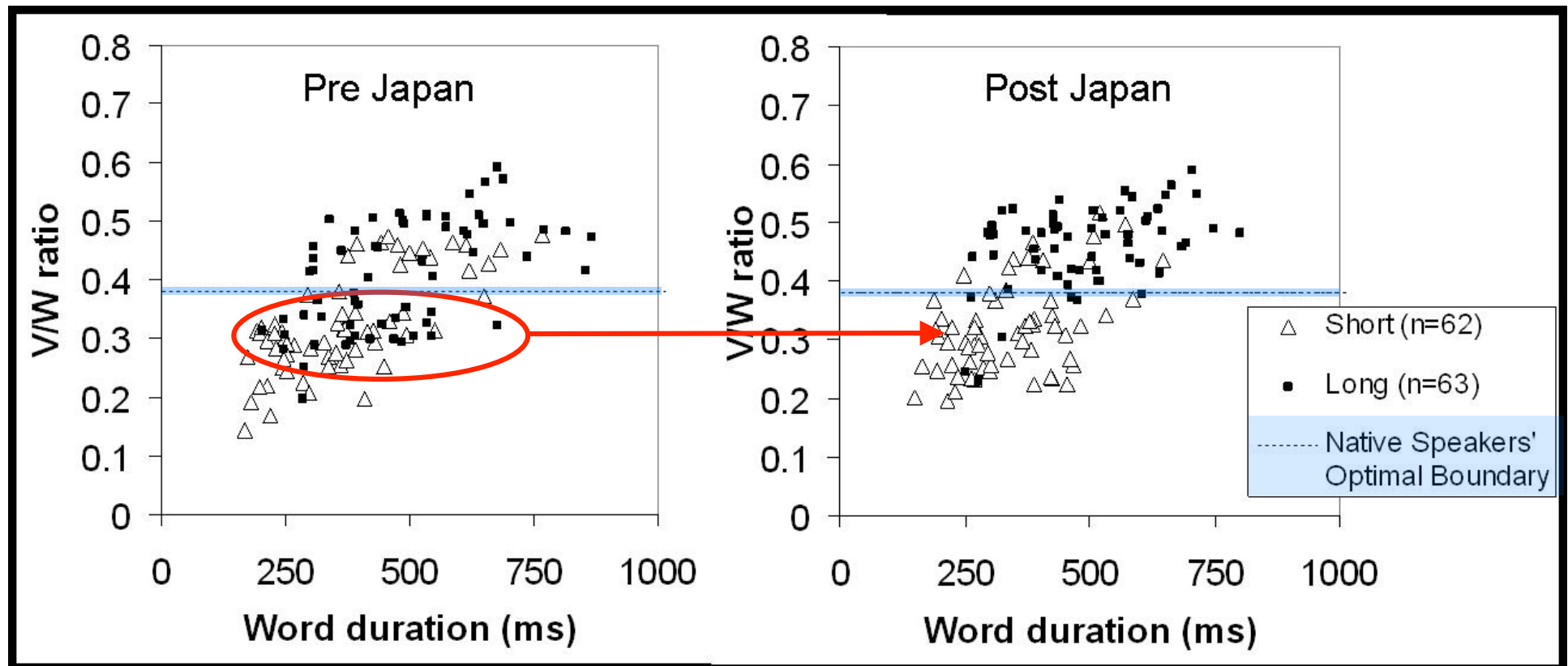
Long vowel

# V/W ratio by NJ (Hirata, 2004)



# Learners' results

## V/W ratio in rika(:)



- Classification accuracy

Pre-Japan: 66%

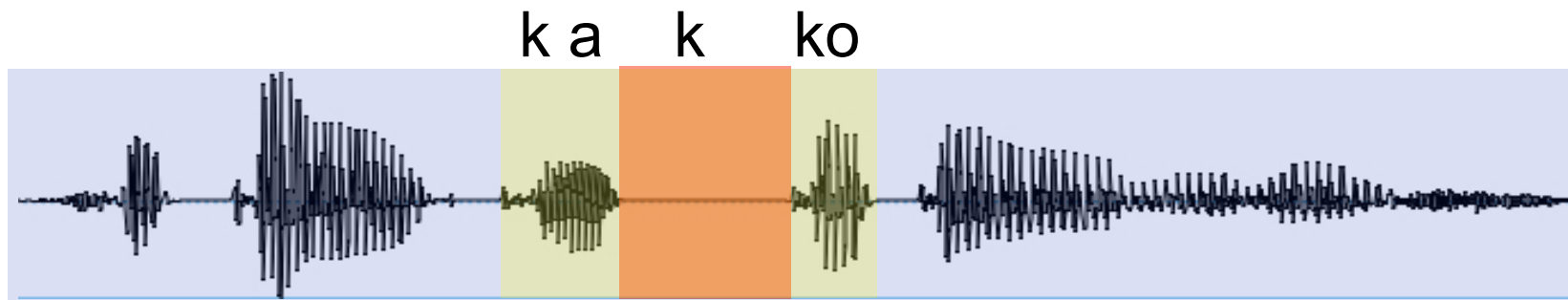
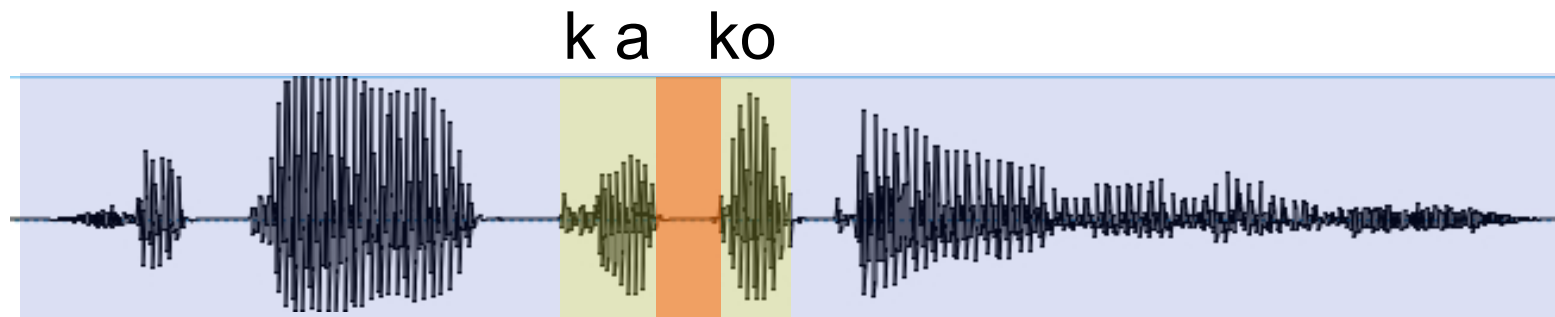


Post-Japan: 85%

- A significant Quantity x Time interaction, indicating improvement in V/W ratio at post-Japan

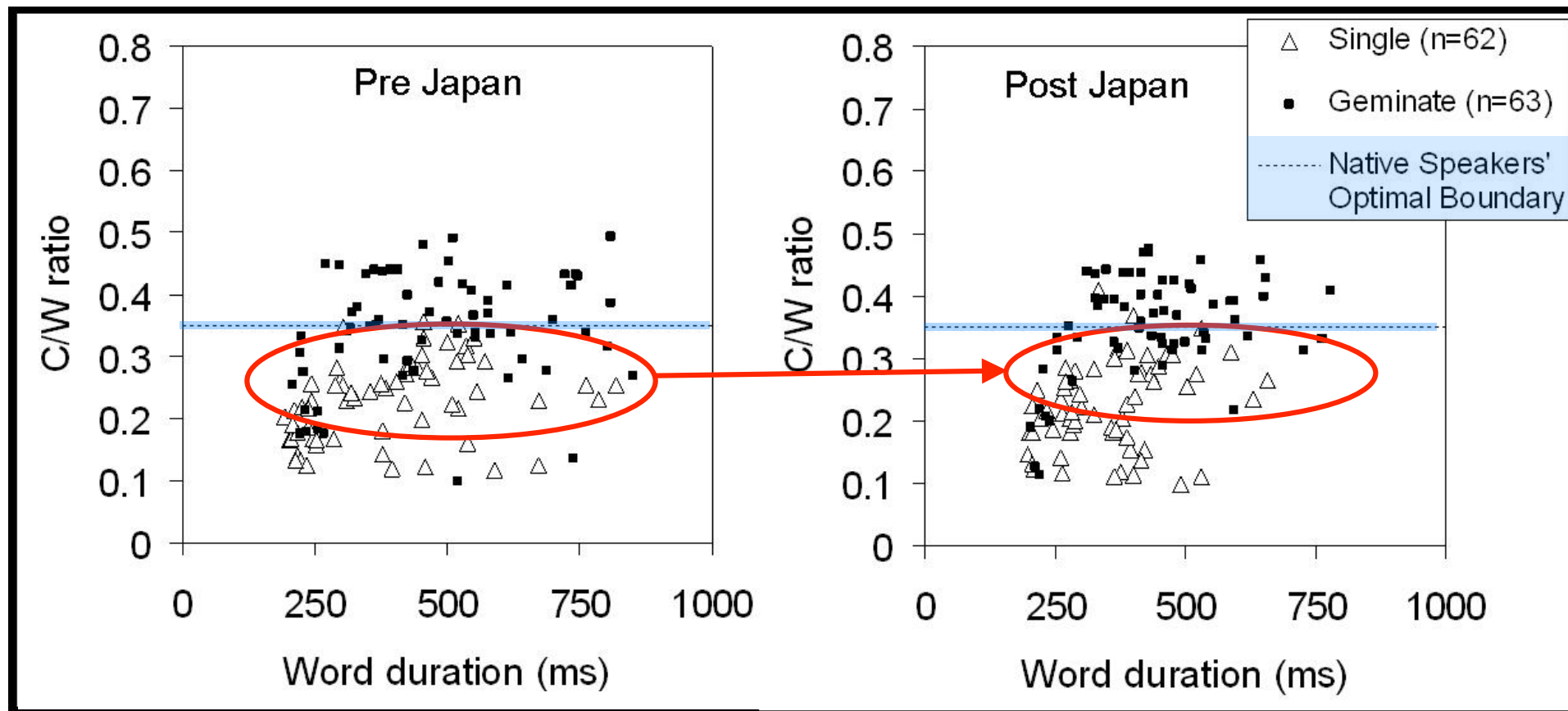
# Consonant-to-Word (C/W) ratio by NJs in kak(:)o pair

(Hirata & Whiton, 2005)



# Learners' results

## C/W ratio in kak(:)o



- Classification accuracy

Pre-Japan: 73%



Post-Japan: 74%

- No significant Quantity x Time interaction, indicating their distinction did not change over time.

How learners' production was perceived  
by native Japanese (NJ) speakers

# Method

## **Listeners**

- 13 & 16 monolingual NJ speakers for Accuracy Test and Accent Rating Test, respectively.

## **Stimuli**

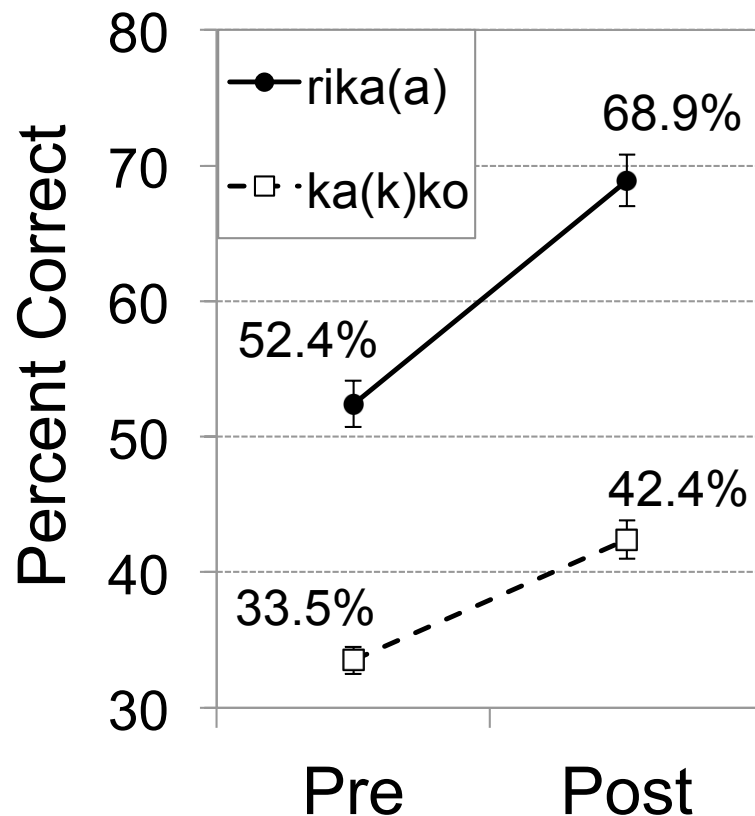
- All learners' production were presented to each listener in a randomized order.

## **Procedure**

- For Accuracy Test, listeners chose one of six response alternatives, e.g.,  
*kako, kaako, kakoo, kaakoo, kakko, kakkoo*
- For Accentedness Test, listeners marked the degree of foreign accent in each stimulus in a 1-7 scale.



# Mean production accuracy Consonant vs. Vowel length pairs

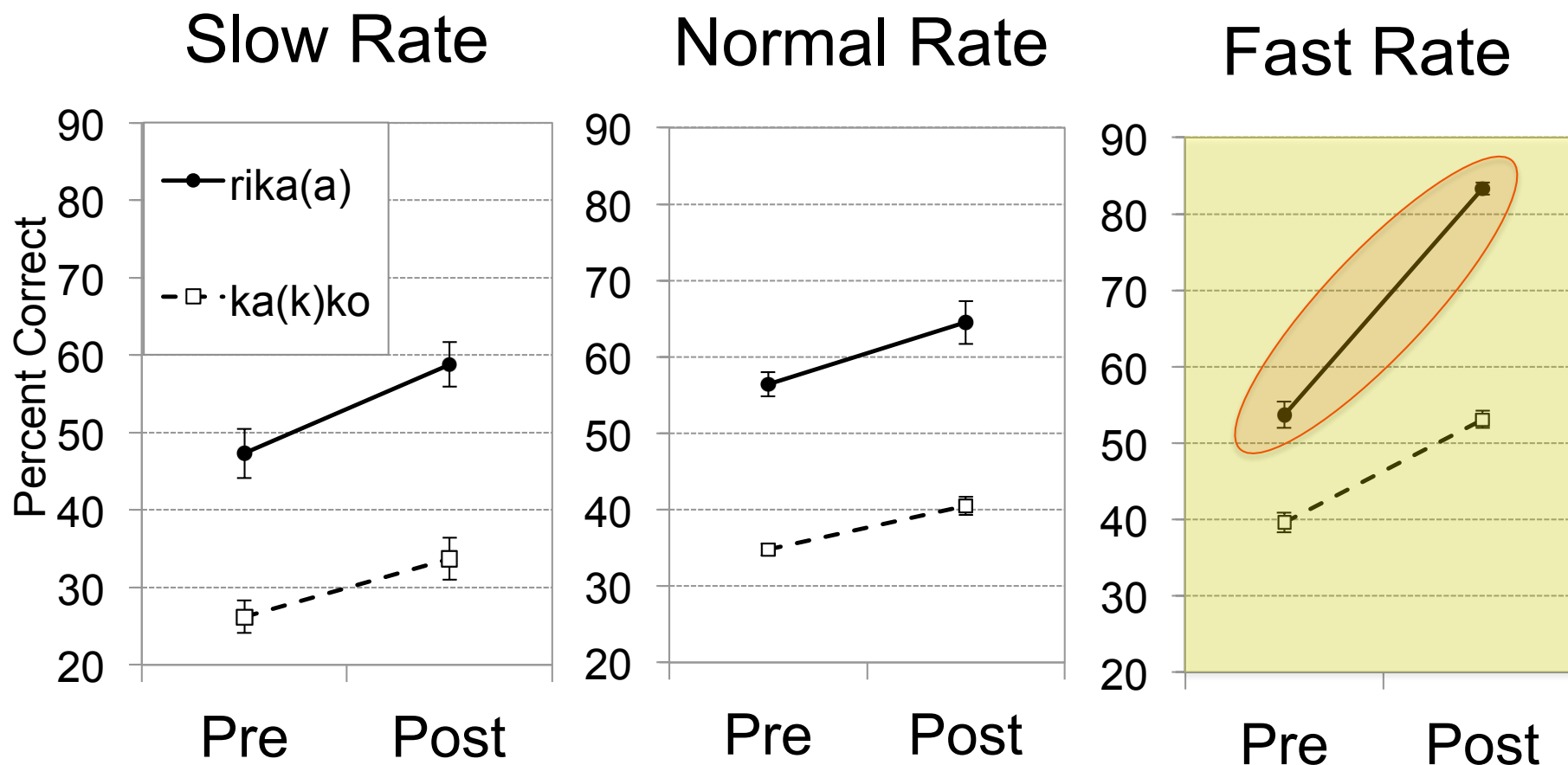


- A significant Contrast type x Time interaction: The amount of improvement was greater for V-pair than C-pair.

V-pair: 16.5%

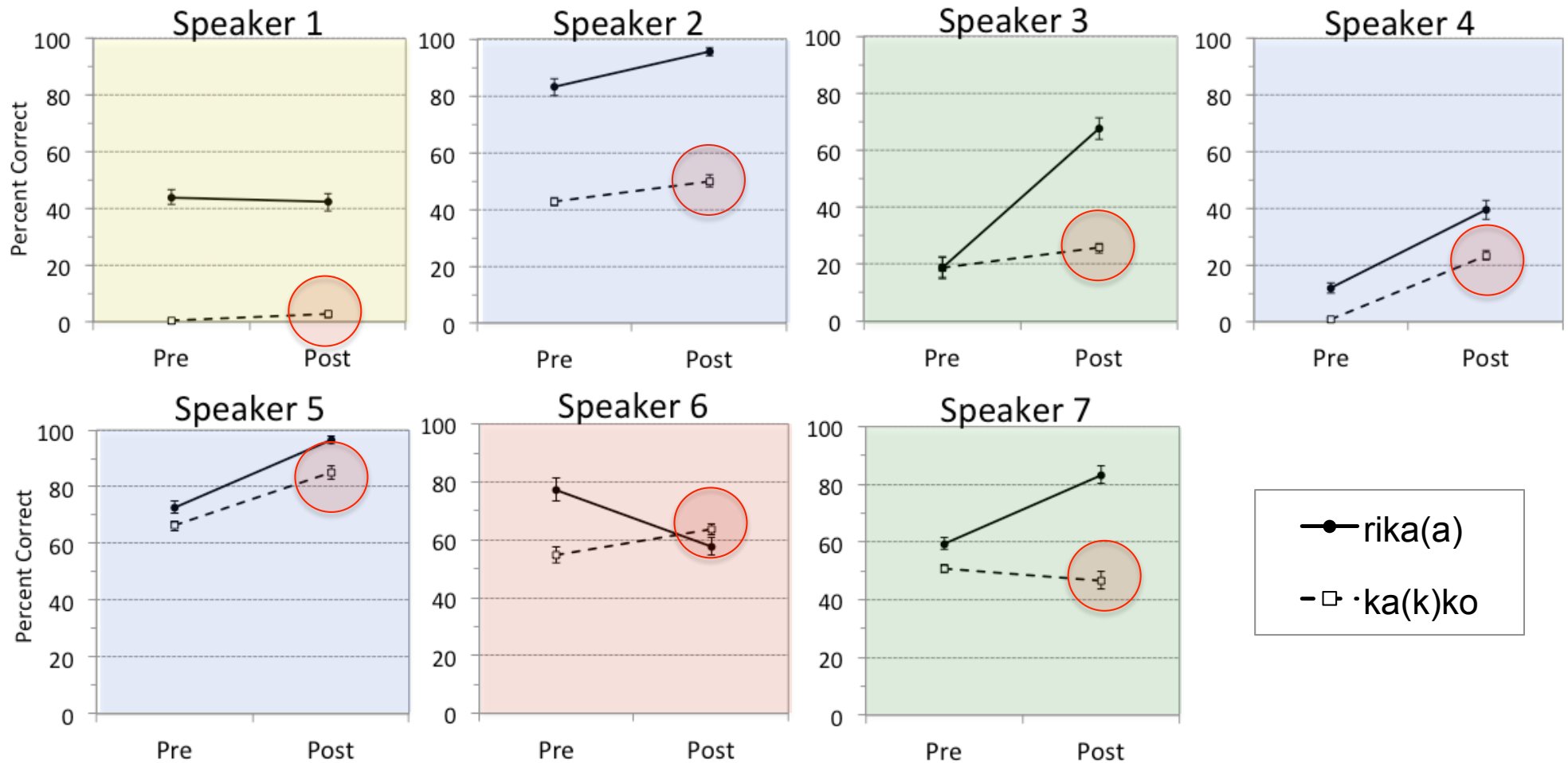
C-pair: 8.9%

# Production accuracy by rate



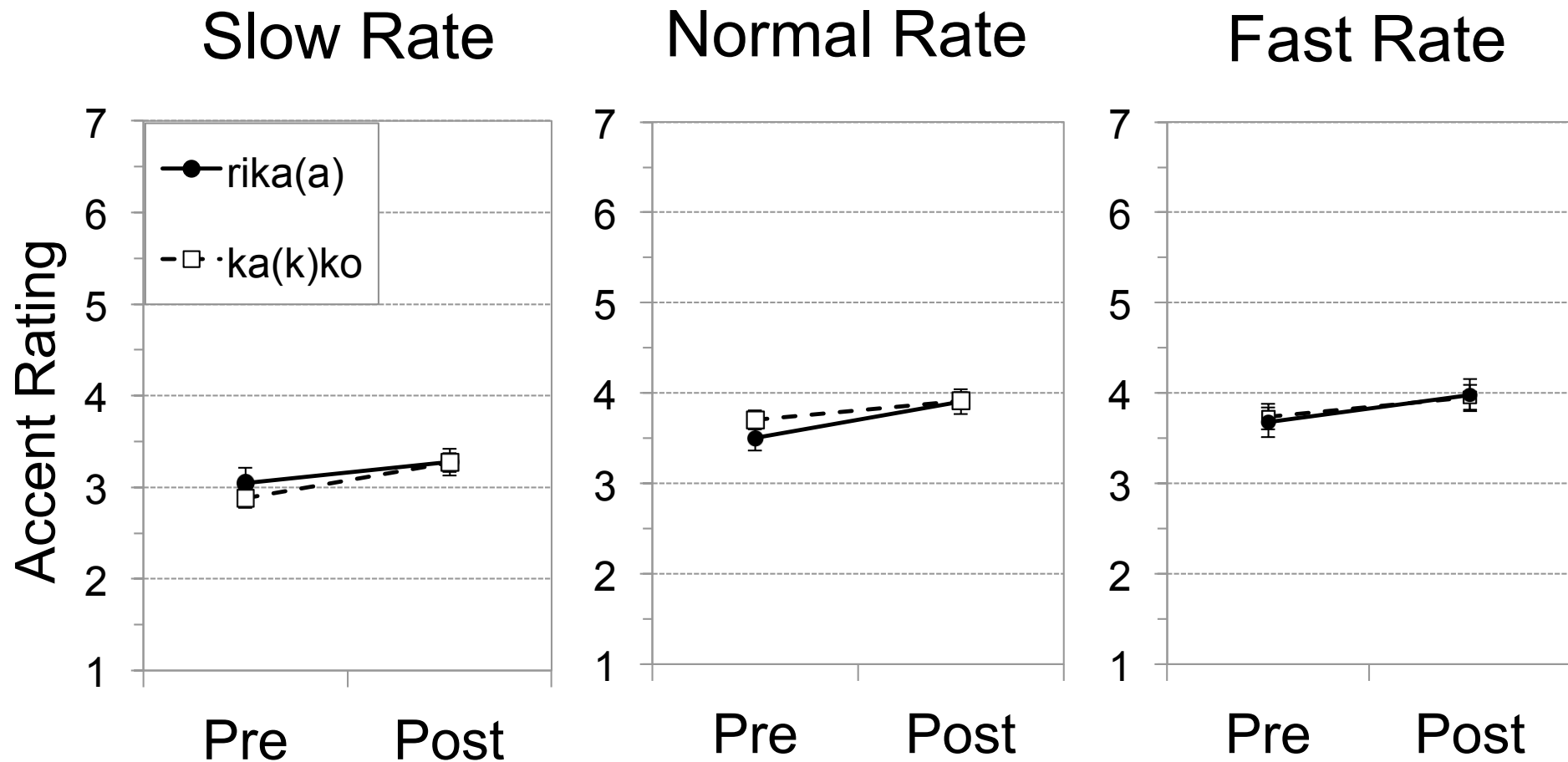
- A significant Contrast type x Time x Speaking rate interaction

# Production accuracy by speaker



- A significant Contrast type x Time x Speaker interaction

# NJ' accent rating on learners' production



- 7 = Native level; 1 = Not at all native-like
- Significant main effects of Time and Rate; No effect of Contrast type

# Summary

## 1. Improve or not?

→ YES, participants with two years of Japanese language study in their home country continued to improve without intensive training.

## 2. Types of length distinctions?

### Consonant length pair

- NO improvement in any acoustic measures
- A small but significant improvement in perceived accuracy and accent rating
- Perceived accuracy improved less for C-pair than V-pair.
- Accent rating improved similarly between C-Pair and V-pair.

### Vowel length pair

- Significant improvement in all acoustic measures, perceived accuracy, and accent rating.
- Greatest accuracy improvement at the fastest rate.

# Summary

## 3. Worth noting...

- Speaking rate of production was a significant factor.
- Large room for further improvement on C-pair  
(post-test accuracy mean: 42%; range: 3%-85%).
- Large individual variation.
- Very small amount of accent improvement.
- The accuracy difference between C-pair and V-pair does not appear to affect the overall accent rating.

# Conclusions

- Intermediate learners are not yet fixed in their ability to produce vowel length distinction (Toda, 1997), but about to reach a plateau for consonant length (Han, 1992).
- Focused training on consonant length distinction may be necessary for a notable amount of improvement for intermediate learners.
- However, the amount and type of improvement depend greatly on individual learners.
- Methodological: Native speaker durational measures were useful in characterizing production learning.

But some discrepancy was observed between durational measures and NJ auditory judgments for the consonant length pair.

# Discussion

Further research is necessary...

- To investigate why learners improved more on vowel length than on consonant length distinctions.
  - Generalize to other vowels and consonants?
  - Infants' first language acquisition
  - Sonority of segments
  - Similarities and differences across languages



# References

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Thank you!

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