

What we did

- We measured Japanese EFL learners' reaction time (RT) to retroflex and bunched pronunciation of /r/ in English words spoken by native English speakers.
- Using E-prime, we carried out a forced-choice RT experiment with 30 Japanese listeners & 4 native English listeners.

Introduction

- Two common tongue shape categories for producing North American English /r/ sound are **retroflex** and **bunched**.
- In junior high school, Japanese students generally learn only retroflex pronunciation of /r/.

Hypothesis: If there is a strong link between speech production and perception [1], we would expect Japanese students to be able to perceive retroflex /r/ faster than they perceive bunched /r/.

- We measured 30 Japanese listeners' RTs when they listened to minimal pairs with retroflex /r/, bunched /r/, and /l/. We also measured 4 native English speakers' RTs as a control.
- We also checked the relationship between RT and English skill, by plotting TOEIC score against RT.

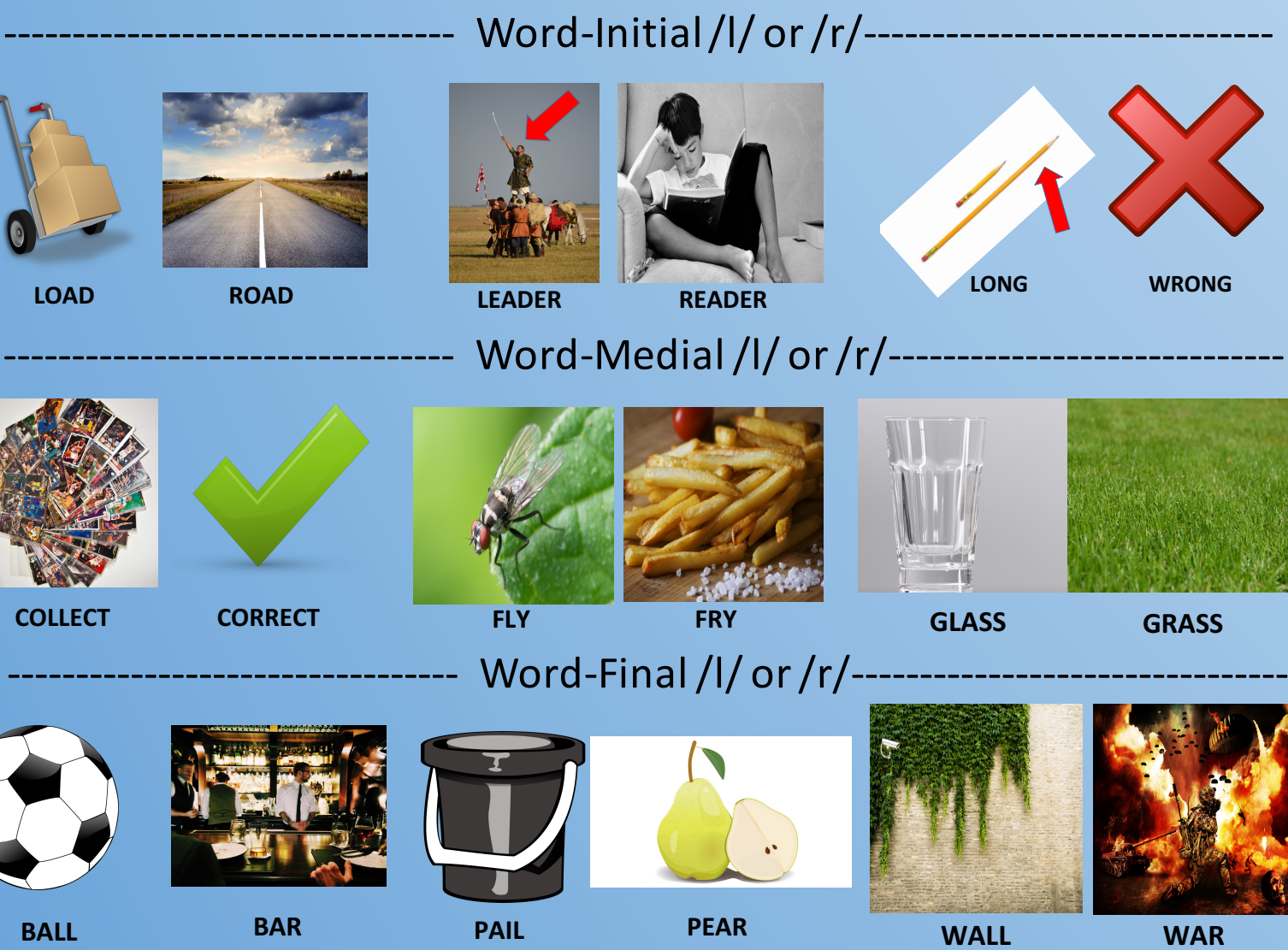


Fig.1: The 9 pairs of stimuli

Reaction time of Japanese listeners to retroflex and bunched /r/ pronunciation by native English speakers

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Method

Participants:

- 30 Japanese listeners – students from University of Aizu
- 4 native English listeners – students from University of Aizu

Stimuli:

- 2 speakers (both Canadian professors from University of Aizu)
- 9 minimal pairs (see Fig.1)
- Minimal pairs had 3 productions (retroflex /r/, bunched /r/ and /l/)

Date Collection and Analysis:

- In the RT experiment, listeners had to identify the spoken word by choosing the left or right picture as fast as possible. They were given feedback (correct or not) in the form of an image (see Fig.2).
- To be sure that stimuli were indeed retroflex or bunched, we used ultrasound while recording the audio. We also checked the formants of retroflex vs bunched /r/ for both speakers (see Fig.3).



Fig.2: Experiment process

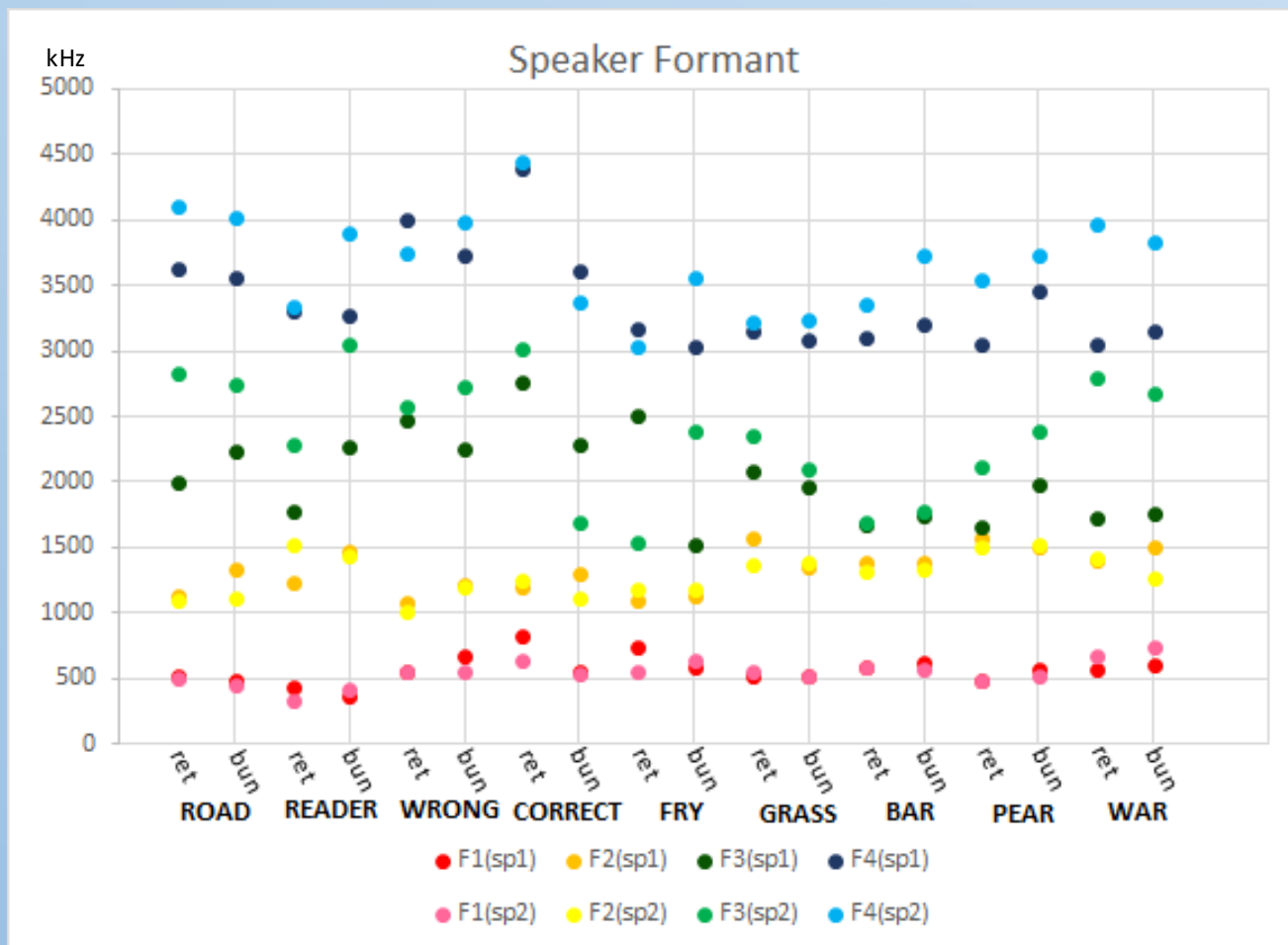


Fig.3: The two speakers' formants for retroflex & bunched /r/

Results

- Fig.4 shows the RT for each participant. Using RT, we could measure speed of perception of sounds that are (i) produced the same way one has learned to speak vs. (ii) produced in a different way. We found that Japanese listeners' RTs for retroflex and bunched /r/ pronunciation of English words spoken by native speakers were **not significantly different**. This was true **even for native listeners**.
- Proficiency (measured by TOEIC test score) was somewhat correlated with RT. Higher-proficiency Japanese speakers had faster RTs. A significant negative correlation between TOEIC score and RT was obtained ($r = -0.215$, $p < 0.01$) – See Fig.5
- Mean accuracy rate was almost 100% for native English listeners, whereas it was about 66% for Japanese. 13 Japanese participants with less than 66% accuracy were not included.

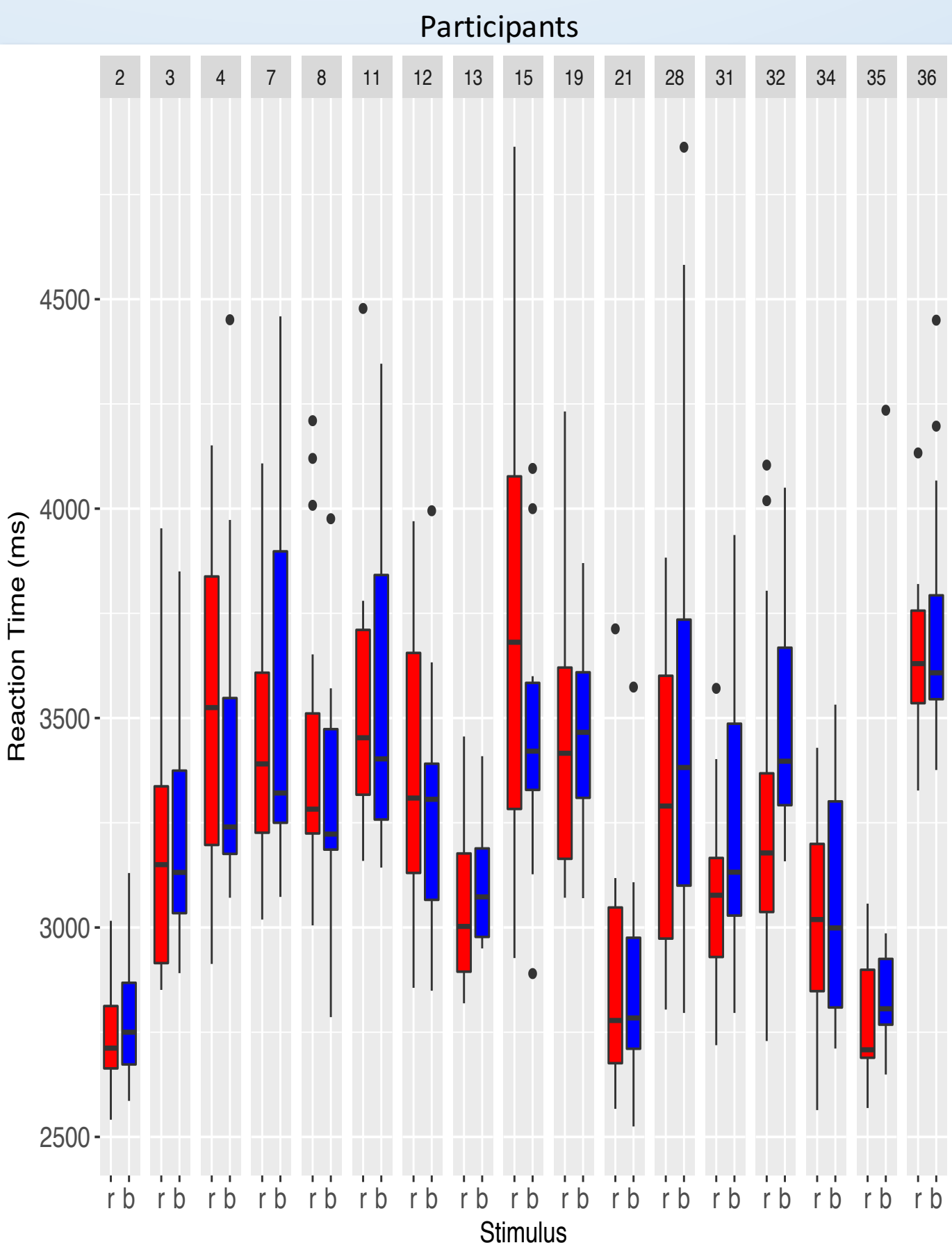


Fig.4: RT by stimulus (retroflex/bunched) per participant

1 = /l/, 2 = retroflex /r/, 3 = bunched /r/

Stimulus Type	English (ms)	Japanese (ms)
/l/	3019	3298
retroflex /r/	3047	3309
bunched /r/	3115	3333

Table 1: Mean RTs by stimulus

Stimulus Type	English Participants	Japanese Participants
/l/	100.0%	66.1%
retroflex /r/	98.7%	65.9%
bunched /r/	100.0%	67.3%

Table 2: Accuracy rate by stimulus & Participants language

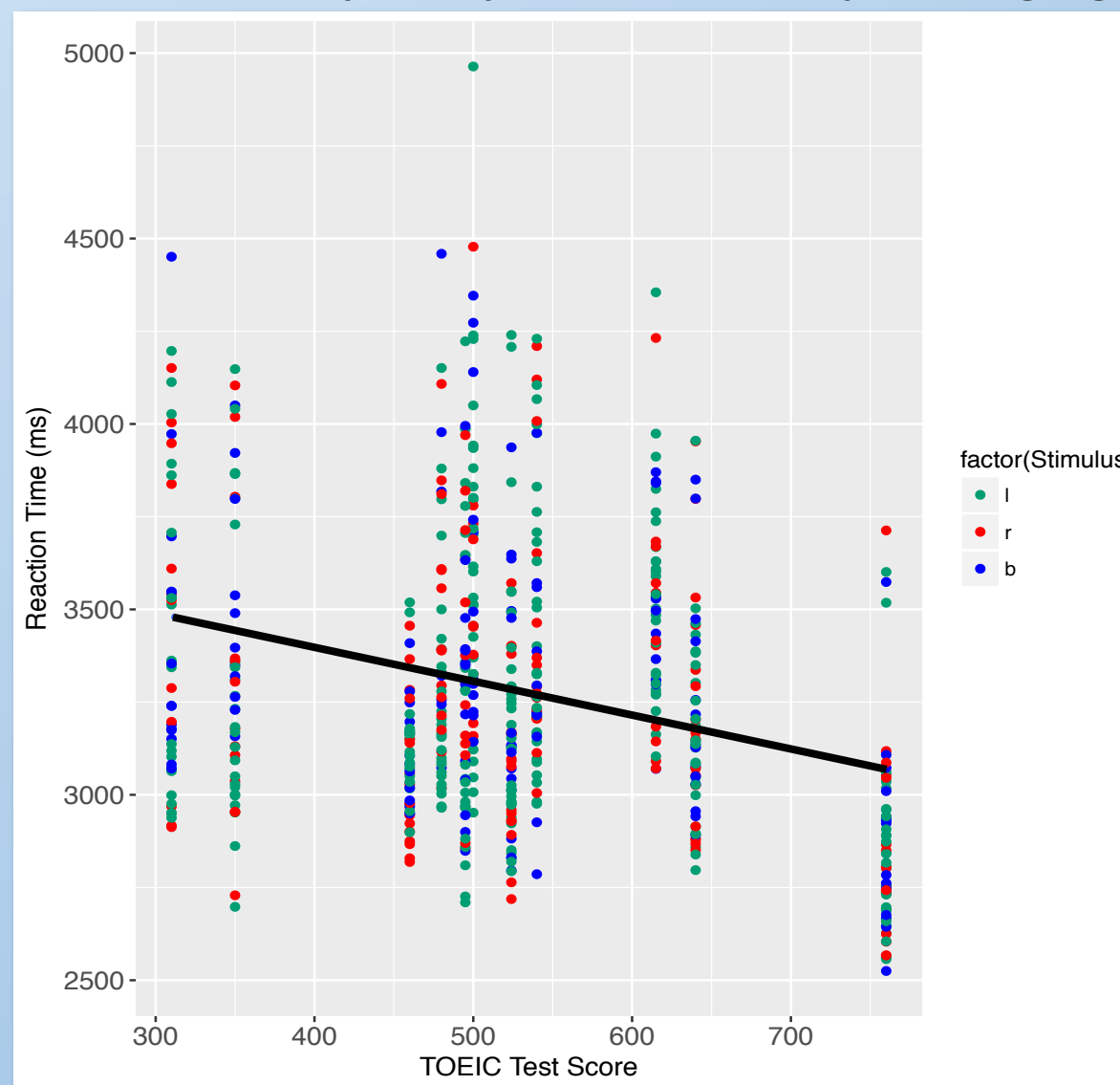


Fig.5: RT by TOEIC Score

Discussion and Conclusion

We measured Japanese listeners' RT to native English speakers' retroflex and bunched /r/ pronunciation. We carried out a forced-choice RT experiment for 30 native Japanese listeners and 4 native English controls. This experiment used 2 speakers' voices (both Canadian English) and 9 minimal pairs of /r/ and /l/ words. Stimuli were spoken words and picture-pairs (2 simultaneously-presented in each trial).

- The RTs for retroflex and bunched /r/ pronunciation of English words spoken by native speakers were not significantly different, even for native listeners.
- TOEIC score and RT have a weak negative correlation.

Our results do not support the hypothesis that Japanese EFL listeners would react more quickly to retroflex /r/ than to bunched /r/. Given that the native listeners also turned out not to show any difference, this was not surprising.

Future Work

- Results need to be analyzed further to determine why there is so much variability in the RTs within and across participants.

References

[1] Rochelle S. Newman (2003), "Using links between speech perception and speech production to evaluate different acoustic metrics: A preliminary report", JASA 113 (5): 2850-2860.

Acknowledgments

Thank you to Ms. Ayaka Orihara for giving the first author the idea and motivation to research about RT. We would also like to thank all participants who generously shared their time for this experiment.