# Tone merging in Hong Kong Cantonese

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# Acknowledgements

- Mok, P., Zuo, D. & Wong, P. (2013) Production and perception of a sound change in progress: tone merging in Hong Kong Cantonese. *Language Variation and Change,* 25: 341-370.

- Mok, P. & Zuo, D. (2012) The separation between music and speech: evidence from the perception of Cantonese tones. *Journal of the Acoustical Society of America,* 132: 2711-2720.

# Sound change

- Language changes

  e.g. fashionable expressions in Hong Kong 潮語

- Many segmental changes in Cantonese

  e.g. n/l alternation, n/ng alternation

- 'lazy pronunciation'

# Sound change

- Many studies on Cantonese segmental sound changes
- Few examined changes at the suprasegmental level (tone)
- Signs of incipient tone mergers

# Sound change

- 苦 婦 椅 耳
- 貴 櫃 障 像
- 黃 旺 聯 亂

# Sound change

- 苦 婦 椅 耳　　　T2/T5
- 貴 櫃 障 像　　　T3/T6
- 黃 旺 聯 亂　　　T4/T6

# Outline

- Cantonese tone system
- Production experiment
- Perception experiment
- Possible factors affecting sound change/tone merging in Hong Kong

# Cantonese tones

- Six contrastive lexical tones in Cantonese

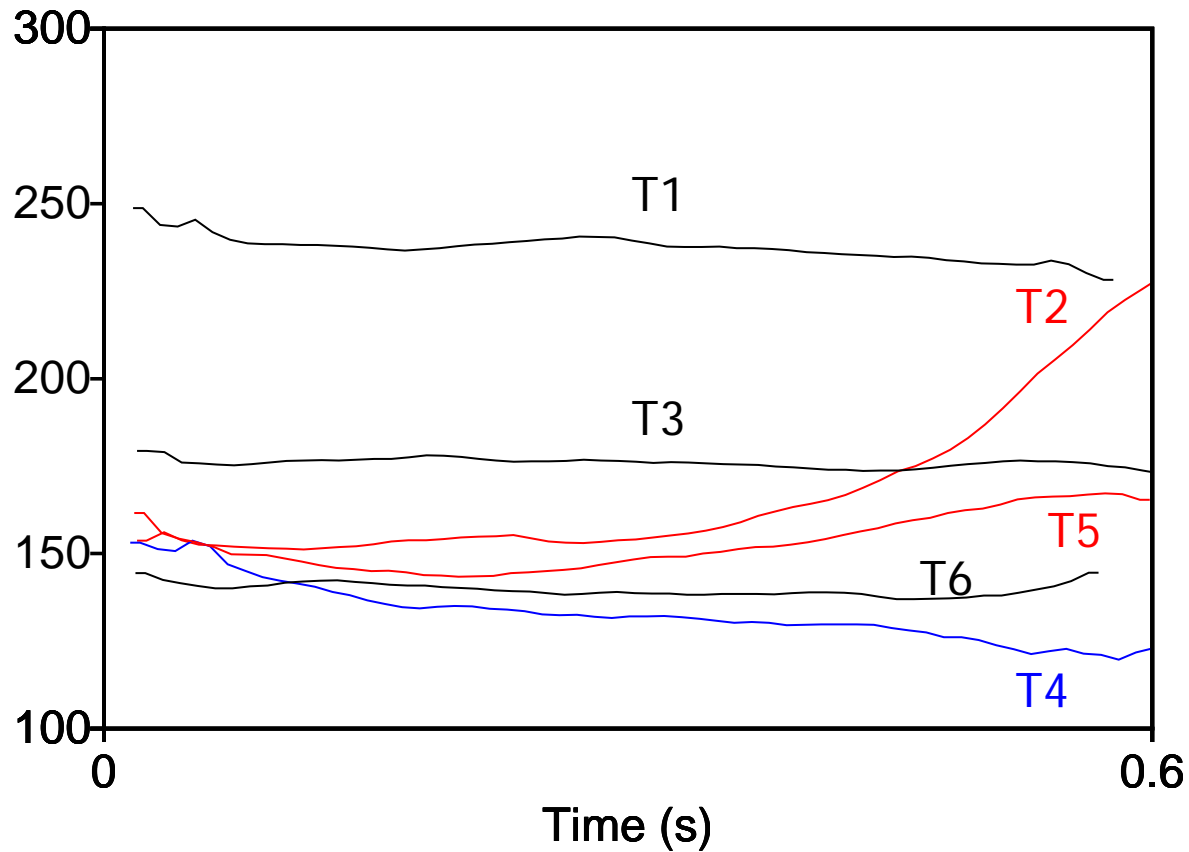3 level tones:  T1 [55] 詩 poem

T3 [33] 試 try

T6 [22] 是 is

2 rising tones: T2 [25] 史 history

T5 [23] 市 market

1 falling tone:  T4 [21] 時 time

# Cantonese tones

# Cantonese tones

- T1 is well separated from other tones
- A crowded 'tone space'
- Several tone pairs are acoustically similar
  T2 vs T5 (rising)
  T3 vs T6 (level)
  T4 vs T6 (slight fall vs level)

# Previous studies on tone merging (T2/T5)

- Some Hong Kong speakers no longer clearly distinguish all 6 tones in production, esp. T2 vs T5

  - Kei, Smyth, So, Lau and Capell (2002)

    15 subjects against 56 control speakers, 6 out of the 15 with 'tone production errors' for T2 vs T5

  - Bauer, Cheung and Cheung (2003)

    2 out of 8 male speakers had uncanonical production of T2 and T5

# Previous studies

- Yiu (2009)

  5 out of 15 subjects confused some of the T2/T5 pairs in perception, only 3 out of 15 appeared to merge them in production, only 1 female subject had confusion in both production and perception

# Previous studies

- All with few subjects and limited data
- Impressionistic observations for T3/T6 and T4/T6 confusion as well
- More systematic study on both production and perception of all tone pairs needed

# Experiments for tone merging

- 169 young speakers were screened by 2 native Cantonese phoneticians

  28 merging subjects (16.6%)

      all 28 for perception

      17 for production only

  30 control subjects

- Undergraduate students at CUHK

# Production experiment

- 6 high and 6 low frequency monosyllabic words for each tone (6 x 6 x 2 = 72 tokens) in a carrier phrase
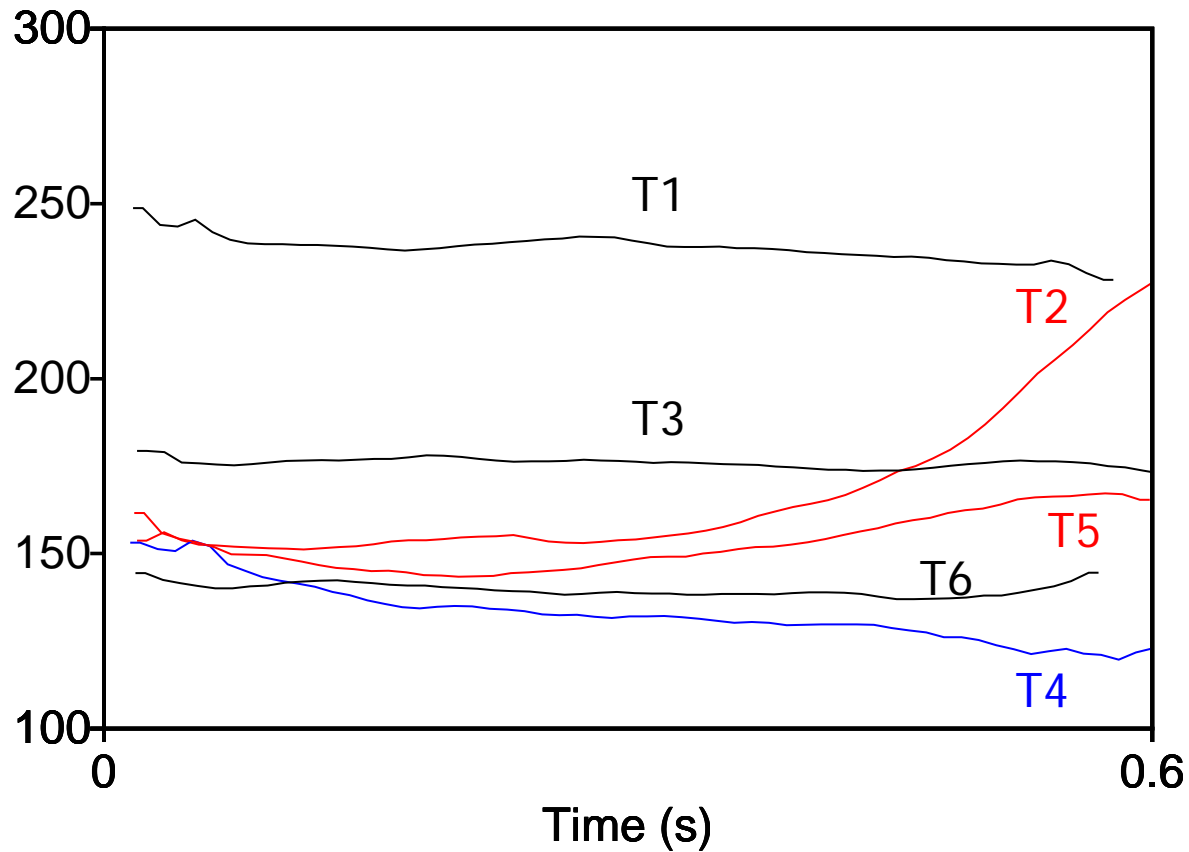
  我讀 ＿＿ 字

- Word frequency calculated based on a written corpus of Chinese newspaper

- 3 repetitions

# Production experiment

- F0 tracked at 10 equidistant points
- Discriminant Function Analysis (DA) with 4 predictors ($2^{nd}$, $5^{th}$, $6^{th}$, $9^{th}$ points)
- DA: a statistical procedure for predicting group membership from a set of predictors; can handle individual variations well
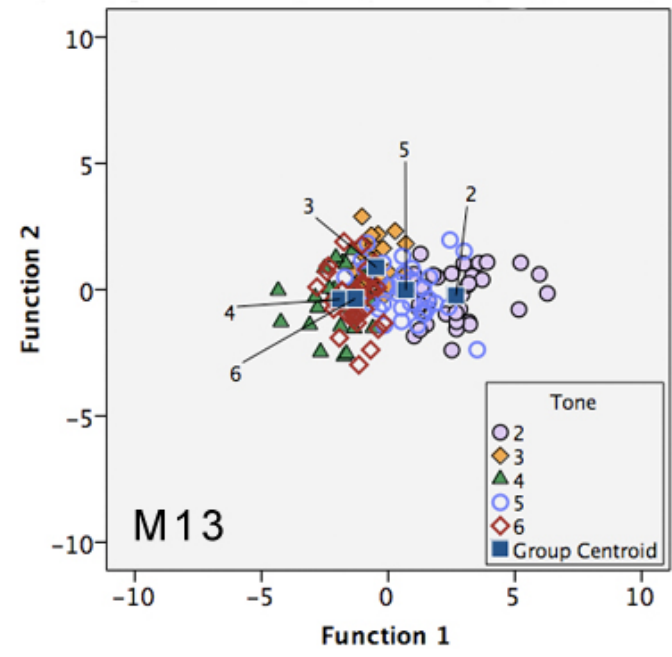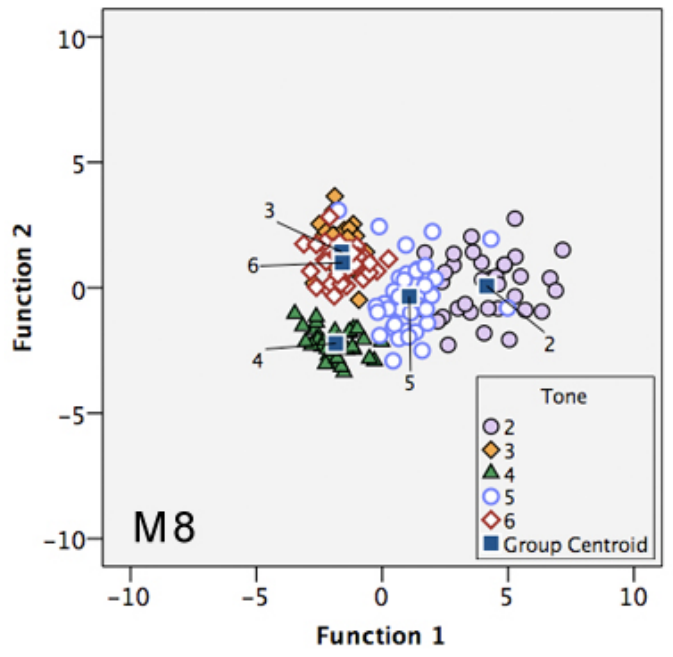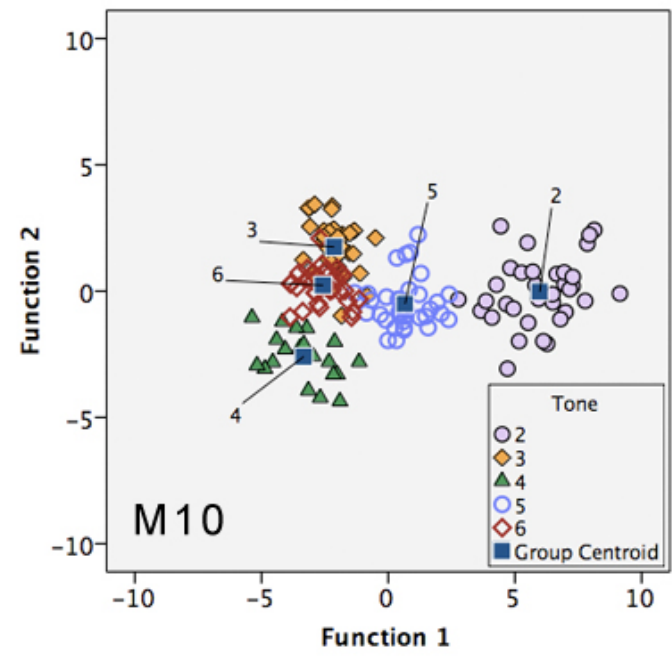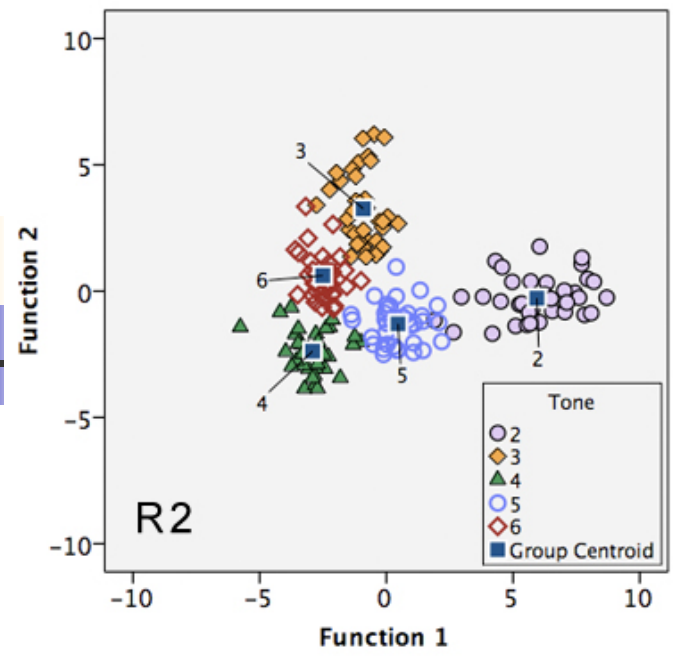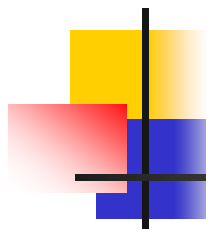- Higher classification rates = better separation of tones

# Cantonese tones

# Production experiment

- Very high overall classification rate for 2 reference speakers (94.2%, 94.4%)
- Much lower overall classification rate for 17 merging speakers

    mean = 80.5%, S.D. = 9%

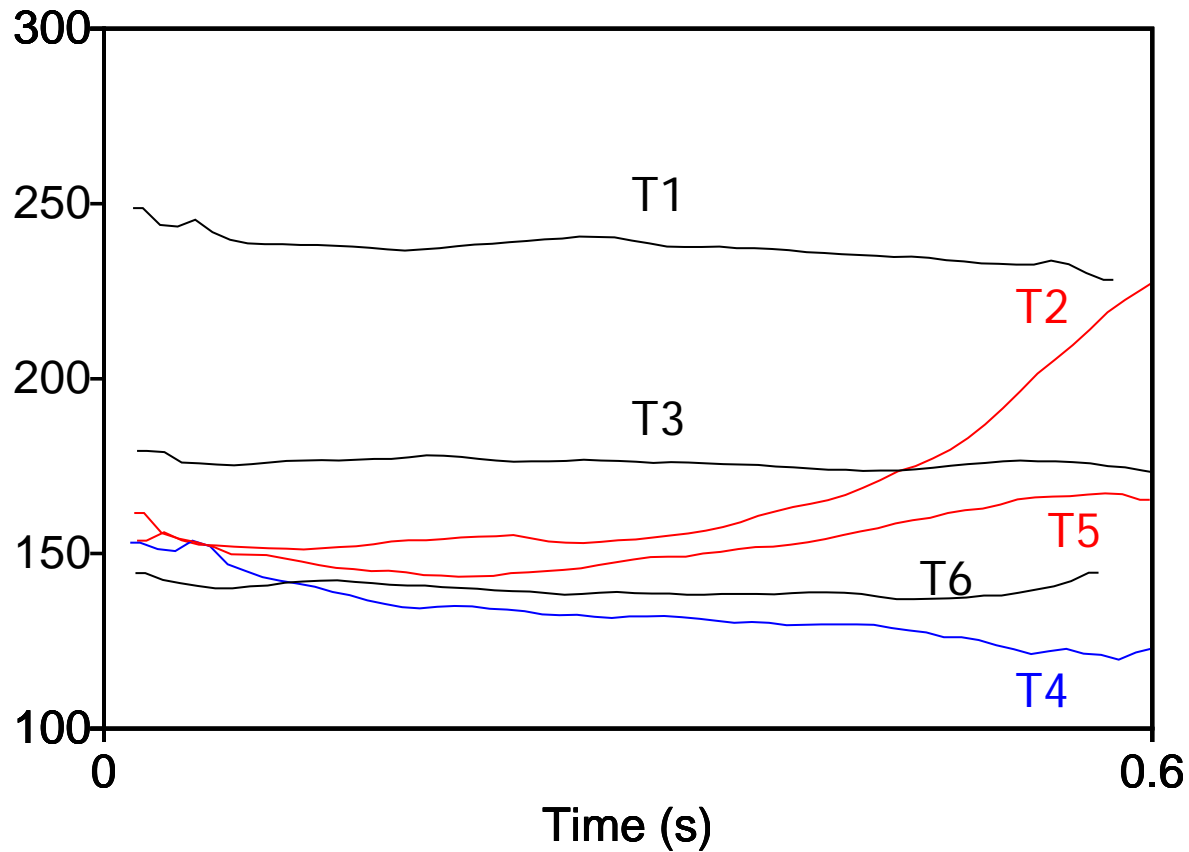    ranging from 58.5% to 93.2%.
- Merging patterns

Scatterplots of canonical discriminant functions of four female speakers

20

# Production experiment

- Are tones produced by merging speakers more similar than those by control?

# Cantonese tones

# Production experiment

- Are tones produced by merging speakers more similar than those by control?
- Quotients of 9th measuring points for tone space estimation

|         | T2/T5    | T3/T6 | T4/T6 |
|---------|----------|-------|-------|
| Control | 1.188    | 1.096 | 1.143 |
| Merging | 1.098    | 1.066 | 1.080 |
| $p$     | <0.0001  | 0.029 | 0.028 |

# Summary of production data

- Merging speakers still have 6 tone categories

- Tones produced by merging speakers are less distinct than those by control

  > smaller 'tone space'

- Large individual variations

# Perception experiment

- AX discrimination task of 120 AA and 120 AB pairs
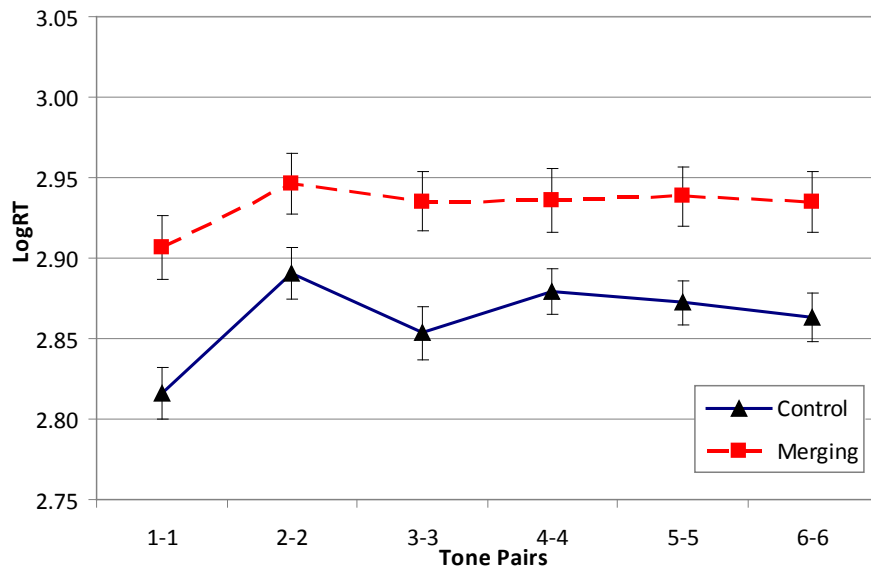- Accuracy and reaction time measured

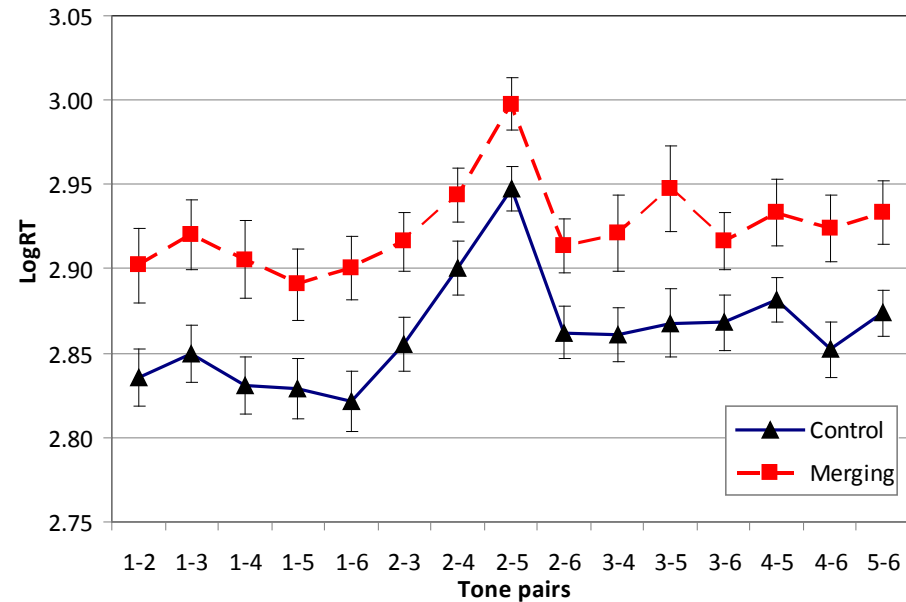# Perception experiment

- High accuracy (over 95%) for both control and merging subjects

  > ceiling effect on a simple task

- But significant differences in log-transformed reaction time

# Perception experiment



AA pairs

AB pairs

Merging speakers are slower than control for ALL tone pairs

# Discussion

- Tone merging at an early stage
- T2/T5 > T3/T6 > T4/T6
- Merging subjects generally still have 6 tone categories, although the tones are less distinct
- Merging subjects have poorer general tone perception than the controls
- Both production and perception are affected

# Possible reasons

- Acoustic similarity of tone pairs

  > phonetic bias
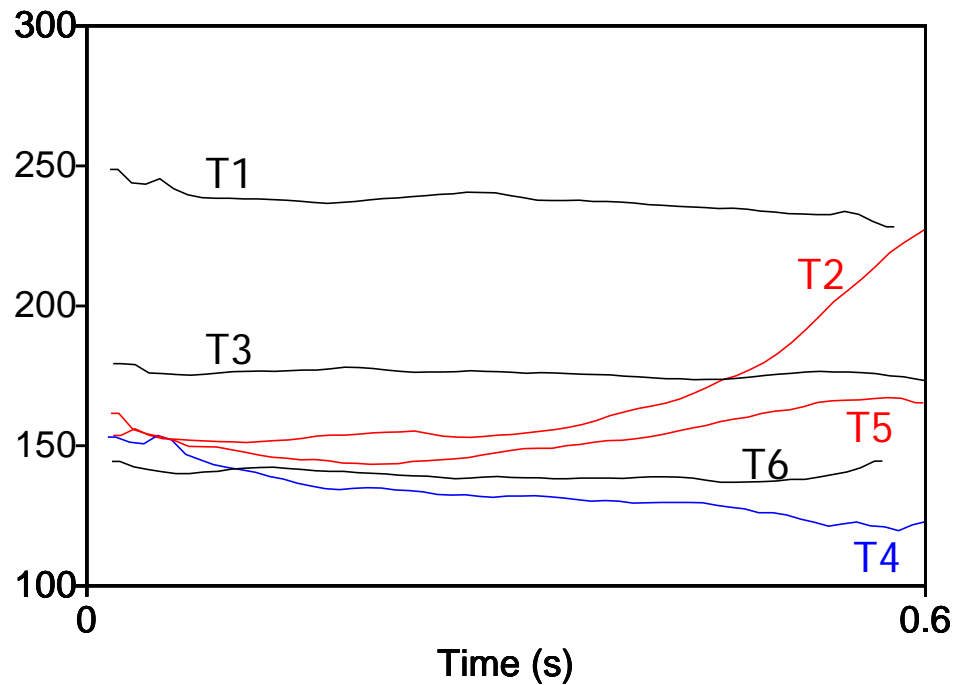
# Possible reasons

- Acoustic similarity of tone pairs

- Listeners as a source of sound change
  Ohala 1981, 1983

  Merging listeners were significantly slower than control listeners

  > less sensitive to tone differences in general, not just being 'lazy'

  > high accuracy in experimental settings

# Possible reasons

- Acoustic similarity of tone pairs
- Listeners as a source of sound change
  Ohala 1981, 1983
- Merging patterns concur well with child acquisition data e.g. Ciocca & Lui, 2003; Wong et al., 2009; So & Dodd, 19
  - > T1 acquired first
  - > T2/T5, T3/T6 acquired later
  - > same underlying phonetic cause

# Possible reasons

- Acoustic similarity of tone pairs
- Listeners as a source of sound change Ohala 1981, 1983
- Patterns concur well with child acquisition data e.g. Ciocca & Lui, 2003; Wong et al., 2009; So & Dodd, 1995
- Demographic composition and language contact in Hong Kong over the past 60 years as triggers?

# Demographic changes

- Increasing no. of <u>cross-border marriages</u>

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  > many children growing up with accented Cantonese

- Difficulty in acquiring acoustically similar tones

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  > many children growing up with accented

   Cantonese

- Difficulty in acquiring acoustically similar tones

- Immigrants adopting mainstream Cantonese > much language contact with other dialects

- Increasing Mandarin influence

# Future development

- Longitudinal studies needed
- Will tone merging take full course or be suspended?
- Patterns for disyllabic words?
- More sociolinguistic investigations to confirm speculations on demographic changes

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