

# Acoustic similarities between front rounded and back unrounded vowels as evidenced by French /ø/ and /u/ produced by Japanese-speaking learners

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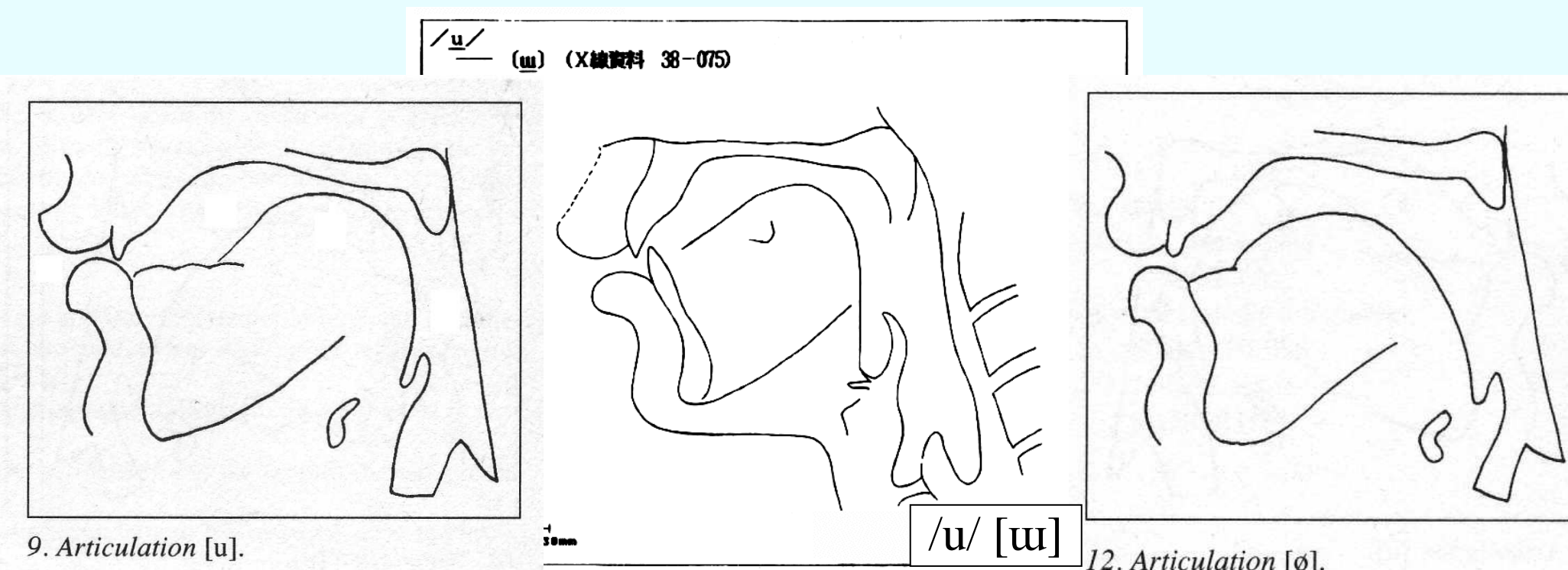
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## Japanese-speaking learners' difficulty of distinguishing French /u/ and /ø/

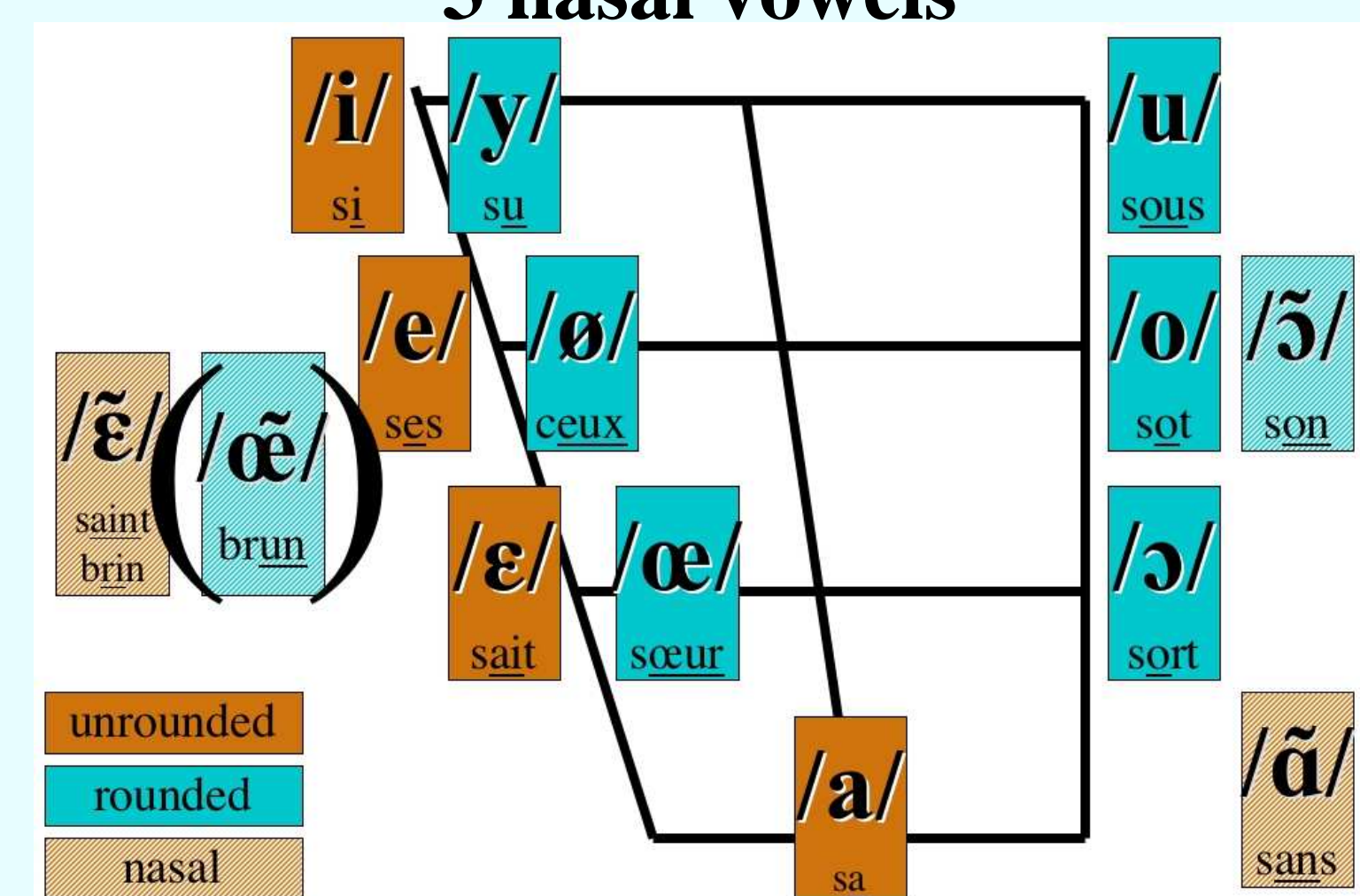
	F1/F2 close	F2 low
French /u/	Yes	Yes (< 1000 Hz)
Japanese /u/	No	No (> 1000 Hz)
French /ø/	No	No (around 1500 Hz)

## French /u/ [u], Japanese /u/ [ɯ], French /ø/ [ø]

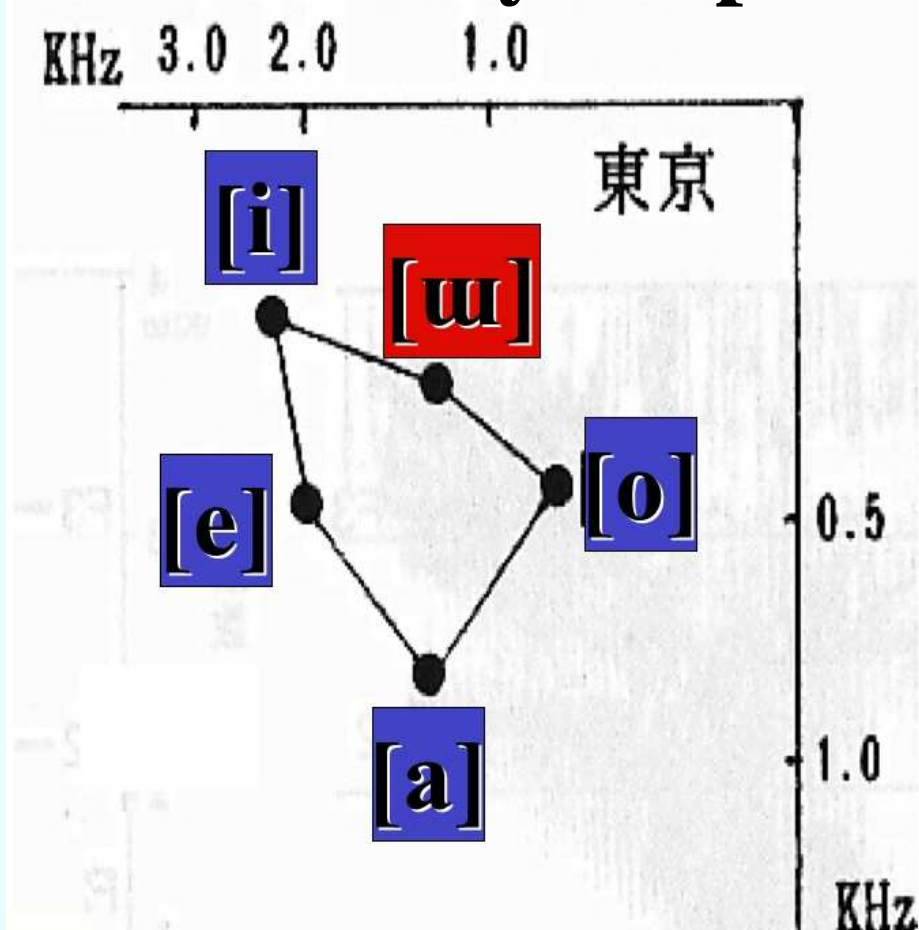


French /u/ (Wioland 1991) Japanese /u/ (Uemura 1990) French /ø/ (Wioland 1991)

## Parisian French: 10 oral vowels and 3 nasal vowels



## Tokyo Japanese: 5 vowels



F1 (y-axis) and F2 (x-axis) of the five vowels (male voice) of Tokyo Japanese (Sugito 1995).

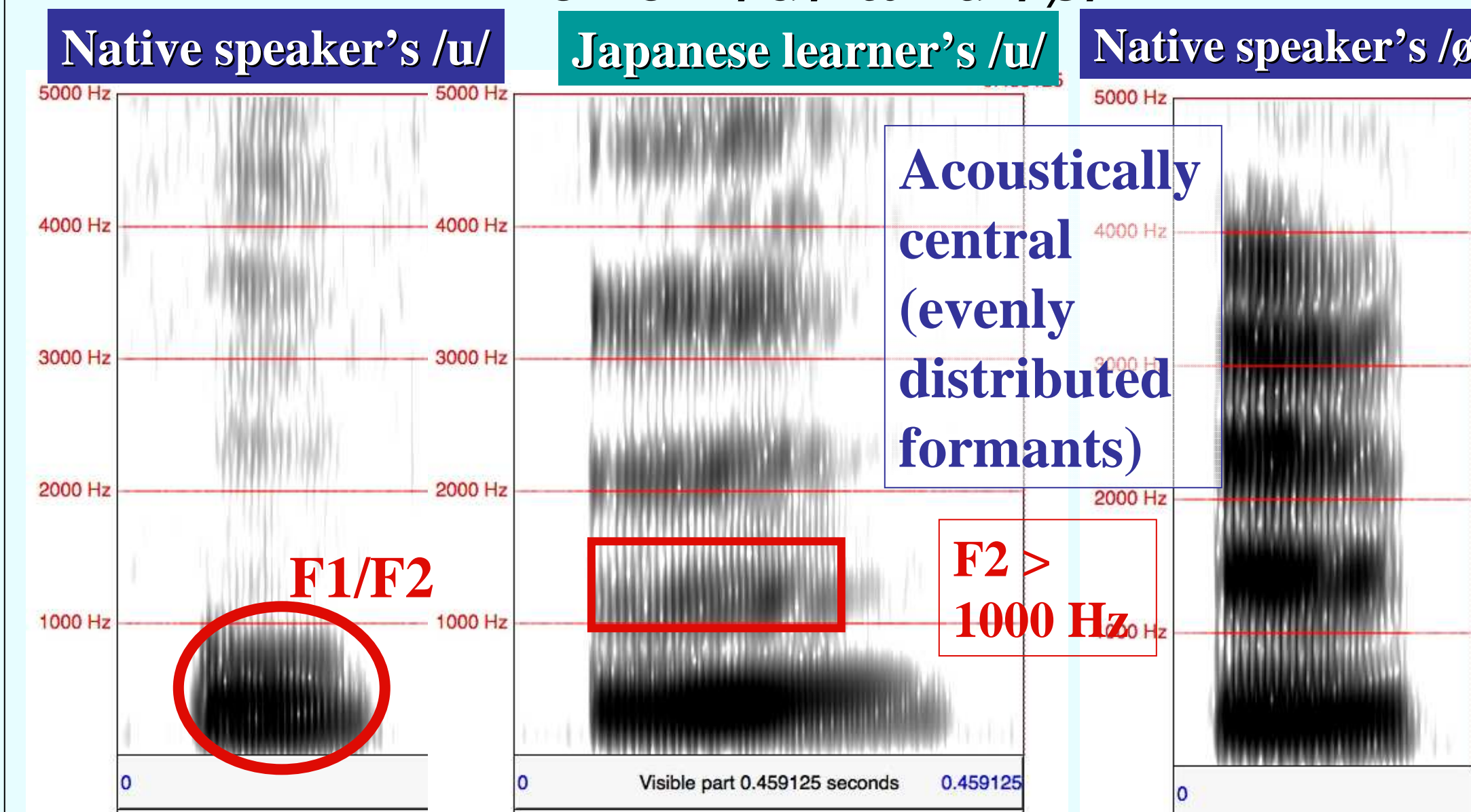
## Research question

How do native speakers of French perceive high back unrounded vowels, produced without grouped F1/F2?

## Answer suggested by the present study

As /ø/ or /œ/ (acoustically central vowel).

## French /u/ and /ø/



## Perception of French vowels by Japanese-speaking learners

	i	e	a	ɔ	o	y	ø	œ	ɛ	ɑ	ɔ̃	ɑ̃	total stimuli
Responses	39	1	1	1	1	1	1	1	1	1	1	1	40
1) (stimuli)	39	1	1	1	1	1	1	1	1	1	1	1	40
2) High-mid and low-mid vowels (28% of the errors)	15	16	1	1	1	1	1	1	1	1	1	1	40
3) /u/ /y/ /ø/ (17%)	1	1	1	1	1	1	1	1	1	1	1	1	40
4) Nasal vowels (33% of the errors)	1	1	1	1	1	1	1	1	1	1	1	1	40
total responses	44	32	40	40	41	36	43	41	56	41	32	42	32

5 JP listeners x 8 responses (= 2 female + 2 male FR speakers) x 2 repetitions Kamiyama (2006)

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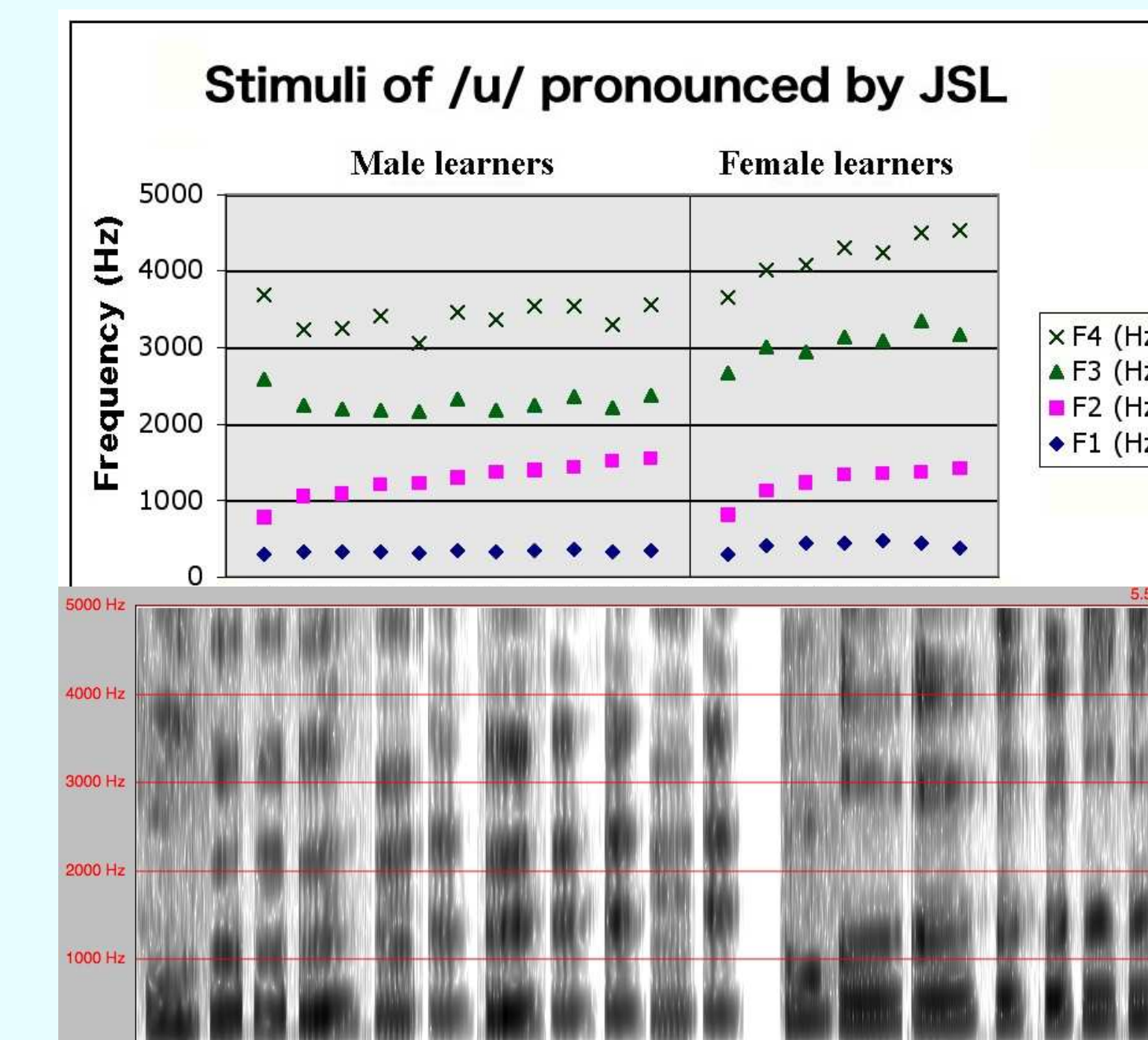
## Hypothesis

Native French listeners perceive back unrounded vowels (Japanese-speaking learners' less back and rounded French /u/ and synthesized stimuli) as front rounded vowels.

## Experiment I Perception of French /u/ pronounced by Japanese-speaking learners

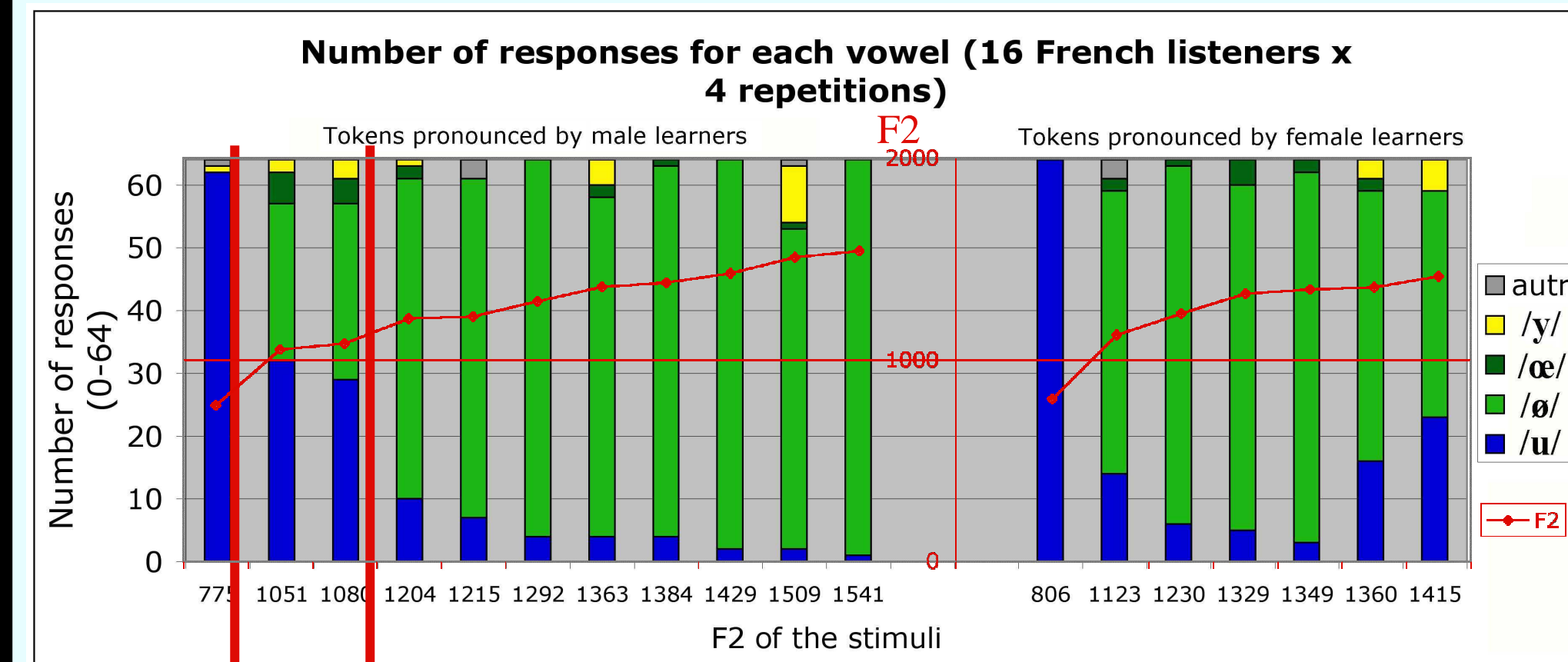
### Stimuli

- French vowels /u y ø/ in isolation.
- Carrier sentence: "Je dis /N/ comme dans ..." (e.g. Je dis /u/ comme dans "loup").
- 5 Japanese-speaking learners (JSL: 3 male and 2 female) studying French in Tokyo.
- 18 tokens x 3 vowels x 4 repetitions.



## Results: identification

16 French listeners



## Experiment II Perception of synthesized vocoids simulating rounded and unrounded high back vowels

### Stimuli

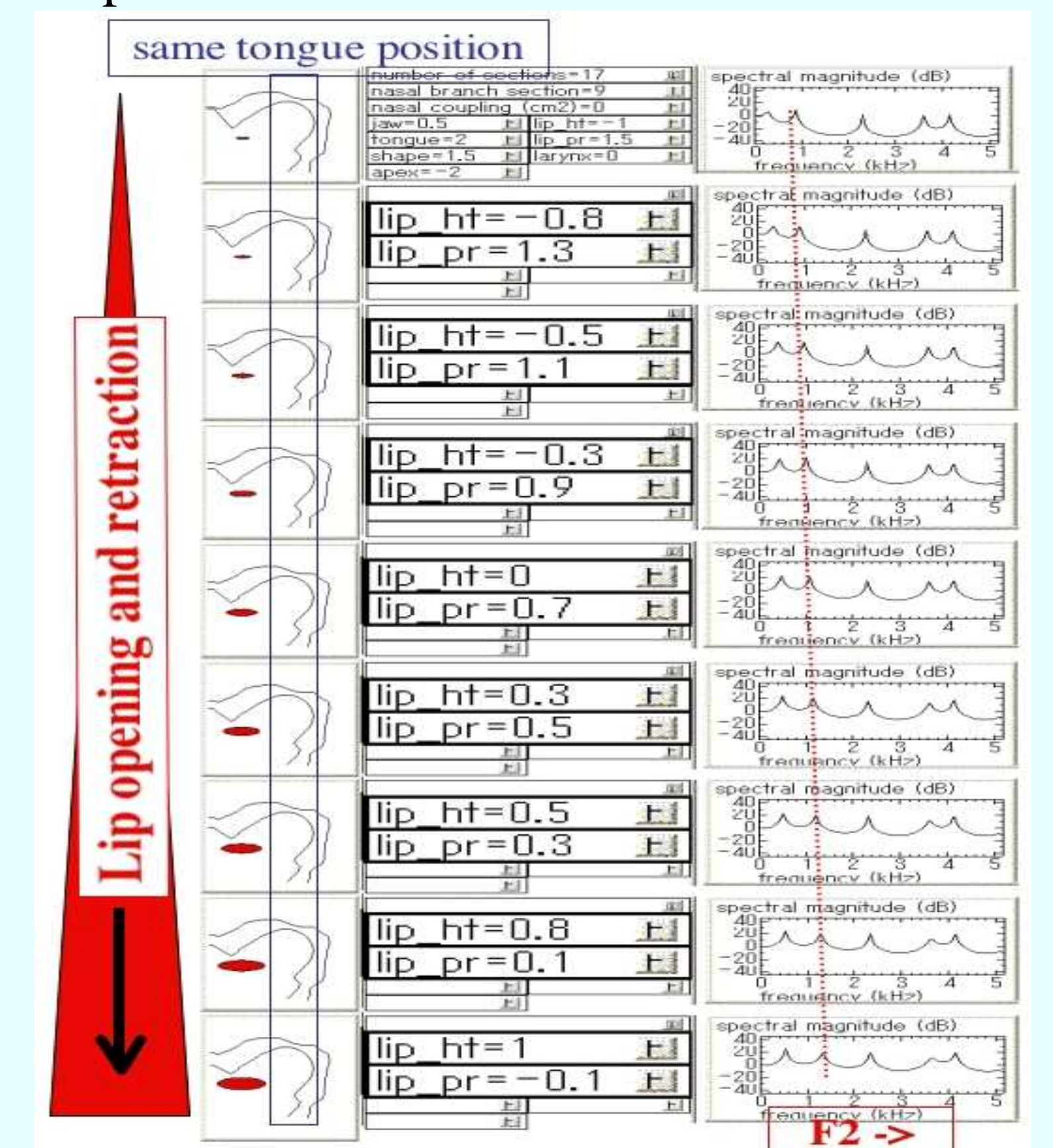
- 9 stimuli created using the articulatory synthesizer VTCalc (Maeda 1982), and simulating different degrees of lip rounding and protrusion of high back vowels.
- 9 stimuli x 4 repetitions.

### Listeners

- 16 native listeners of French from mainland France.

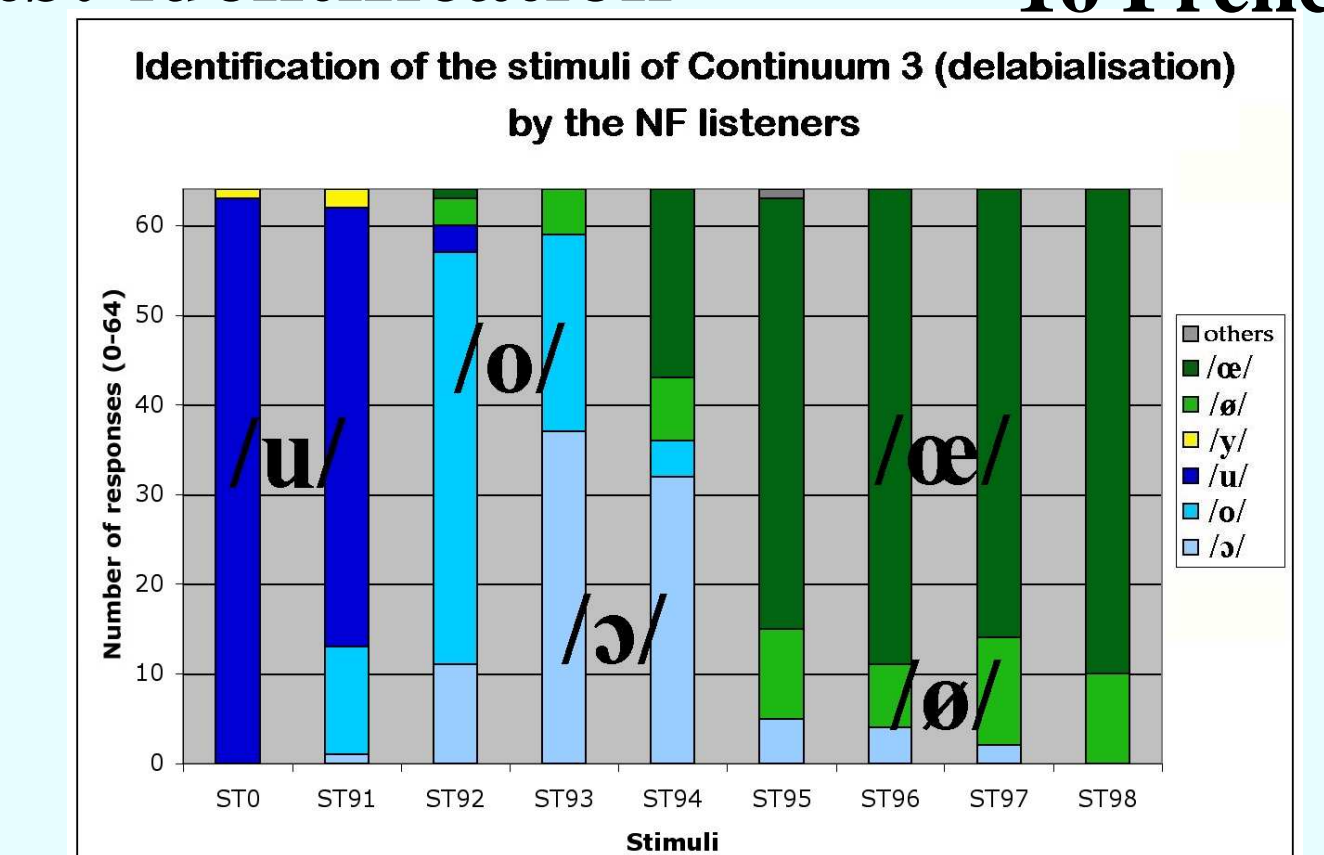
### Protocol

- Identification: multiple forced choice (10 oral and 4 nasal vowels of French)
- Rating: 1-5 (good exemplar or not?)



## Results: identification

16 French listeners



## Concluding remarks

- French /u/ pronounced by Japanese-speaking learners was mainly perceived as /ø/ by native listeners of French.
- High back unrounded vocoids were mainly perceived as /œ/ or /ø/ by native listeners of French.
- These findings confirm the small acoustic distance between front rounded and back unrounded vowels.

## Acknowledgement

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