The Canadian Vowel Shift in Production and Perception: New Evidence from Montreal

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Cognitive and Information Sciences

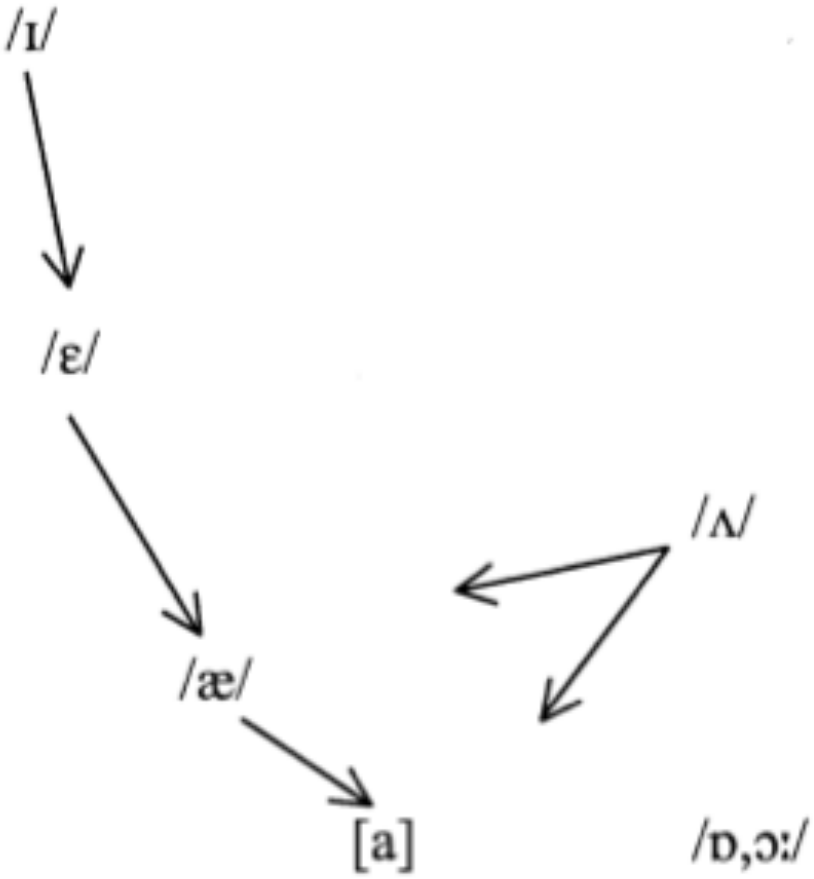
Aims of the study

1. Account for age- and gender-based variation in the pronunciation of non-high short vowels (æ, ɛ, ʌ, ɒ) in (Jewish) Montreal English

1. Investigate the relationship between ongoing change in vowel production with inter-gender and inter-generational perceptual variation

What is the Canadian Shift?

Clarke, Elms and Youssef (1995)



Roeder and Jarmasz (2010)

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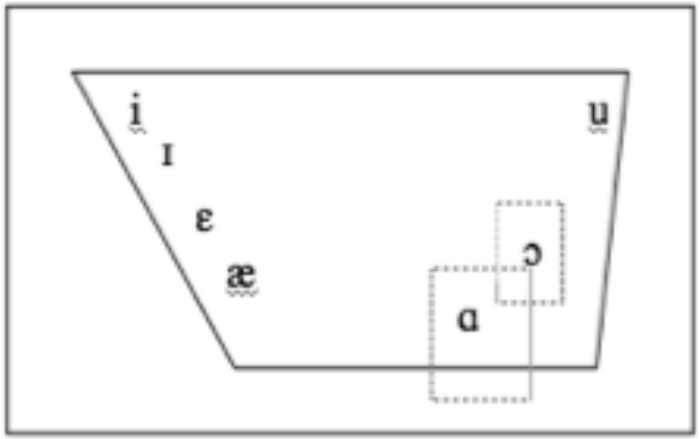

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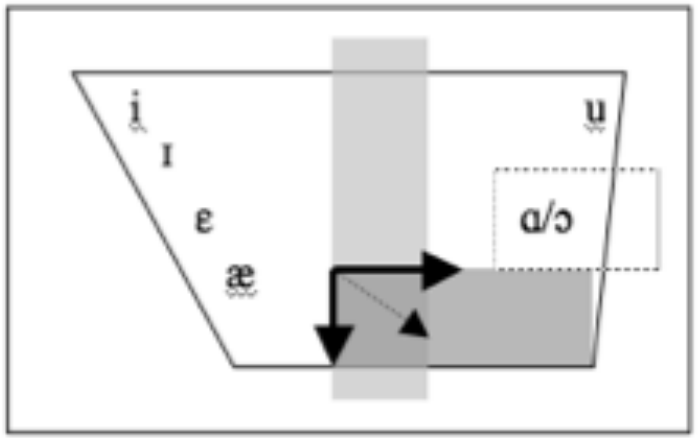

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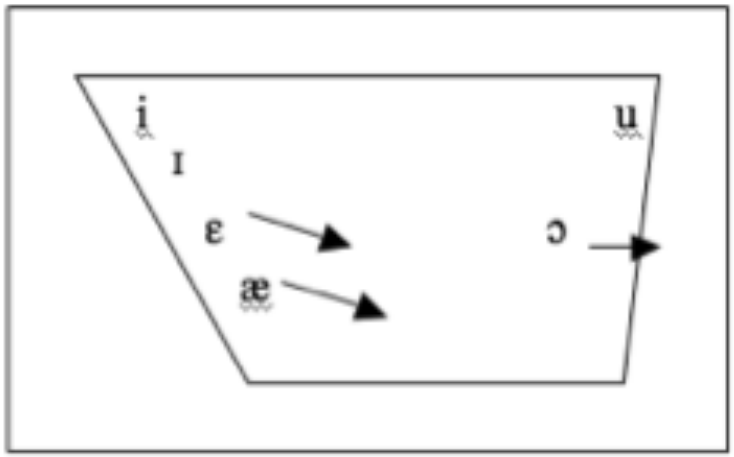

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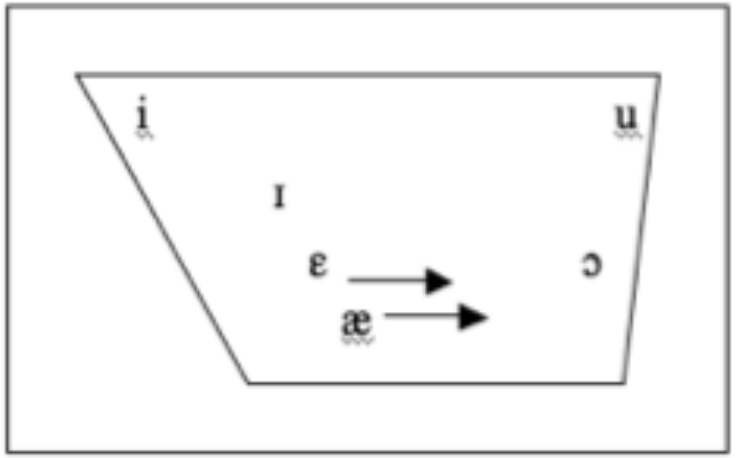


Present Study – Participants

- Have at least one Jewish parent
- Grew up speaking English as a first or home language
- Grew up in Montreal

	Female	Male
Younger	1991	1995
	1989	1992
	1988	1992
	1988	1991
	1984	1989
		1988
		1987

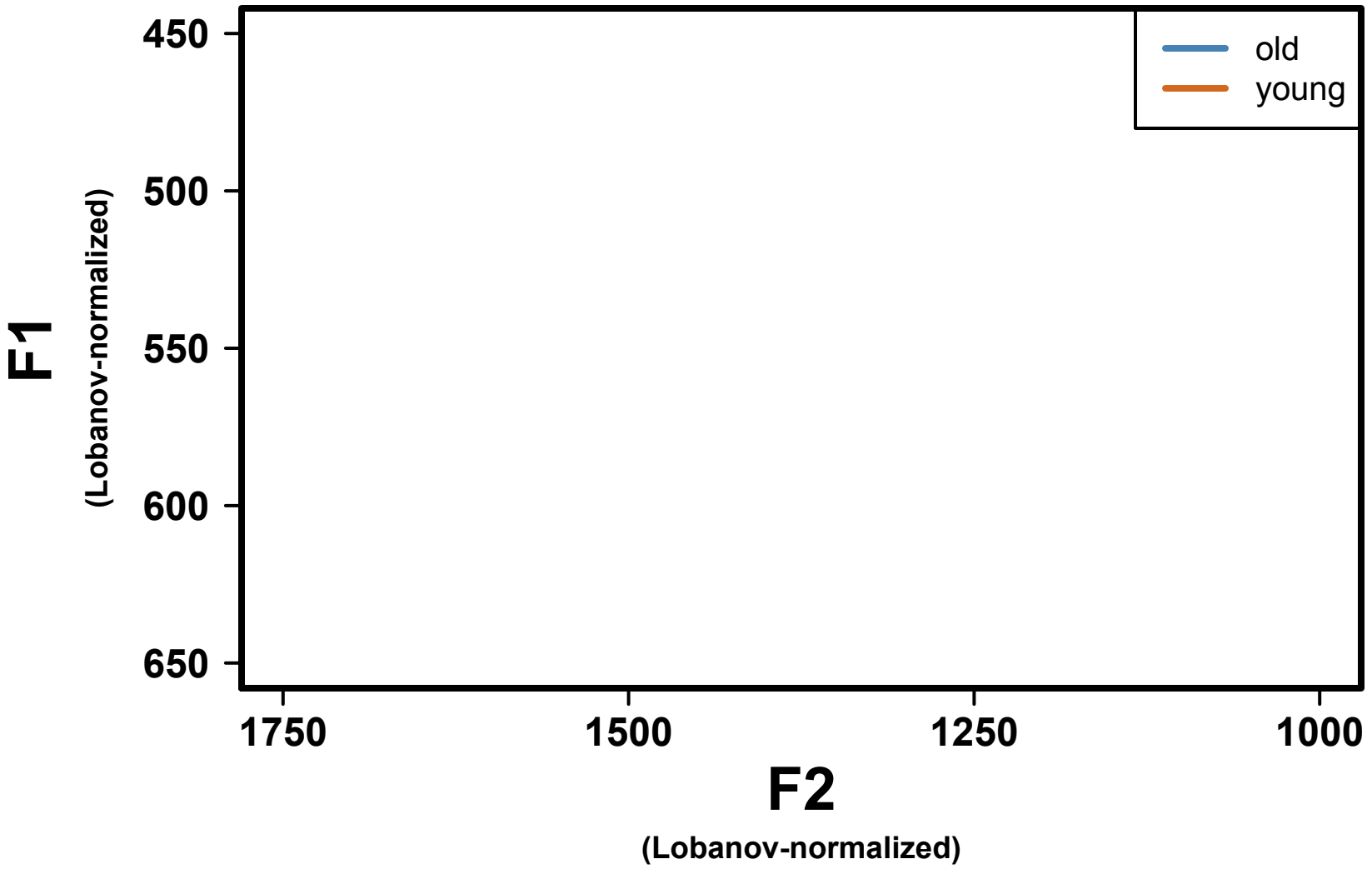
	Female	Male
Older	1961	1961
	1957	1960
	1952	1957
	1950	1953
	1937	1949
		1949
		1949
		1949
		1949
		1943
		1940

Two experiments

- **Production experiment**
  - Classic sociophonetic experiment
  - Participants read 44 sentences at their own pace
  - Vowel formant measurement, normalization
- **Perception experiment**
  - Participants listen to synthetic vowel sounds through headphones
  - Classify as BET, BAT, BUT, or BOUGHT by clicking on screen
- Both experiments in one session

Production experiment

Production results



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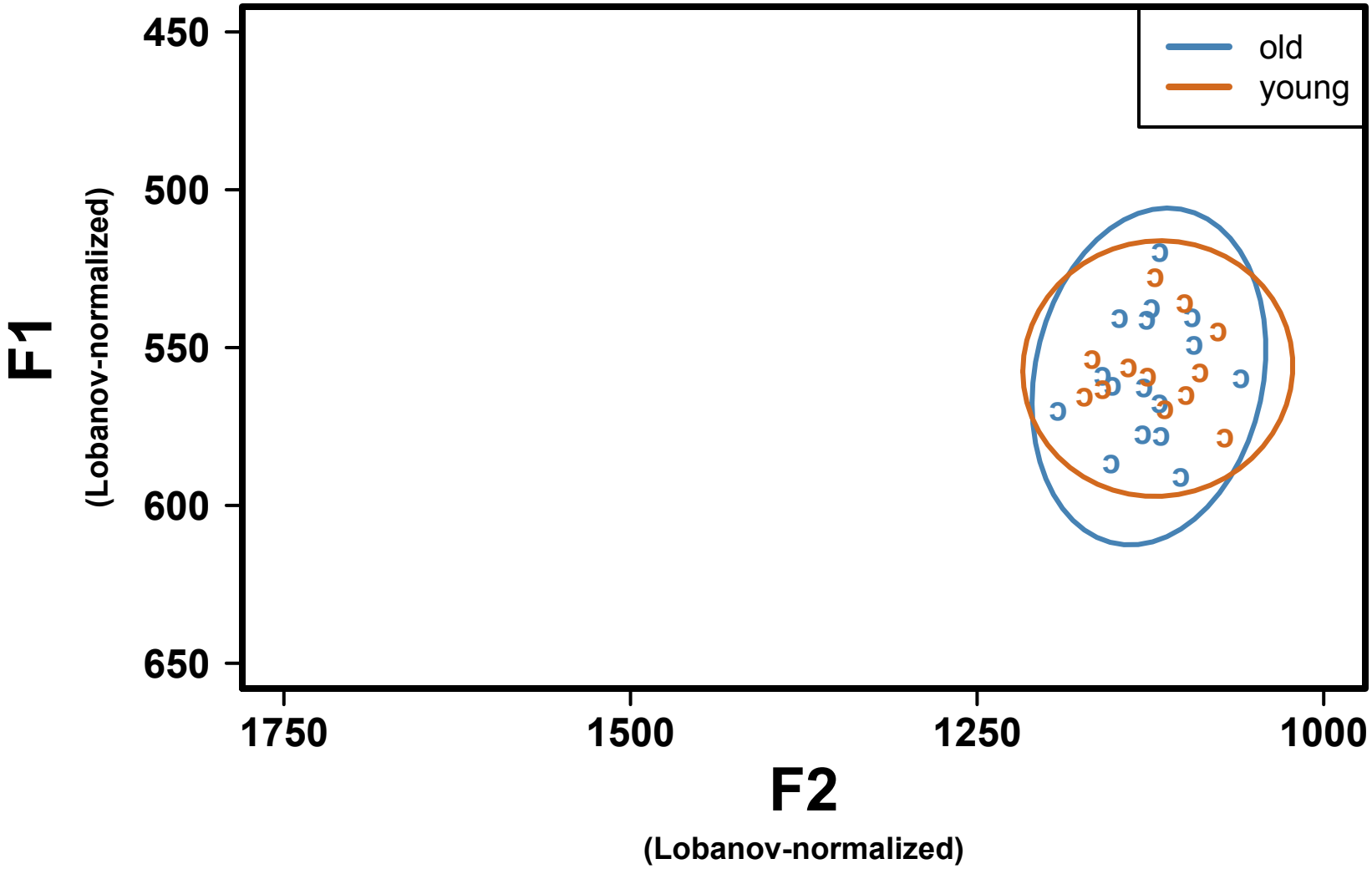

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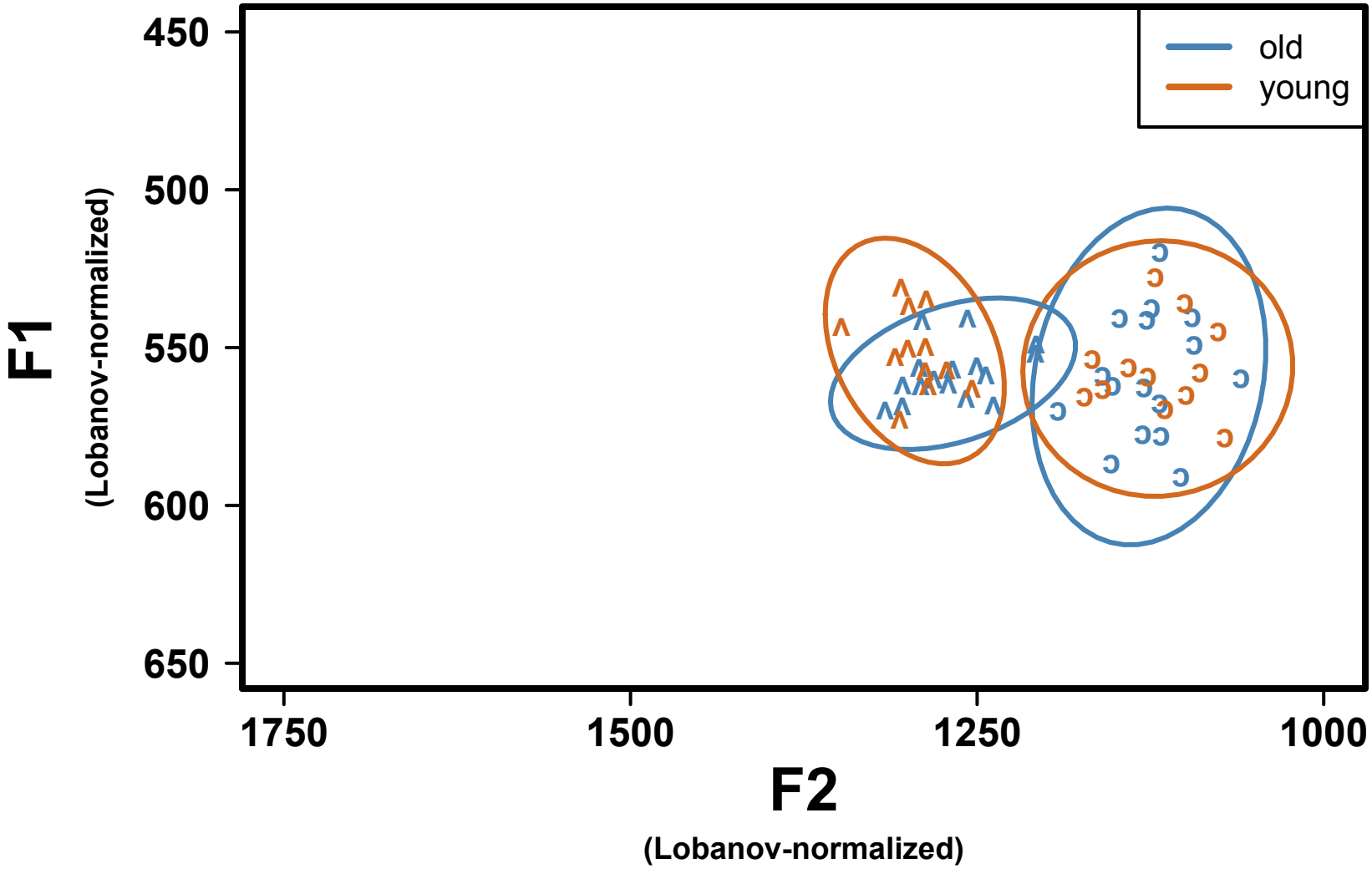

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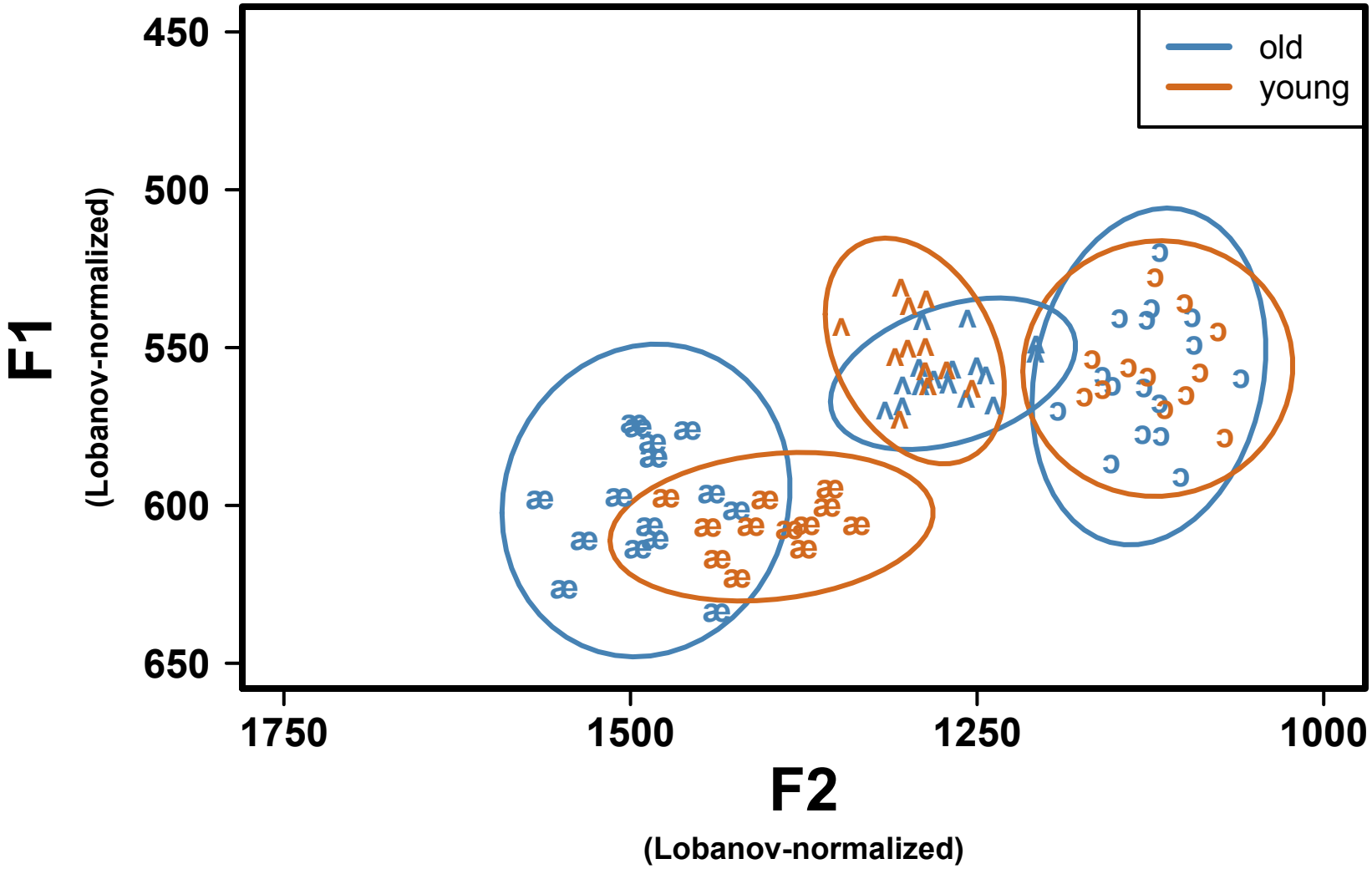

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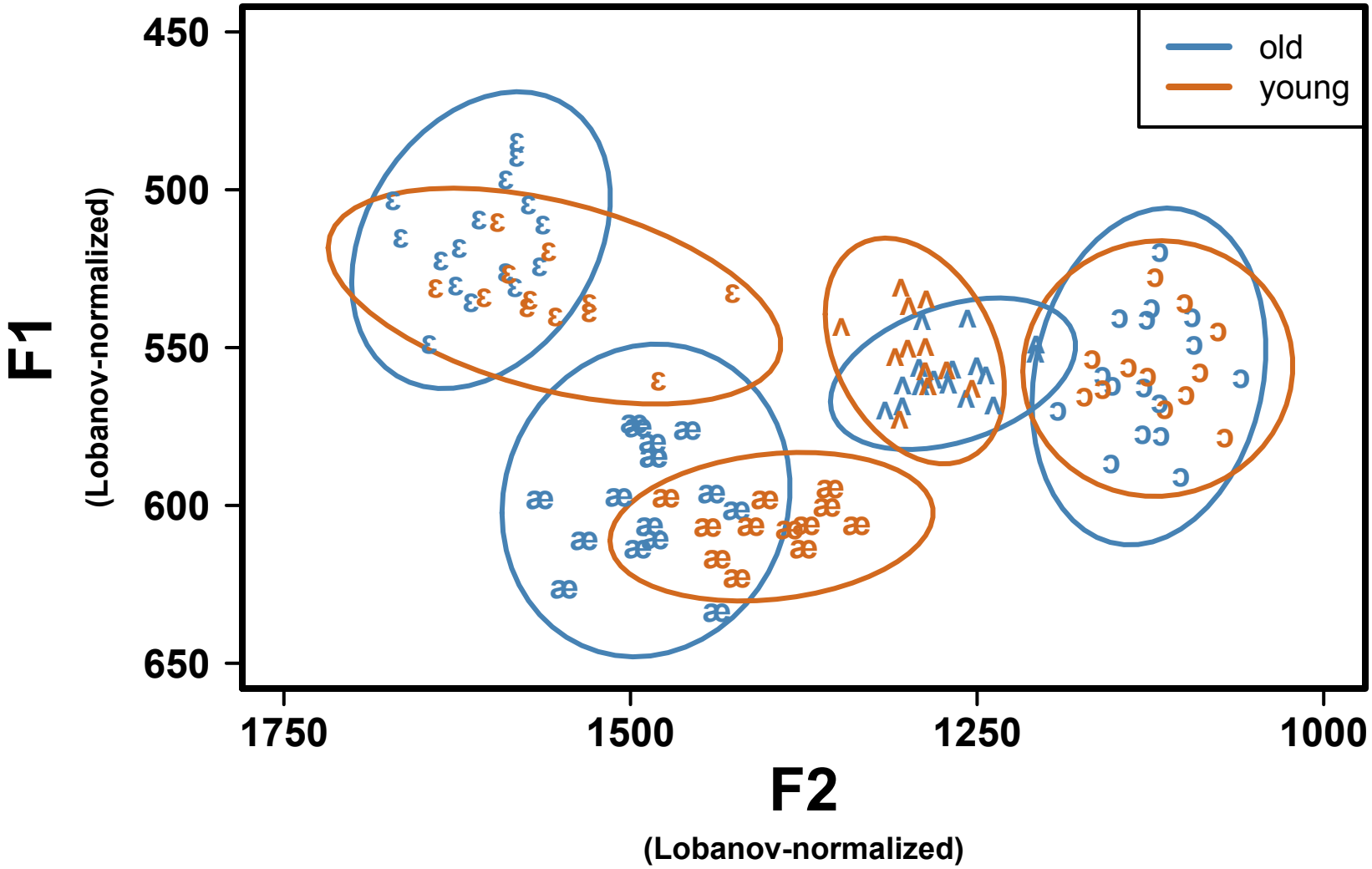

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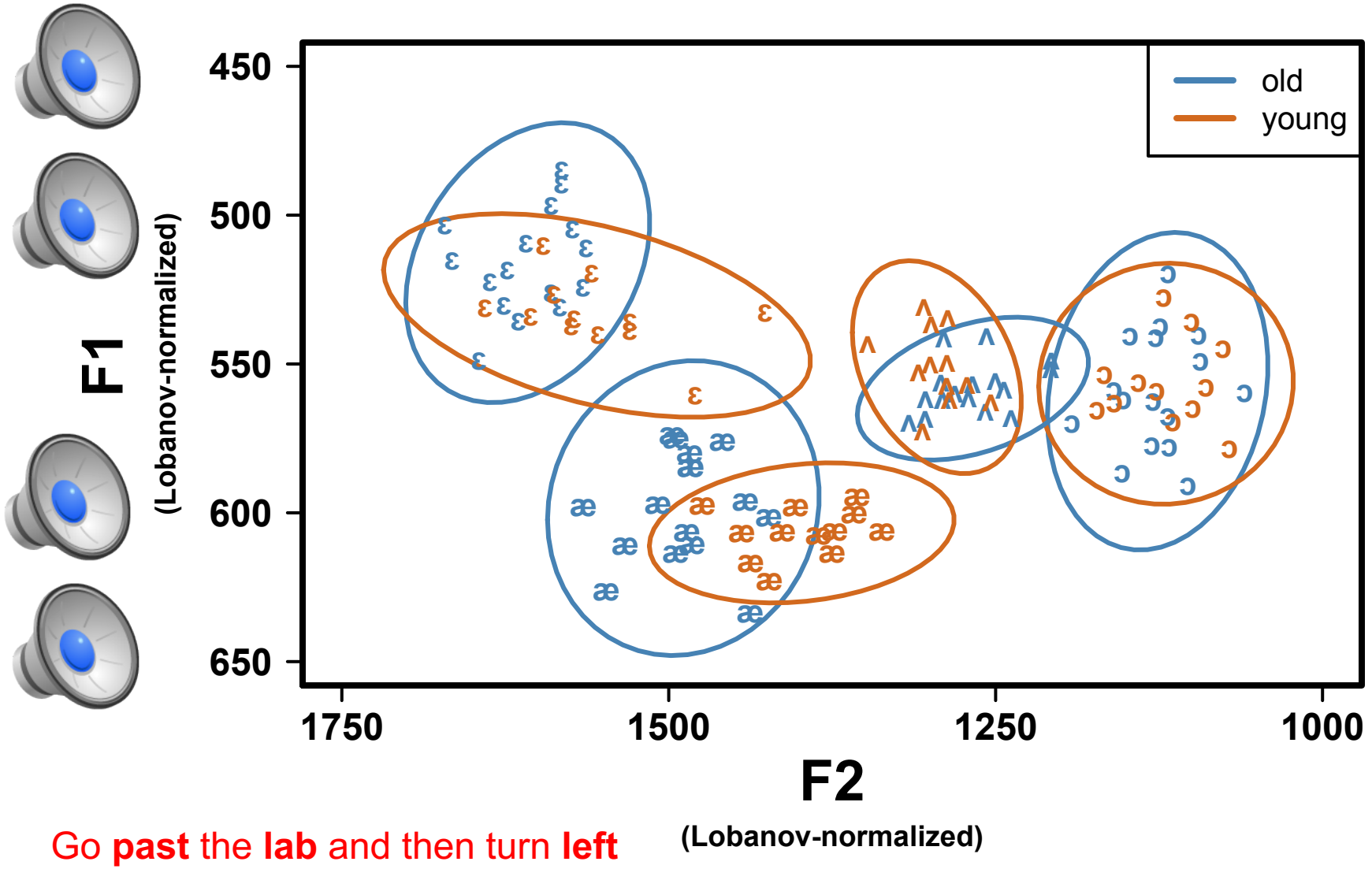


Go **past** the **lab** and then turn **left**

Linear mixed effects modeling

(Pinheiro & Bates, 2000; Baayen et al., 2008)

```
F1 ~ Age + Gender + Vowel + WordFreq +
     Age:Vowel + Gender:Vowel +
     WordFreq:Vowel +
     Voicing + Syllables + Manner + Place +
     Voicing:Vowel + Syllables:Vowel +
     Manner:Vowel +
     (1+Vowel|Speaker) + (1|Word) +
     (0+Age|Word) +
     (0+Gender|Word)
```

Linear mixed effects modeling

(Pinheiro & Bates, 2000; Baayen et al., 2008)

F1	Age*Vowel	p<0.02	✓
F2	Age*Vowel	p<0.001	✓
F1	Gender*Vowel	p<0.047	✓
F2	Gender*Vowel	p<0.03	✓

Linear mixed effects modeling

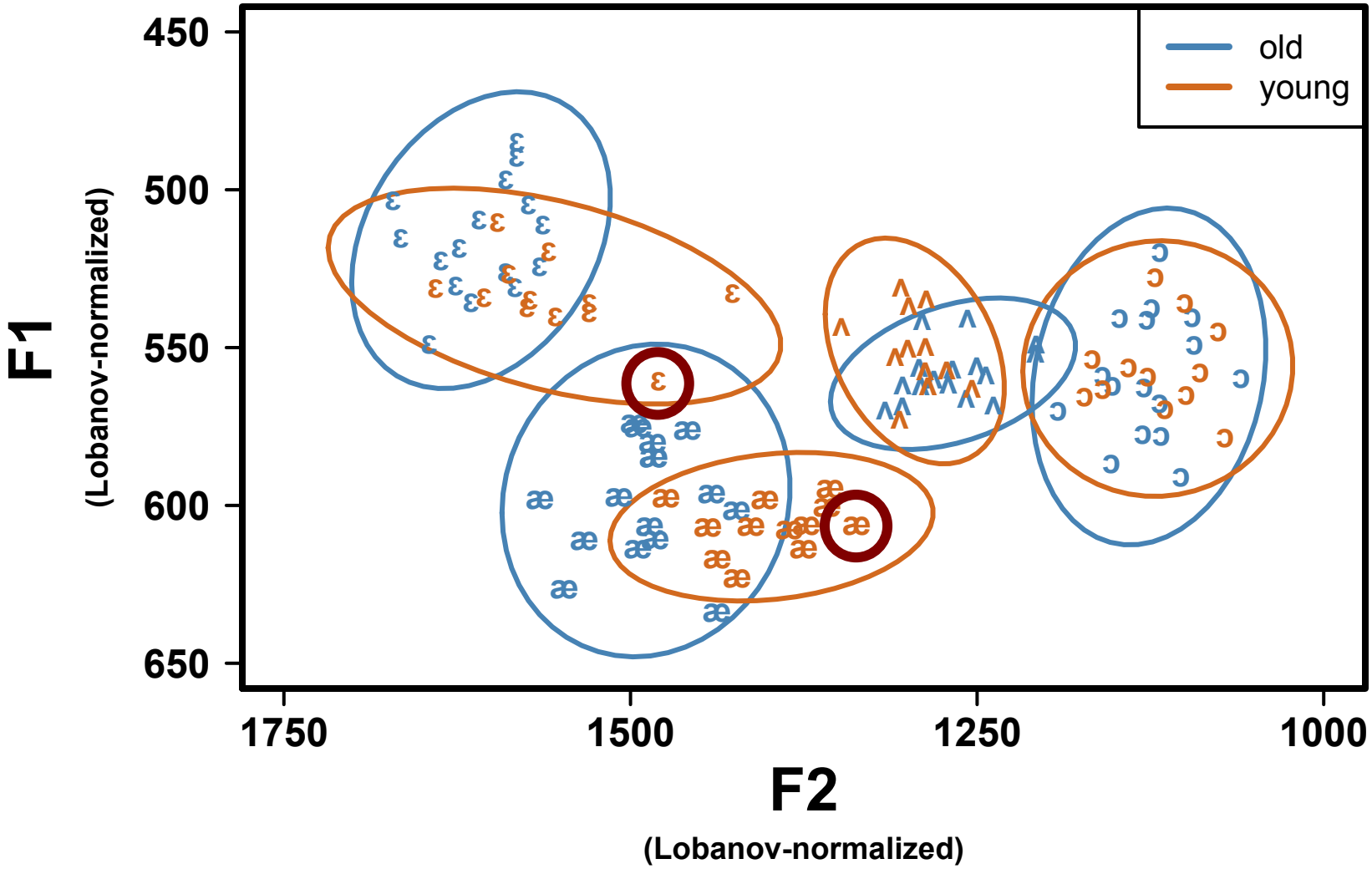
(Pinheiro & Bates, 2000; Baayen et al., 2008)

Age difference for each vowel

(Bonferroni-corrected for performing 8 tests)

	F1	F2
/ɛ/	✗	✓
/æ/	✗	✓
/ʌ/	✗	✗
/ɔ/	✗	✗

Quantifying shift leadingness



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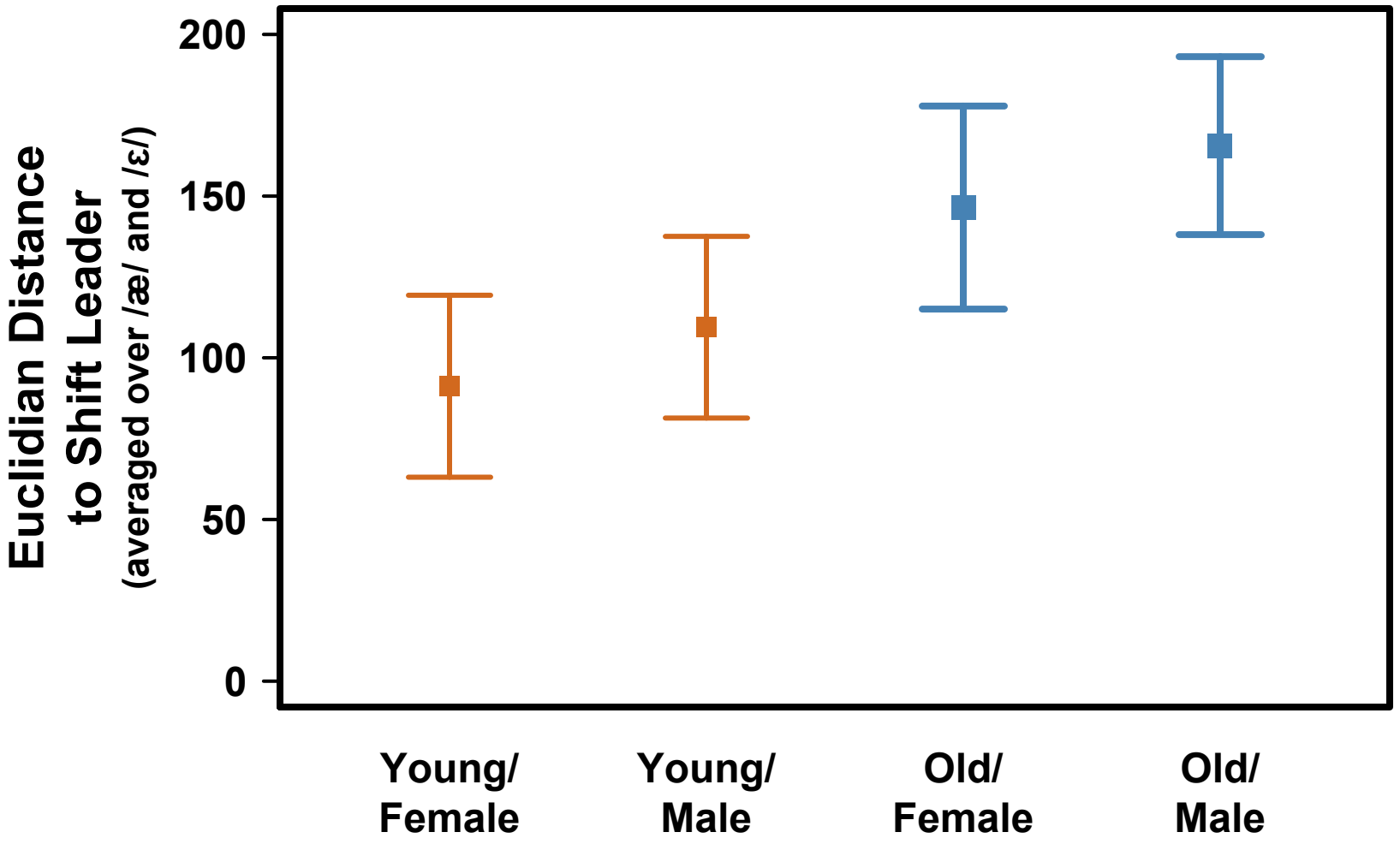

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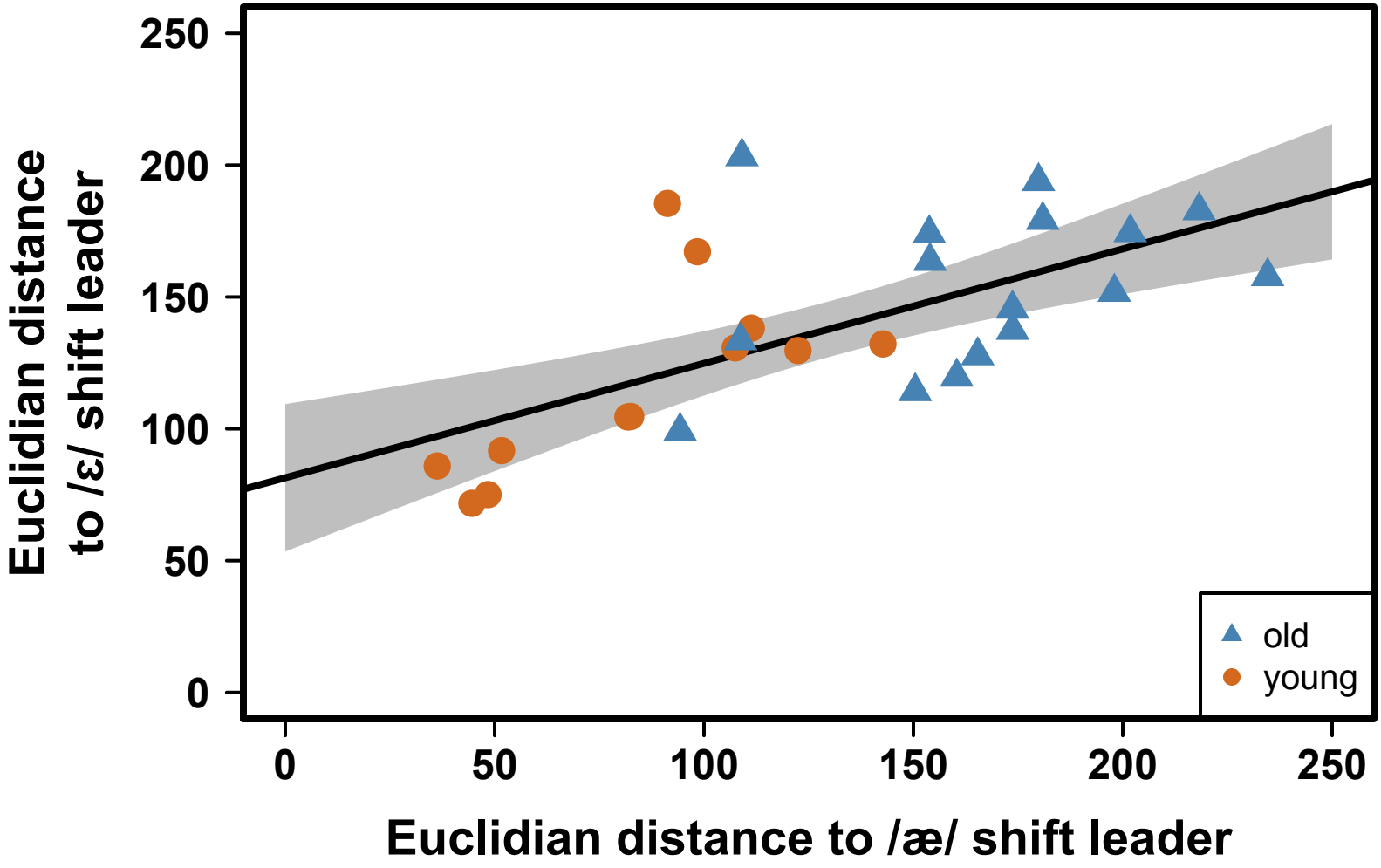
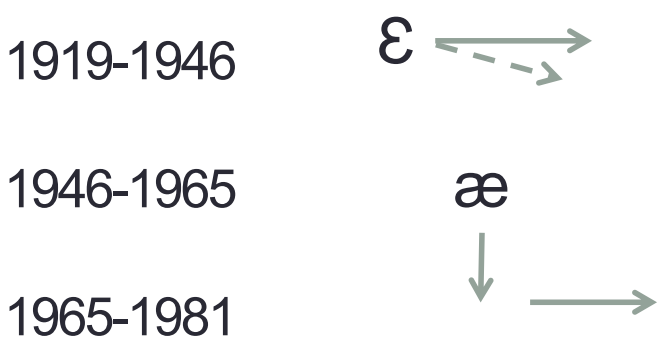
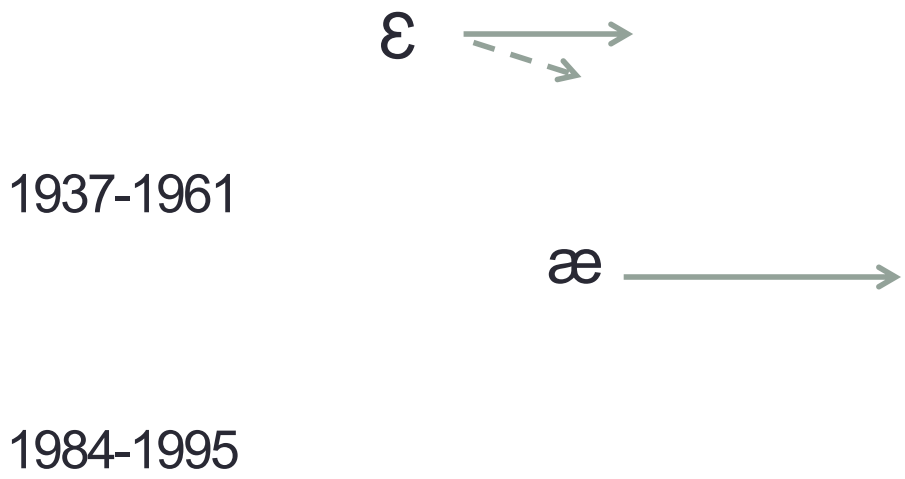


Real-time change – Montreal

Boberg (2005):



Current study:



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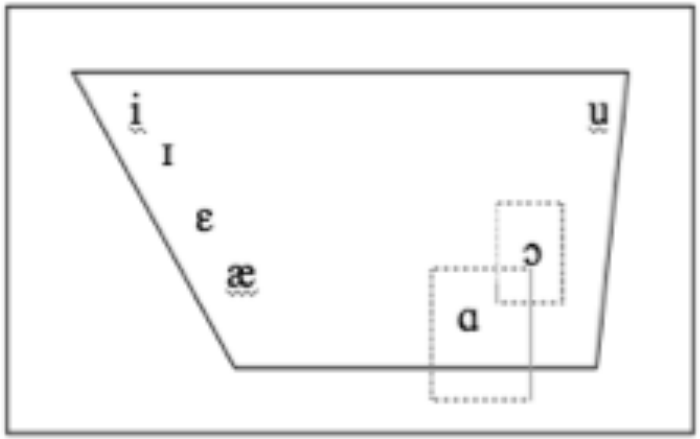

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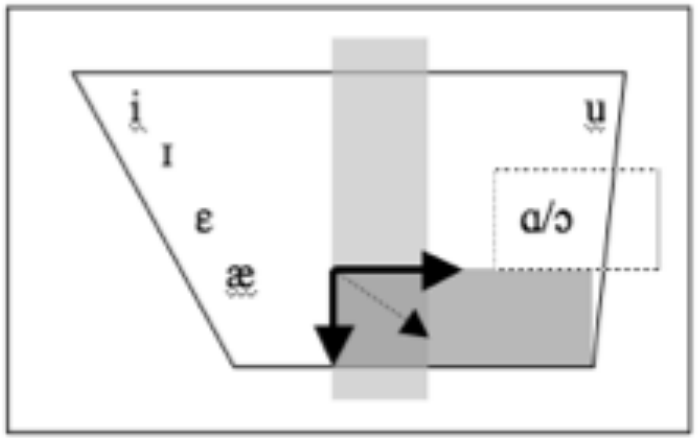

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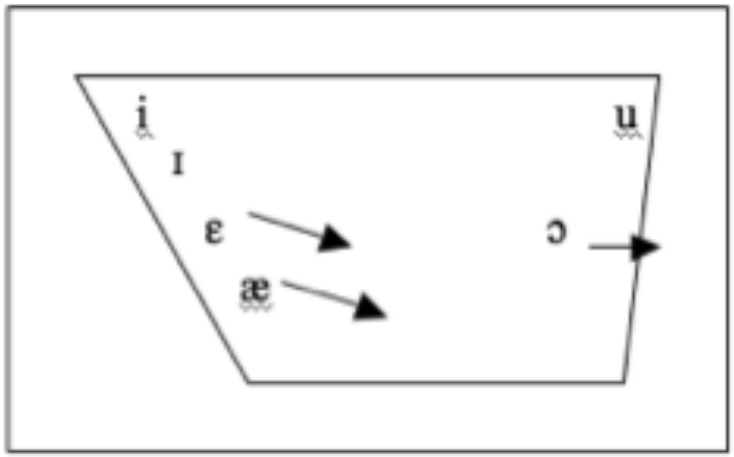

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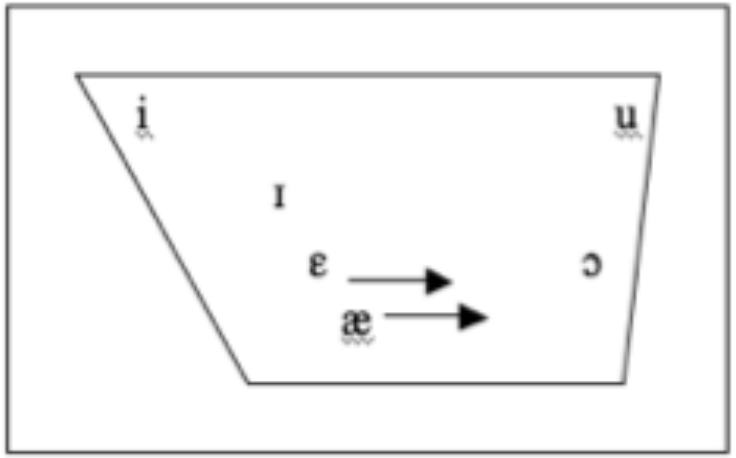


Proposed Schematic of Canadian Shift

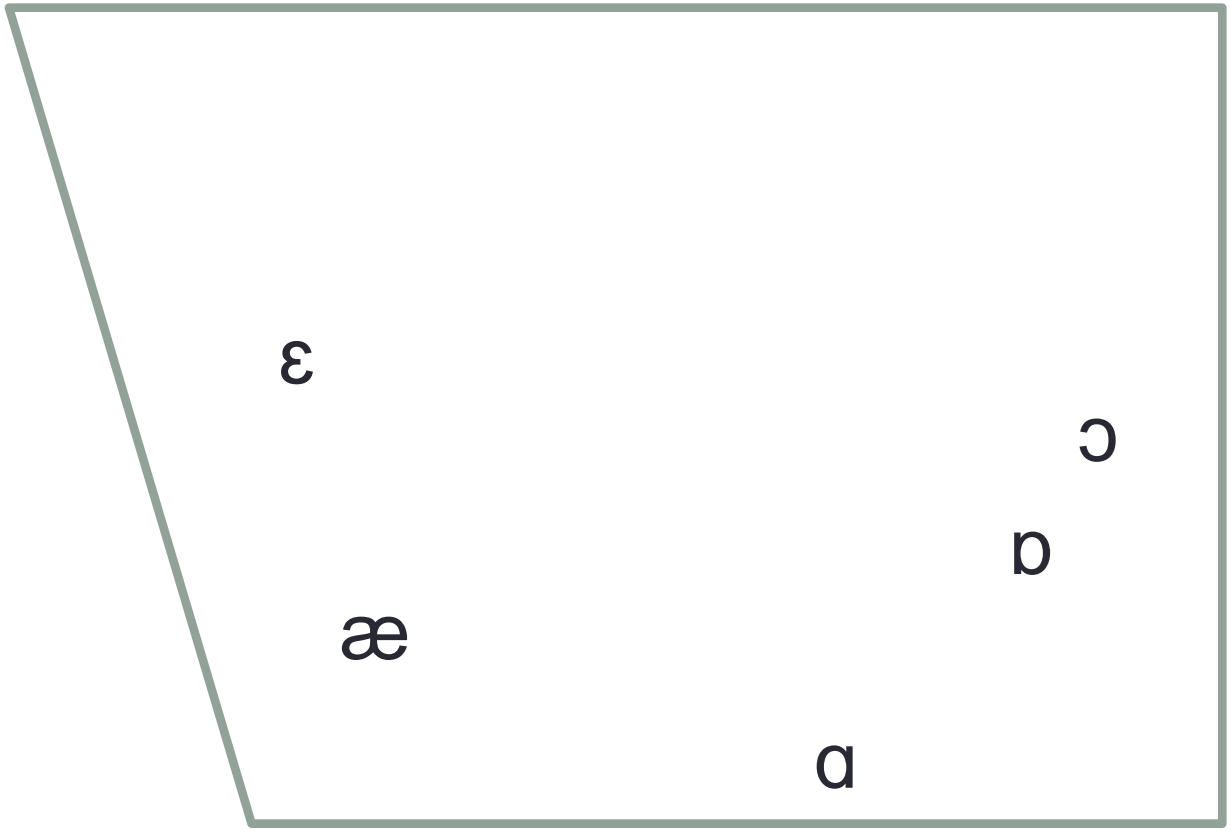
Low-back merger

/æ/ lowering

/æ/ retraction

/ɛ/ retraction

/ɛ/ lowering



Perception experiment

Paired vowel production/perception studies

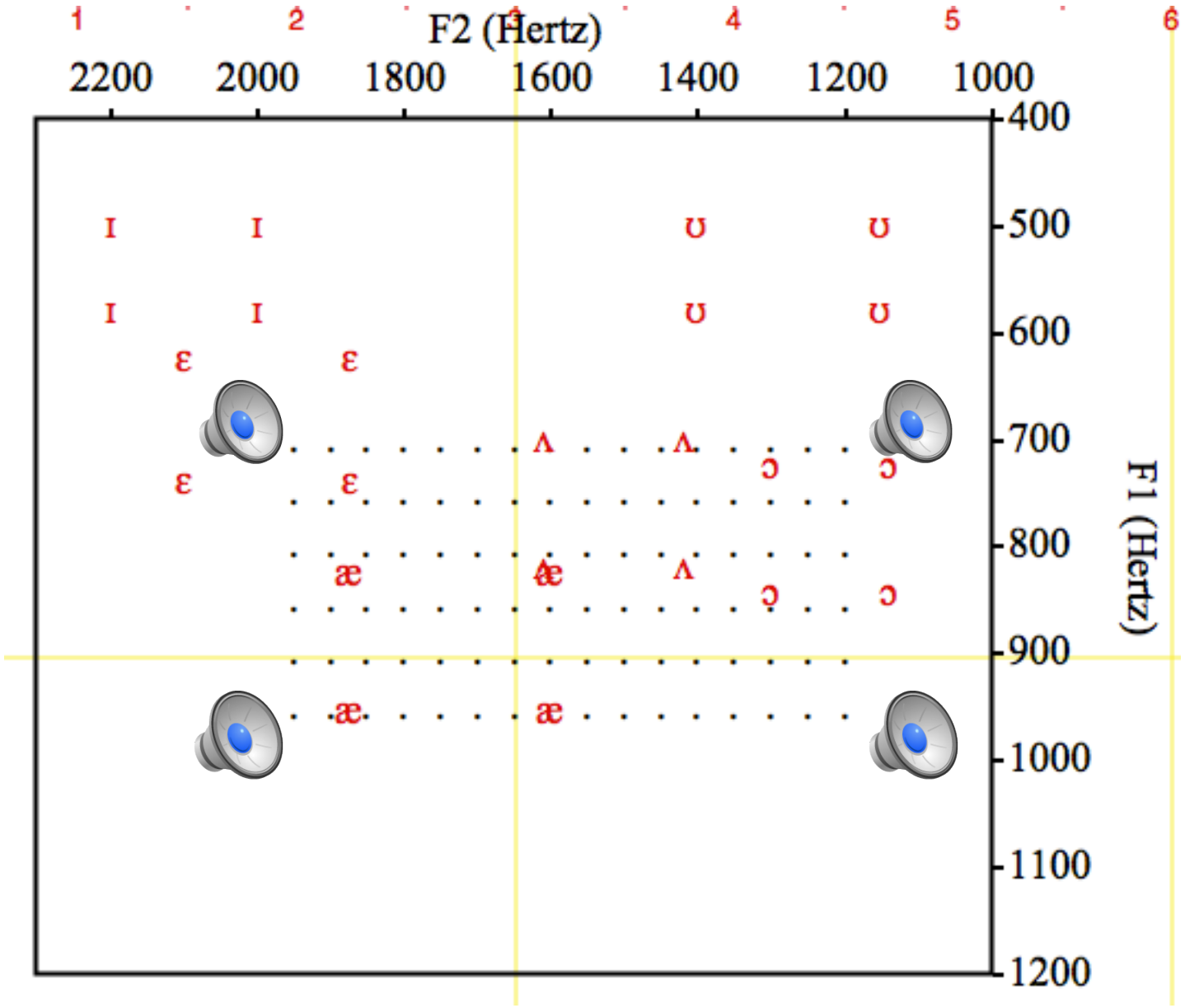
- Janson (1983, 1986): Stockholm Swedish
  - Perceptual boundary between /a:/ and /o:/ tested along one dimension
  - Perception difference lagging behind production difference
- Kendall and Fridland (2010): Southern Shift
  - Perceptual boundary between /ɛ/ and /e/ tested along one dimension
  - Perception can be affected by shift in production at the individual level

Vowel categorization in CS

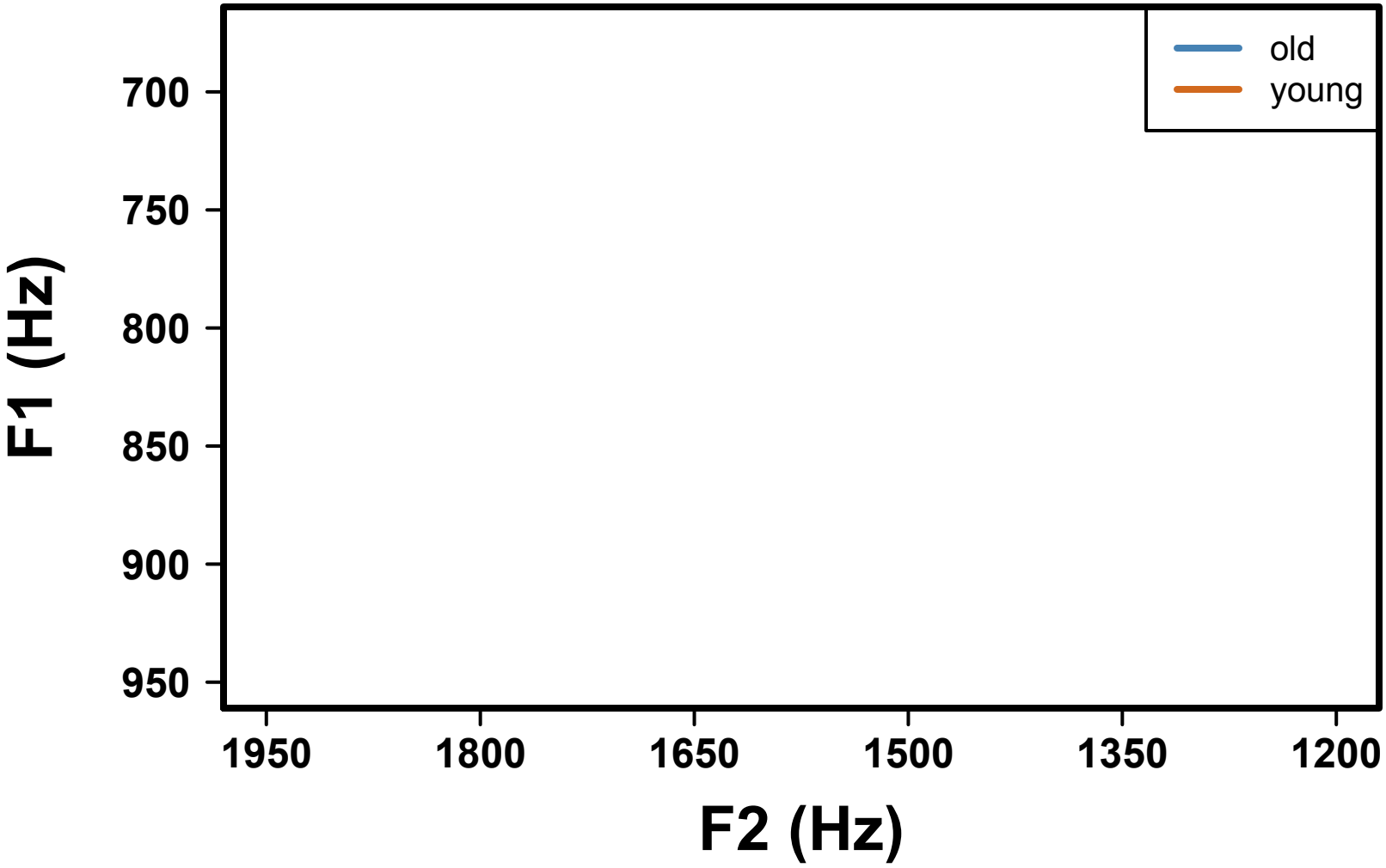
- Willis (1972): American/Canadian regional differences
  - Perceptual boundary between /æ/ and /ɔ/ and between /æ/ and /ɛ/ tested with two-dimensional grid of categorization stimuli
  - Regional speech differences also result in perception differences
- De Decker (2010): Canadian Shift (Ontario)
  - Perceptual boundary between /æ/ and /ɔ/ tested along one dimension
  - Found significant gender differences, not very much age difference

Present study

- Same participants, 4-alternative forced choice task
- Heard vowel stimuli, had to click button of word that ‘matched’ each vowel


F2 (Hertz)
2200
2000
1800
1600
1400
1200
1000
400
500
600
700
800
900
1000
1100
1200
F1 (Hertz)

Perception results



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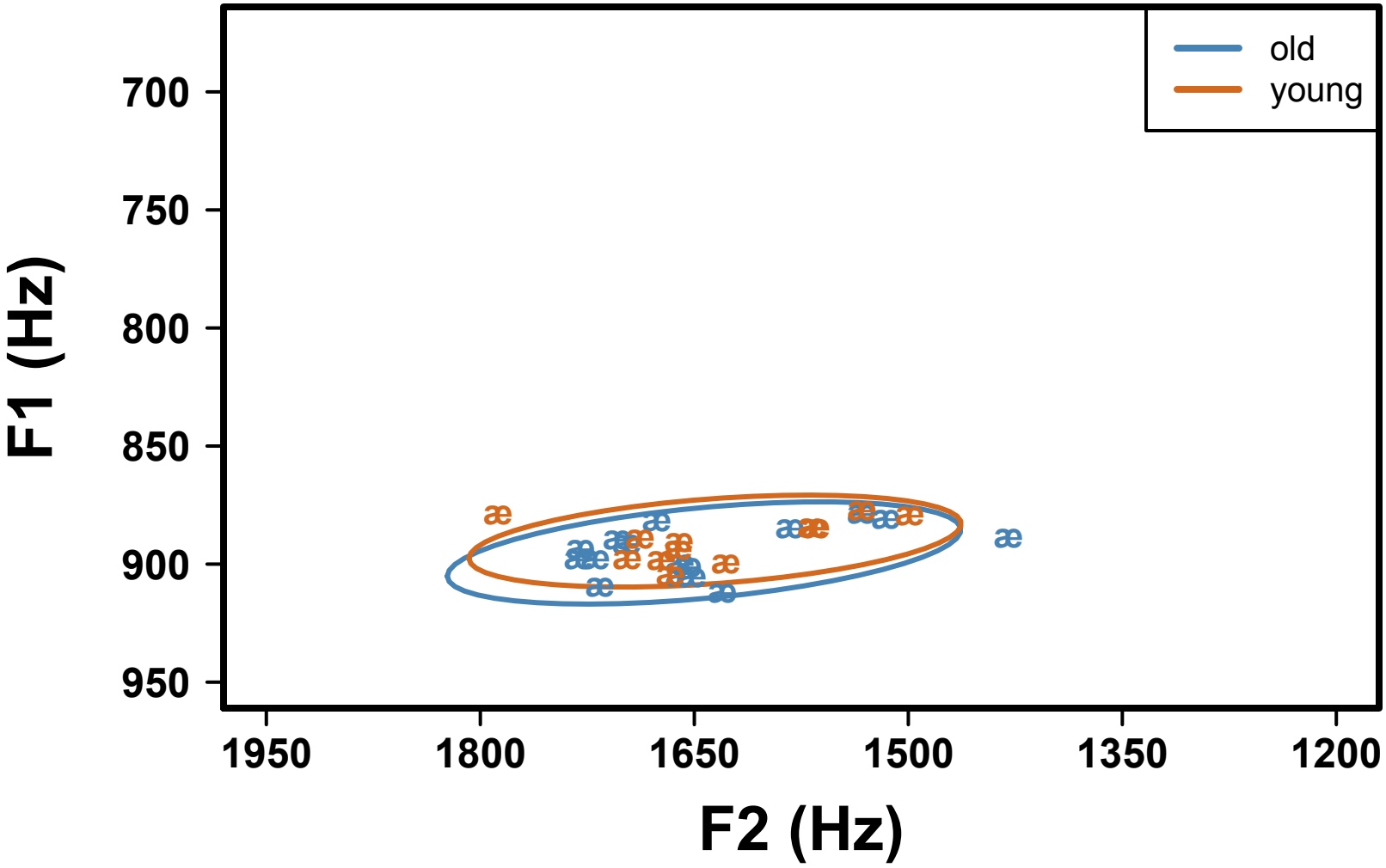

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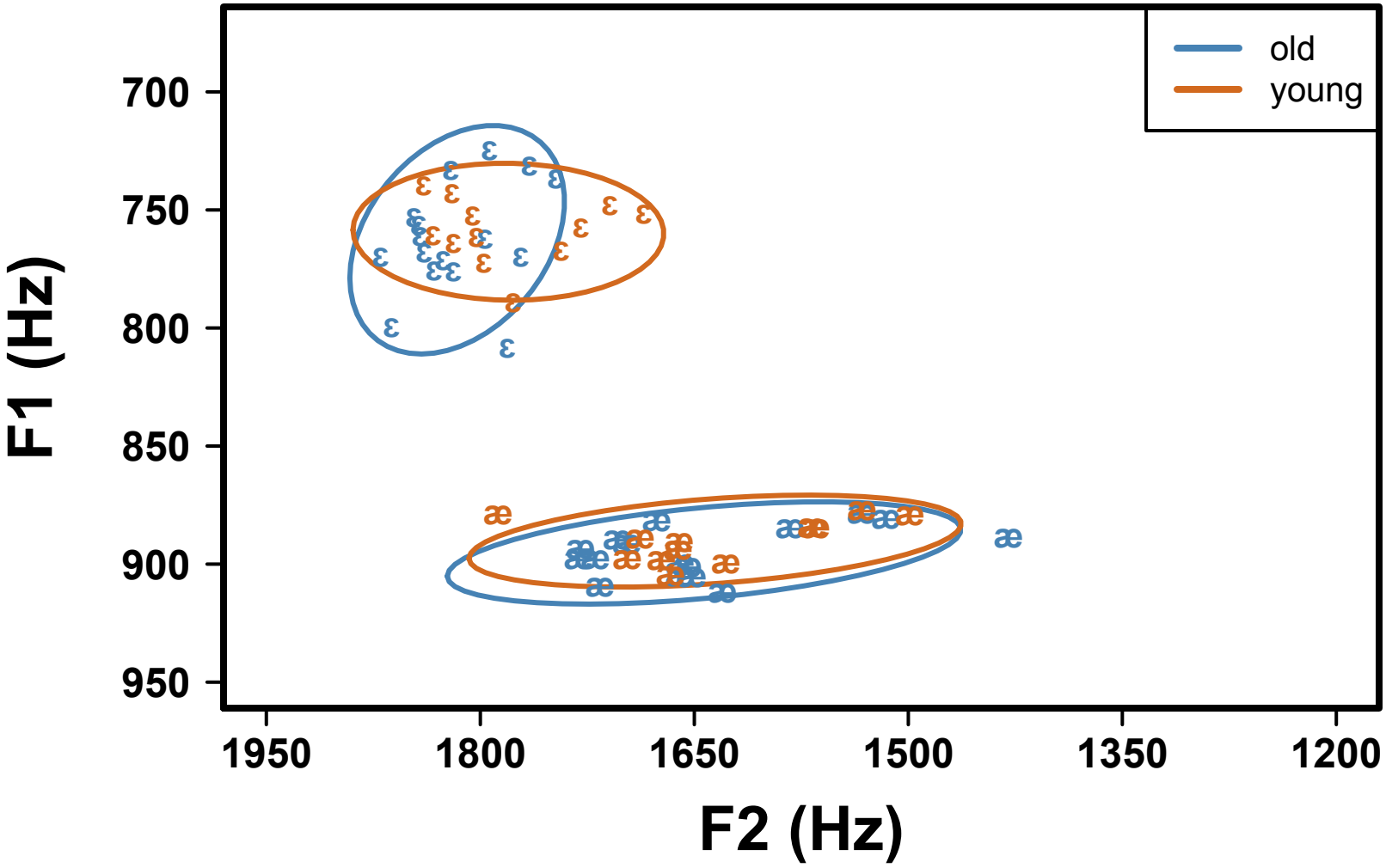

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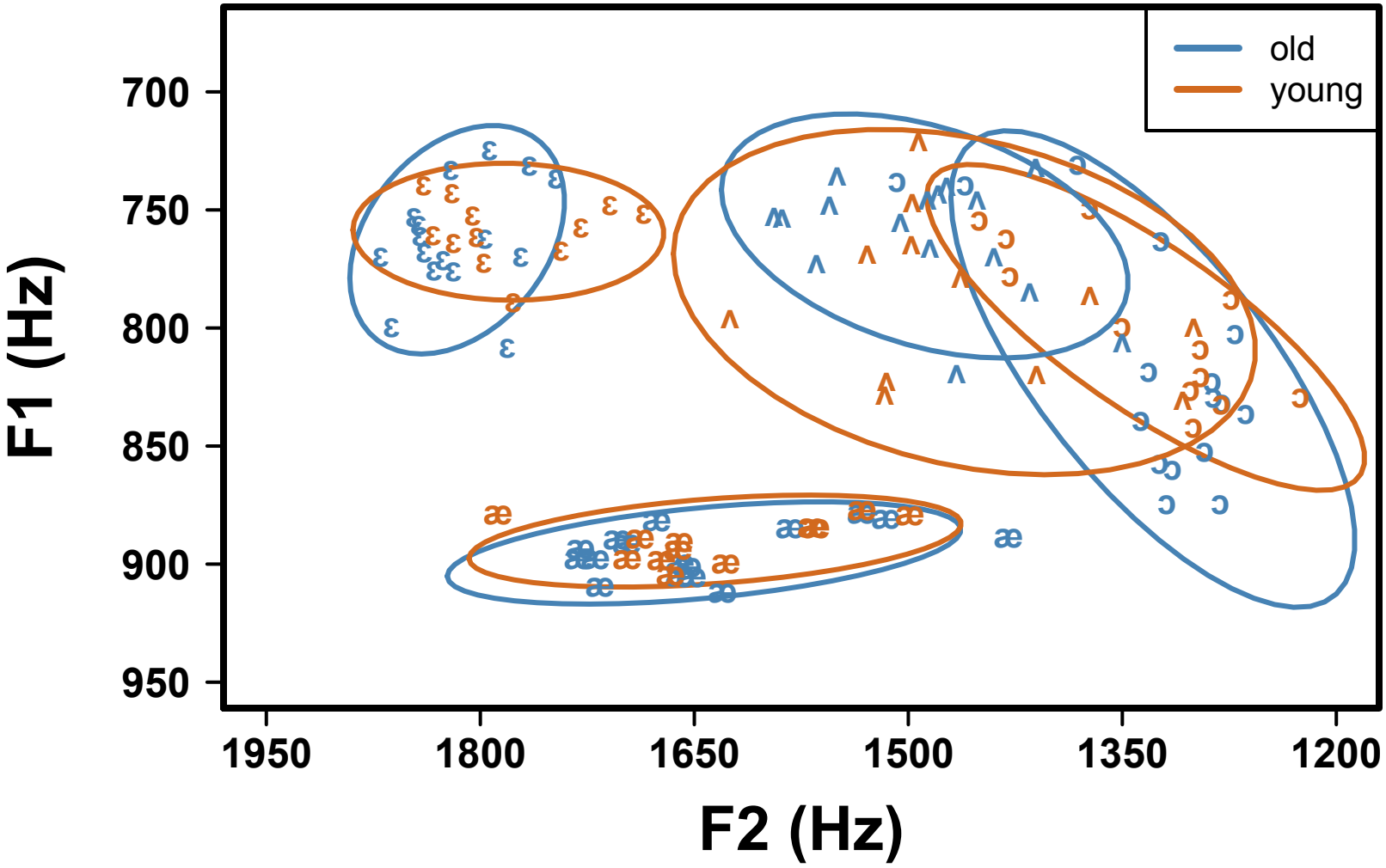


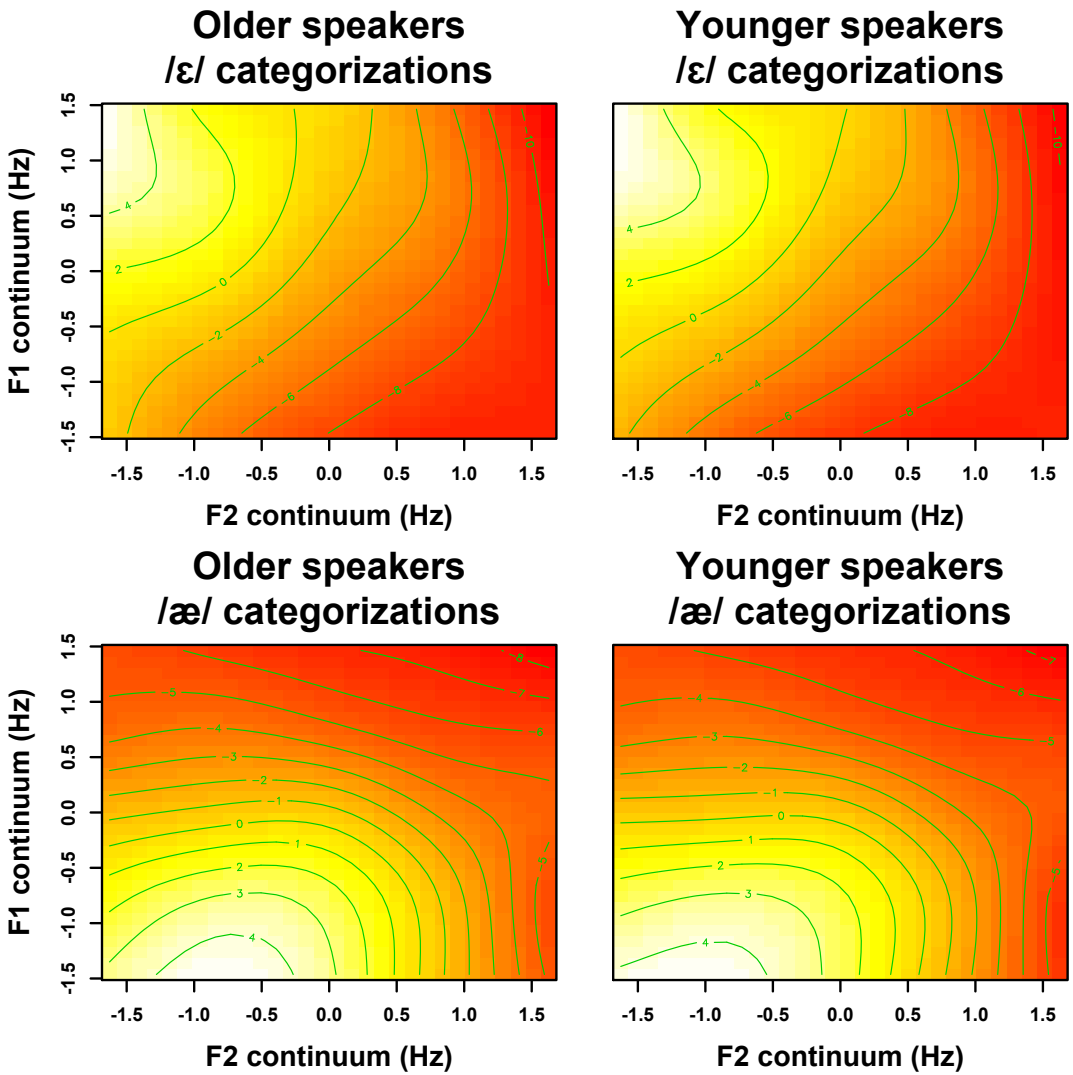
Generalized additive modeling (GAM)

(Wieling et al., 2014; Baayen et al., 2010)

A logistic GAM:

```
/æ/ ~
      Age +
      te(F1,F2) +
      te(F1,F2,Age) +
      s(Subject,bs="re") +
      s(Subject,F1,bs="re") +
      s(Subject,F2,bs="re")
```

GAM results


Older speakers
/ɛ/ categorizations
Younger speakers
/ɛ/ categorizations
Older speakers
/æ/ categorizations
Younger speakers
/æ/ categorizations
F1 continuum (Hz)
F2 continuum (Hz)
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5

GAM results

Age*F1*F2 interactions:

/ɛ/	✗
/æ/	✗
/ʌ/	✓
/ɔ/	✓

Production-perception relationship

- Kendall and Fridland (2010)
  - Some indication that shifters in production also shift in perception, but not a linear relationship
  - Speakers within single community can form similarly adjusted representations, even if they differ in their participation in a shift
- Janson (1983)
  - Perception changes lag behind production changes
  - Younger generation must still classify older generations' sounds correctly, so perception cannot shift too radically

Overall conclusions

- Canadian Shift apparent in Montreal in production
- CS is a pull shift
- Currently stabilizing
- Generational differences in production are not as significant as differences in perception

➔ We currently think this is because speakers need to be able to understand both younger and older forms (cf. Janson 1983)

Thank you

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Real-time change – Toronto

Roeder & Jarmasz (2009)

ɛ →

æ →

1920-1935

1951-1965

1966-1985

Hoffman (2010)

ɛ ↘

1930-1958

æ →

1983-1995

(middle and youngest groups pattern together)

Real-time change – Vancouver

Esling & Warkentyne (1993)

ɛ

æ →

pre-1920

1920-1955

1956-1964

Sadlier-Brown & Tamminga (2008)

ɛ ↘

1922-1972

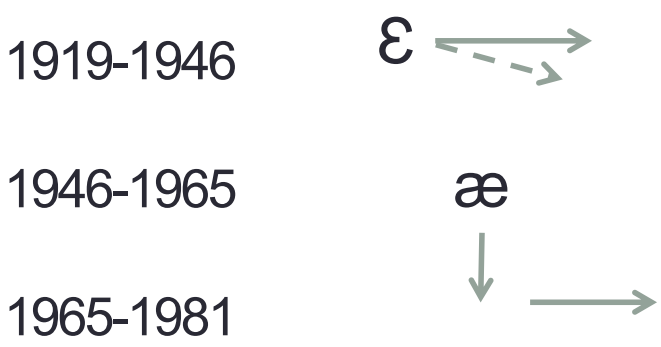
æ →

1981-1986

(oldest and middle groups pattern together)

Real-time change – Montreal

Boberg (2005):



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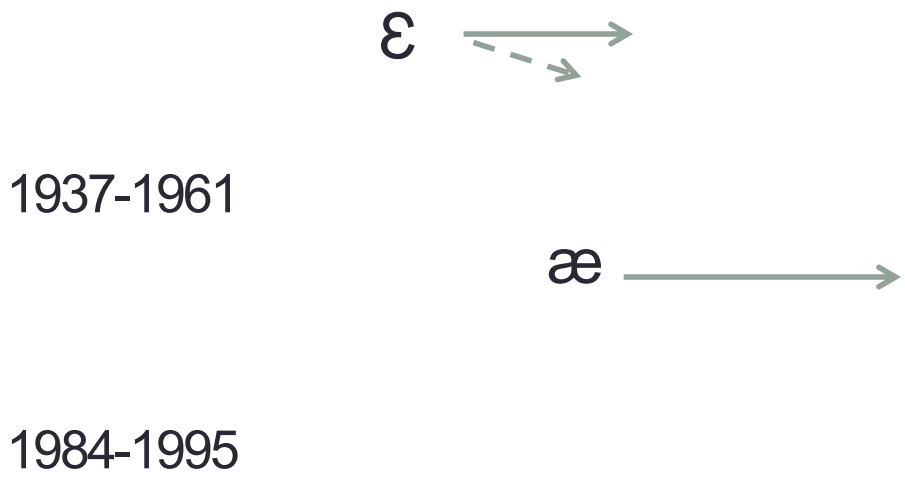

Geographic diffusion

- "…an account of the diffusion of changes through space is fundamental to an understanding of the mechanism of change." – Bailey et al. (1993)
- "…innovation can be seen spreading from a centre to surrounding areas, and then jumping to other members of the central place hierarchy at a greater distance." – Trudgill (1974)

Geographic diffusion

- Roeder and Jarmasz (2009): “Can these findings be reconciled?”
  - CS is no longer active in Toronto, has not been for the past 60 years
  - In Montreal, however, Boberg’s (2005) results indicate that CS only really took off in Montreal once it was over in Toronto
  - No comparative data for Halifax, but later lowering of /æ/ indicates lagging behind metropolitan centres
  - As such, more research is needed in tertiary cities and rural areas throughout Canada to improve modeling of geographic spread

Population	Toronto (Metro)	Montreal (Metro)	Vancouver (Metro)
1941	900,000	1,192,235	393,898
1951	1,262,000	1,539,308 (558,256 English)	562,462
1961	1,919,000	2,110,679	790,741
1971	2,628,045	2,743,208	1,028,334
1981	2,998,947	2,862,286	1,196,831
1991	3,893,933	3,127,242	1,602,590
2001	4,682,897	3,426,350	1,986,965
2011	5,583,064	3,824,221 (599,225 English)	2,313,328

BUT in 1951, only 558,256 had English as “mother tongue” *in all of Quebec*

In 2011 only 599,225 “native” speakers *in all of Quebec*; 861,770 use English as a “home language”

Roeder and Jarmasz (2010)

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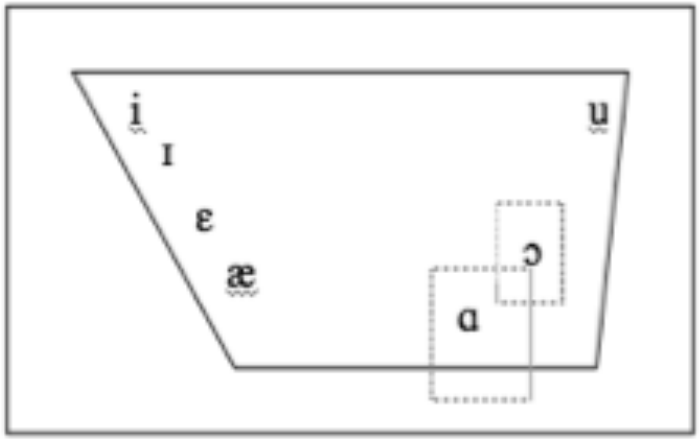

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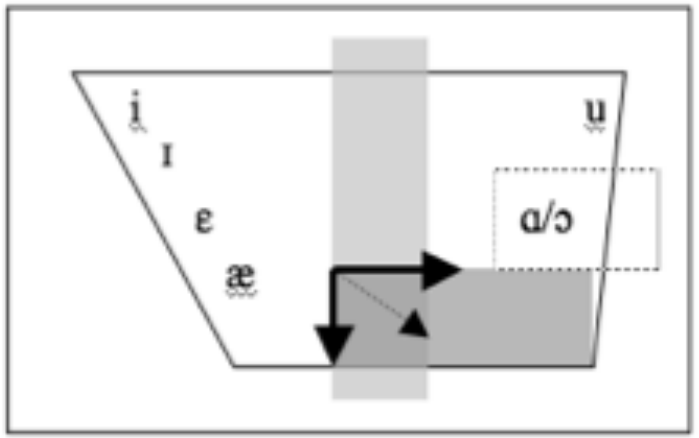

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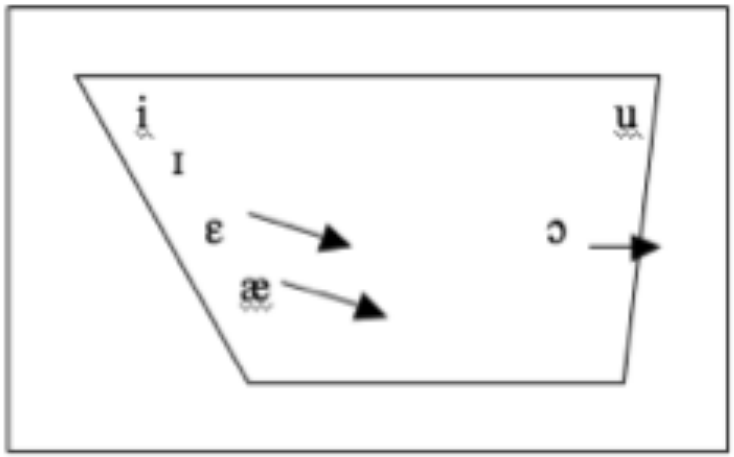

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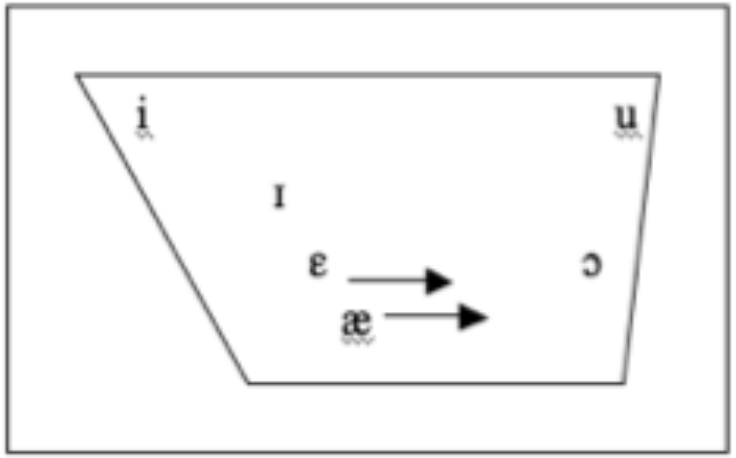

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