Simon Fraser University
Language and Brain Lab

SFU

AdaptiCon: Reversing a Cantonese tone-merger through conversations.

Disclaimer

This is a portion of a larger project that the team at the Simon Fraser University Language and Brain Lab (LAB Lab) is in the process of designing and running under the supervision of the lab director Dr. Yue Wang.

The tentative title for the project is Adaptations in Conversation (AdaptiCon).

Research Question:
Can non-imitation-based tasks reverse Cantonese tone merging through phonetic adaptation in a natural conversation-like setup?

What is Phonetic Adaptation?

What is Phonetic Adaptation?

a.k.a. phonetic/conversational accommodation, speech alignment, entrainment, convergence, resonance

Adjustment of pronunciation:

- Non-conscious, spontaneous[1,2,3]
- For effective communication[1,2,3]
- Acoustic characteristics[1]
  - speech rate
  - vowel intensity
  - vowel spectra
- Influenced by social dynamics[1]

[1] Dias & Rosenblum, 2016; [2] Lewandowski & Jilka, 2019; [3] Lin et al., 2021

What is Phonetic Adaptation? (cont'd)

In particular:

Lin et al. (2021)

→ Reversing a Cantonese tone-merger through shadowing

As such…

We will be using tone-mergers in Cantonese as a means of investigating phonetic adaptation

But before we elaborate...

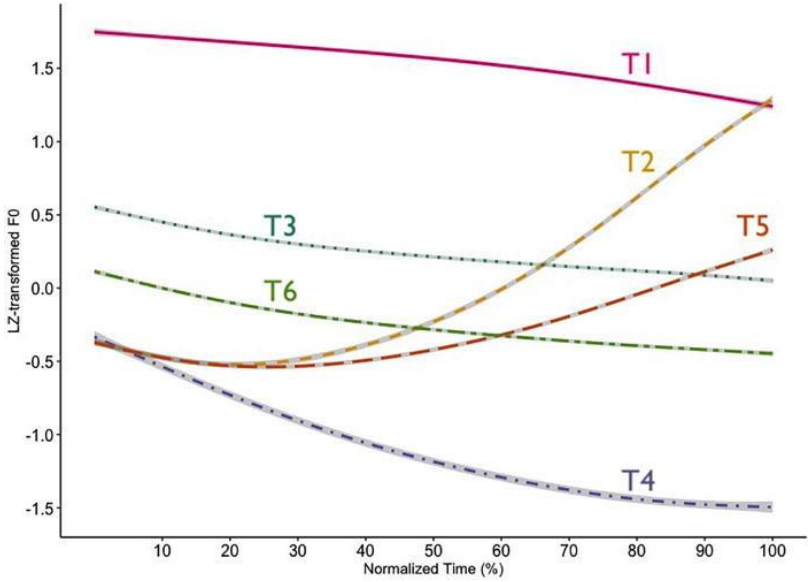
Cantonese Tone-Merger

What is Cantonese Tone Merger?

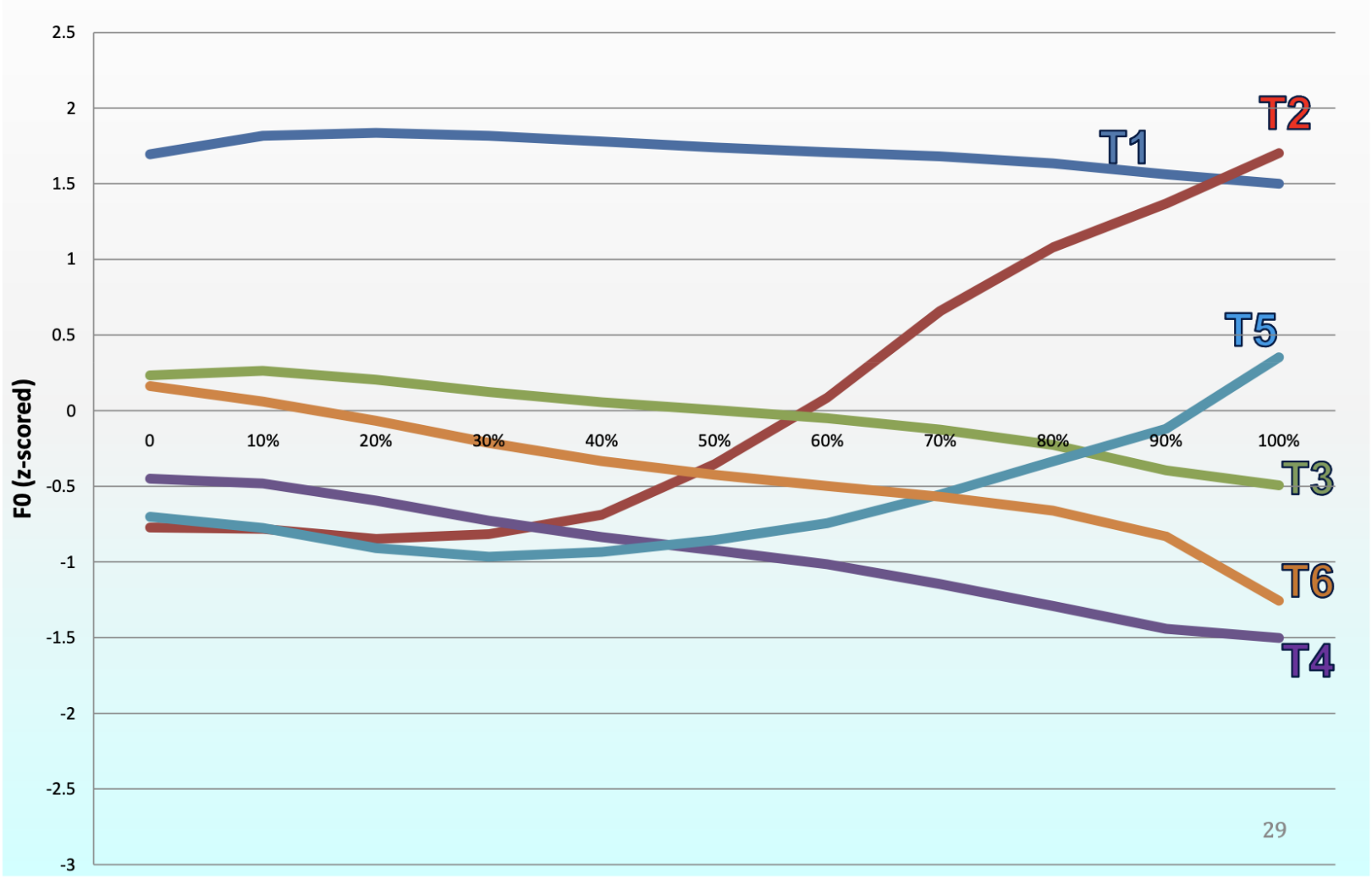
Pairs within 6 lexically contrastive tones that are being merged in production and/or perception

Fung & Lee, 2019

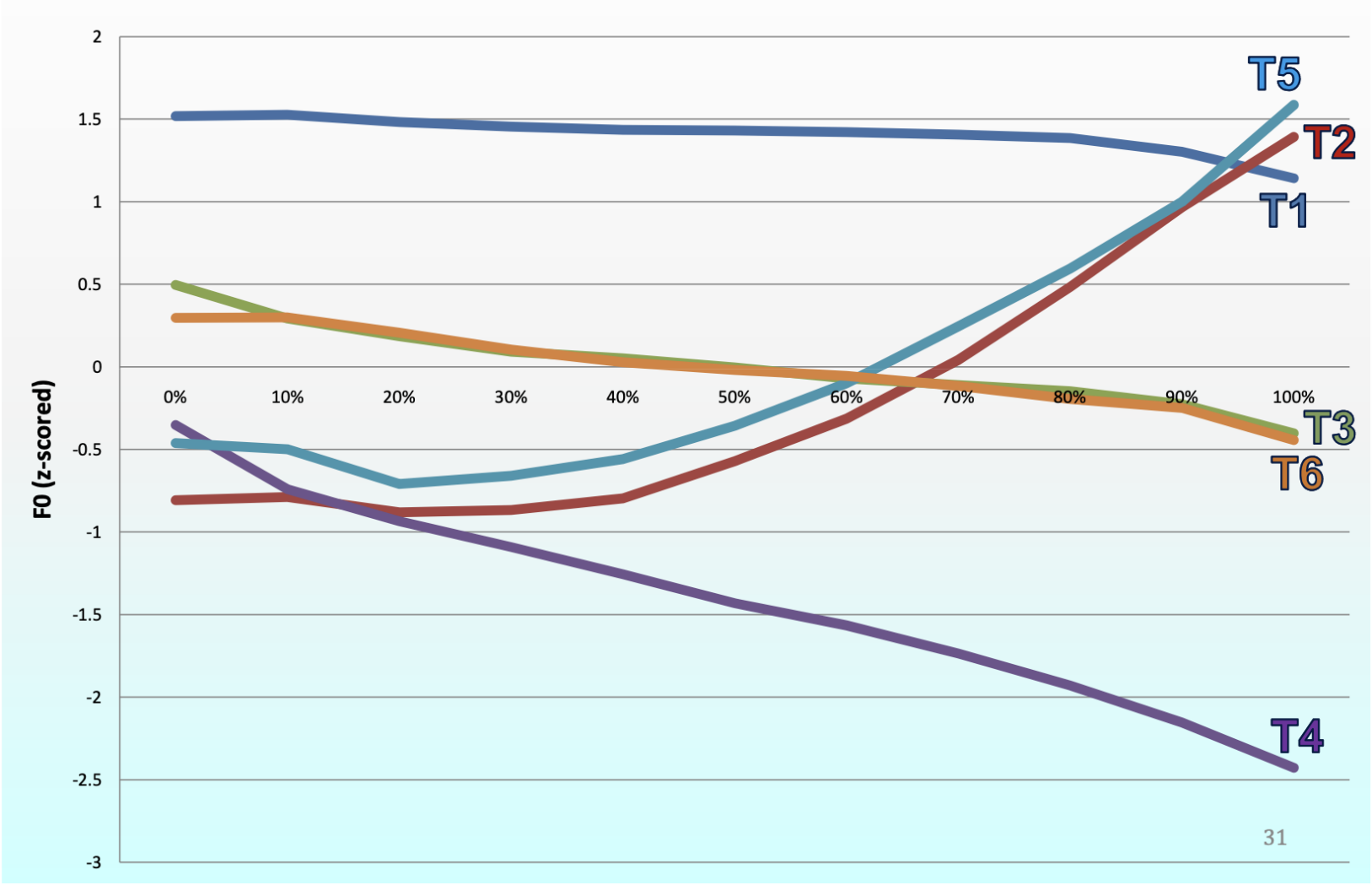
- T2/T5 - Full merger
- T3/T6 - Partial Merger
- T4/T6 - Near Merger



Fung & Lee, 2019



Fung & Lee, 2010



Fung & Lee, 2010

Adaptation on tones

Recall from Lin et al. (2021):

- Reverse a Cantonese tone-merger through shadowing
- Investigated T3/T6
  - The pair unmerged

Adaptation on tones (cont'd)

Previous research:

- → Controlled, less natural tasks (shadowing)
- → Imbalance in power/social dynamics
  - → Map task (Pardo, 2006)
- → Only on T3/T6

Adaptation on tones (cont'd)

Our study aims at investigating:

→ More natural setting

→ Equal grounds

→ More pairs of tones

Why use tone merger?

→ Elicit adaptation

→ Adaptations of tones in natural conversations

Research Question:
Can non-imitation-based tasks reverse Cantonese tone merging through phonetic adaptation in a natural conversation-like setup?

Main Hypothesis

Based on previous findings in Lin et al. (2021), we predict that all mergers will, in some capacity, reverse the trend of tone-merging after exposure to non-mergers.

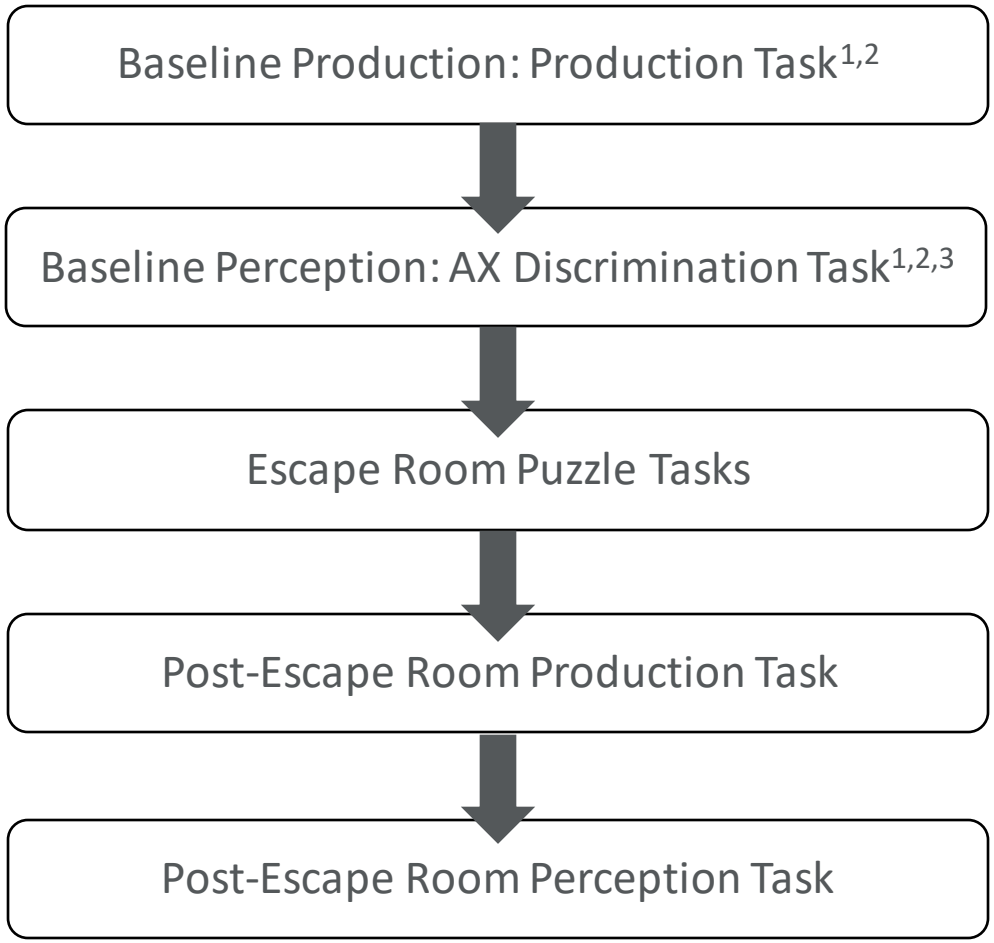
Sub-Hypotheses: Tone Adaptation

To the extent of whether adaptation will happen with tones:

- Convergence of tones:
  - Based on Levitan and Hirschberg (2011) on adaptation of pitch, we suspect that two interlocutors' pitch range for tones might converge to something more similar.
- Divergence of tones:
  - Based on Lin et al (2021) on adaptation of tones, we suspect that speakers with with less tonal distinction would diverge their tones more i.e., tones would become more distinct.
    - In particular, we suspect those that are exhibiting tone-merging already i.e., T2/T5, T3/T6, T4/T6 (Fung & Lee, 2019; Mok et al., 2013) would exhibit a stronger effect

Phonetic Adaptation in Natural Conversations

Experiment Task Timeline



[1] Mok et al., 2013; [2] Fung & Lee, 2019; [3] Soo & Babel, 2020

Main Task: Escape Room

Escape room video game (Escape Simulator, Pine Studio, 2021)

- Puzzle Components:
  - Numbers room
  - Matching room

Task Description and Procedure

Task Description

- Place participants in separate rooms
- Two rooms have unique objects or information
- Only through collaboration will the puzzles be solved

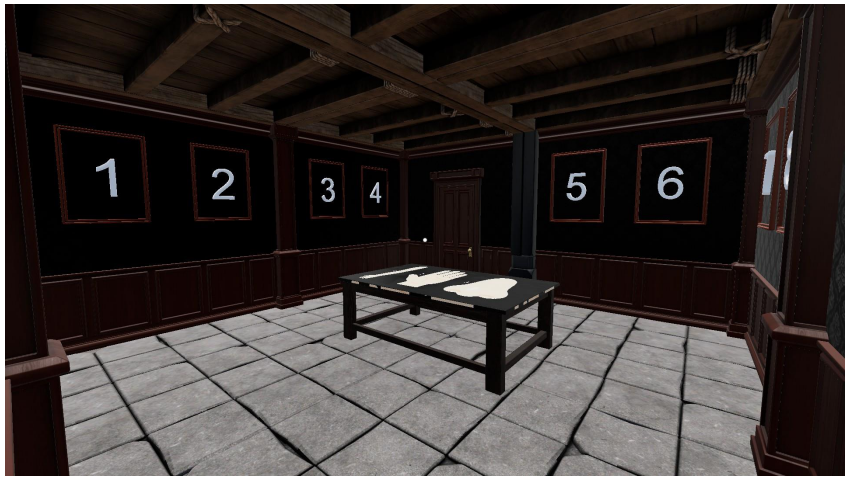
Adaptation will be elicited/promoted through:

- Nature of Tone-Mergers in Cantonese
  - Merger vs non-merger interactions
  - Reversibility of a tone-merger

Task Description and Procedure: Number Room

Room A (merger):

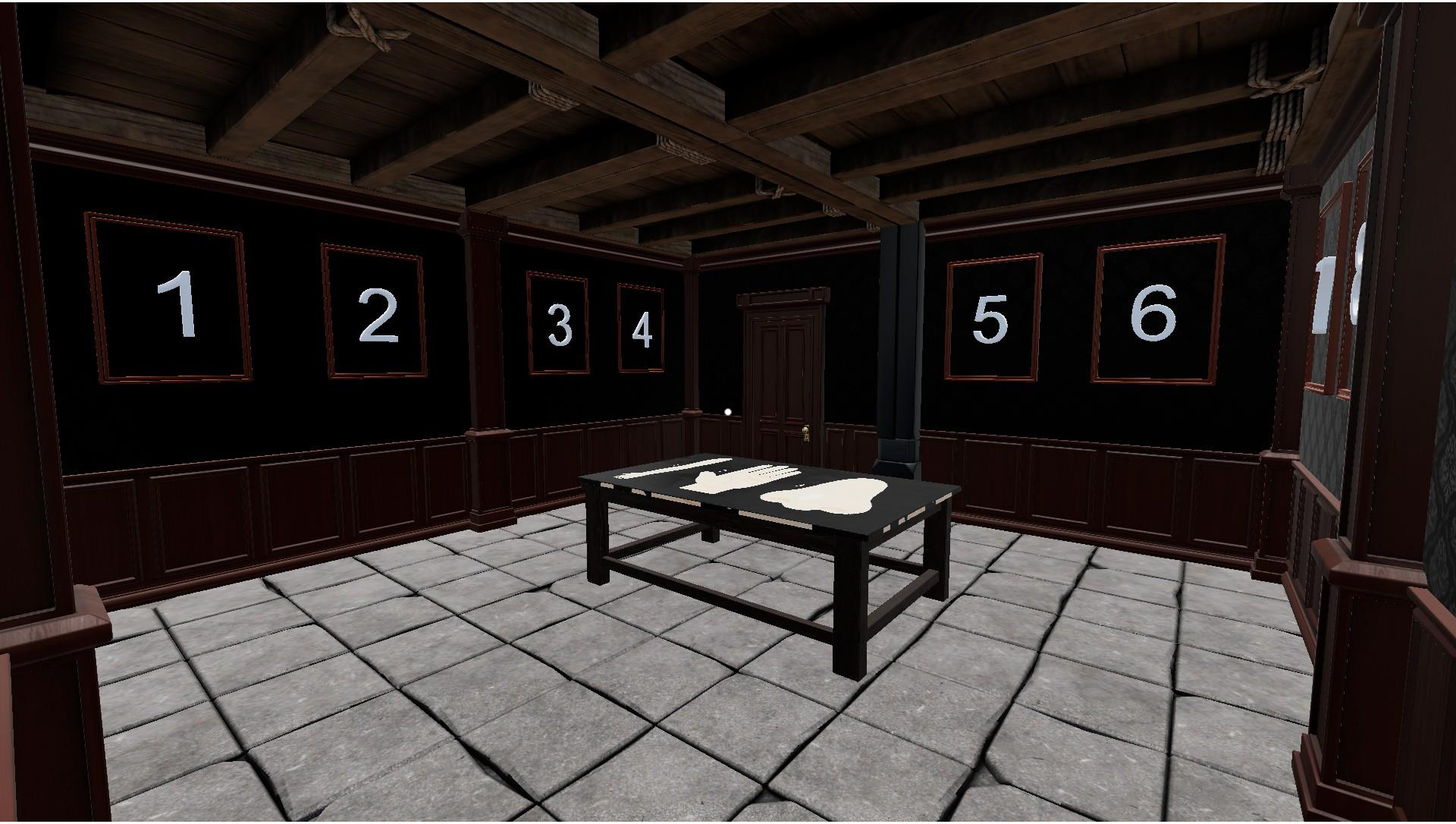
- Portraits of numbers
- Images of body parts in the centre



Room B (non-merger):

- Portraits of body parts
- Number pad lock box in the centre

Number Room: Room A



Number Room: Room B

Simulation for Number Room

NM: You were talking earlier, you said your table had 3 drawings on it. Which three drawings was it?

M: The drawings were an arm **(merged tone)**, hand, nose.

NM: Oh, so the first drawing is a hand and a nose, is that right?

M: No, that's not right. They're not together. First, The first one is an arm **(hyper articulated but still confusable tone)**...

NM: The first one is...

M: The second one is a hand.

NM: The first one you're talking about - is it an arm **(hyper articulated non-merged tone)**? An arm **(hyper articulated tone)**?

M: Yes, an arm **(unmerged tone)**. An arm **(unmerged tone)** would be correct.

NM: Oh, so an arm **(unmerged tone)**. The first one is an arm **(unmerged tone)**. What's after that?

M: The second one is a hand.

NM: Oh, the second one is a hand. Then what's the third one?

M: The third one is a nose.

NM: Oh, so you mean that the first one is arm **(unmerged tone)**, the second one is hand, the third one is nose. So, arm **(unmerged tone)**, hand, nose. Is that right?

M: Yes, yes, that's correct.

NM: Okay, good.

Unmerged

arm – Sau2 Bei3

hand – Sau2

nose – Bei6

Merged

arm – Sau2 Bei6

hand – Sau2

nose – Bei6

∴M's production of arm and hand + nose sound the same to NM.

Simulation for Number Room (cont'd)

NM: You were talking earlier, you said your table had 3 drawings on it. Which three drawings was it?

M: The drawings were an arm **(merged tone)**, hand, nose.

NM: Oh, so the first drawing is an arm and a nose, is that right?

M: No, that's not right. They're not together. First, The first one is an arm **(hyper articulated but still confusable tone)**...

NM: The first one is...

M: The second one is a hand.

NM: The first one you're talking about - is it an arm **(hyper articulated non-merged tone)**? An arm **(hyper articulated tone)**?

M: Yes, an arm **(unmerged tone)**. An arm **(unmerged tone)** would be correct.

NM: Oh, so an arm **(unmerged tone)**. The first one is an arm **(unmerged tone)**. What's after that?

M: The second one is a hand.

NM: Oh, the second one is a hand. Then what's the third one?

M: The third one is a nose.

NM: Oh, so you mean that the first one is arm **(unmerged tone)**, the second one is hand, the third one is nose. So, arm **(unmerged tone)**, hand, nose. Is that right?

M: Yes, yes, that's correct.

NM: Okay, good.

Task Description and Procedure: Matching Room

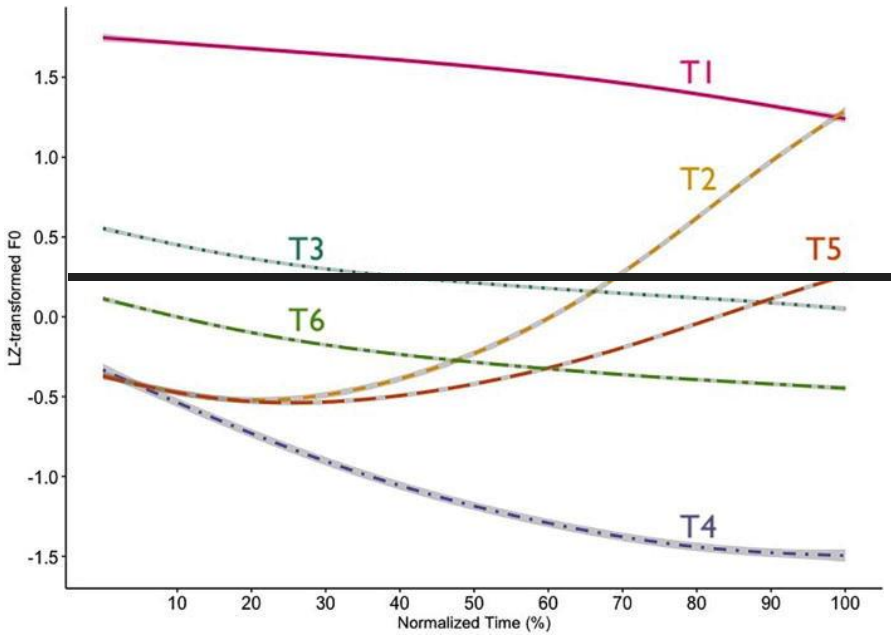
Participants must match portrait sequence

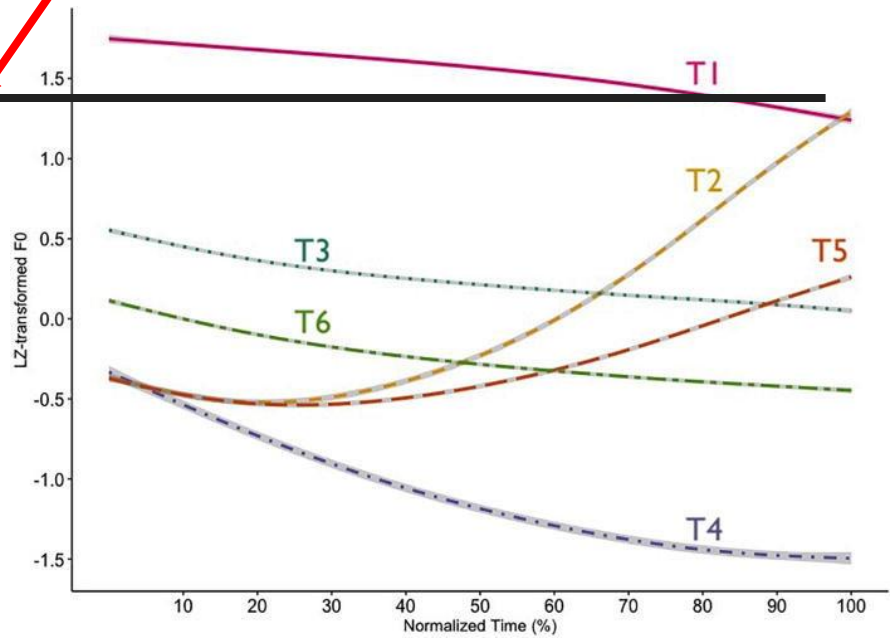
Matching Room Theme: Other Objects

Matching Room Theme: Other Objects

Simulation for Matching Room

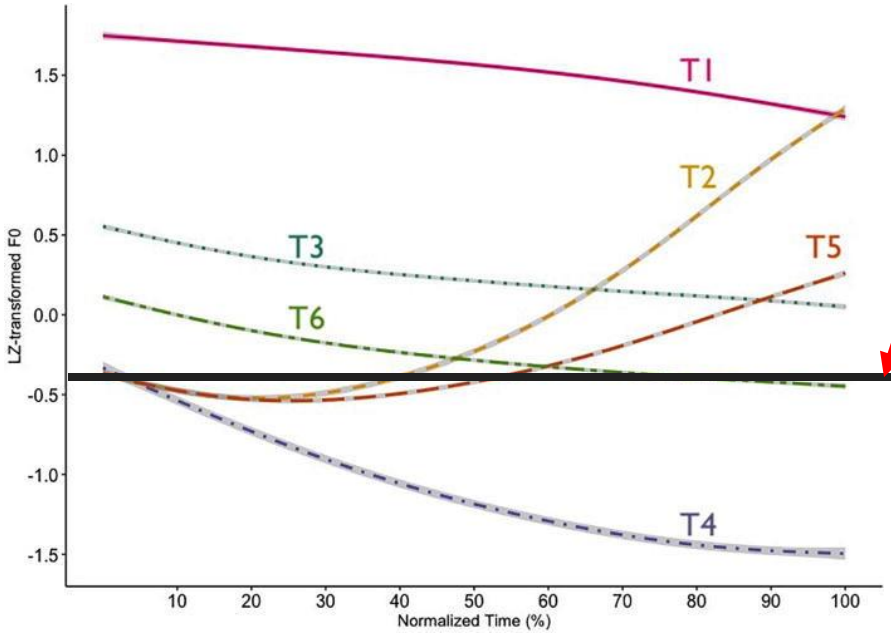
Due to an unfamiliar pitch range, NM's "light" (dang1) might sound like M's chair (dang3)

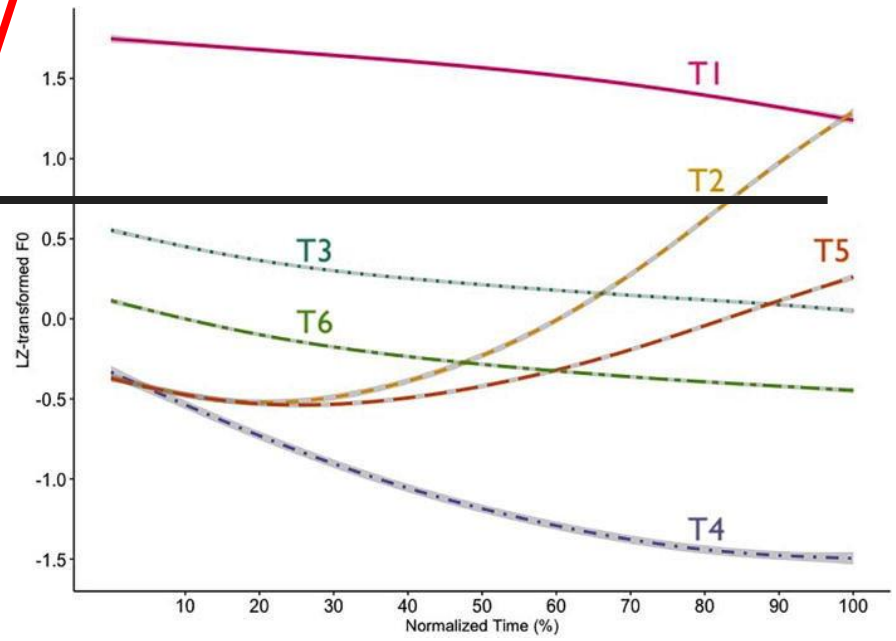




Simulation for Matching Room

After adaptation, the pitch range is established and converged, ambiguity is gone.





Simulation for Matching Room

NM: Okay, great! So now, let's try to take the light **(ambiguous tone due to unknown pitch range)** - take the chair **(unambiguous tone due to both tones being pronounced in the same utterance)**, right, and put it on the right-most side first.

M: But...which chair **(unambiguous tone due to use of classifier)**? My side has two chairs.

NM: Is that right? Mine... Which two chairs do you have?

M: I have one that's blue, and one that's wooden.

NM: Oh, I only have a wooden one. Use the wooden chair and put it on the right-most side.

M: Okay.

NM: And next to that one, put another... put another light **(ambiguous tone)**... put another light **(unambiguous due to hyper articulation, known pitch range, and both tones being pronounced in the same utterance)** beside it .

M: Okay. I only have one **(classifier for chair),** one **(classifier for light)** light.

NM: What? You mean you have another chair? I'm not talking about chairs, I'm talking about lights **(establishing common ground, possibly a common pitch range)**.

M: Lights are right, it's just that I just have one.

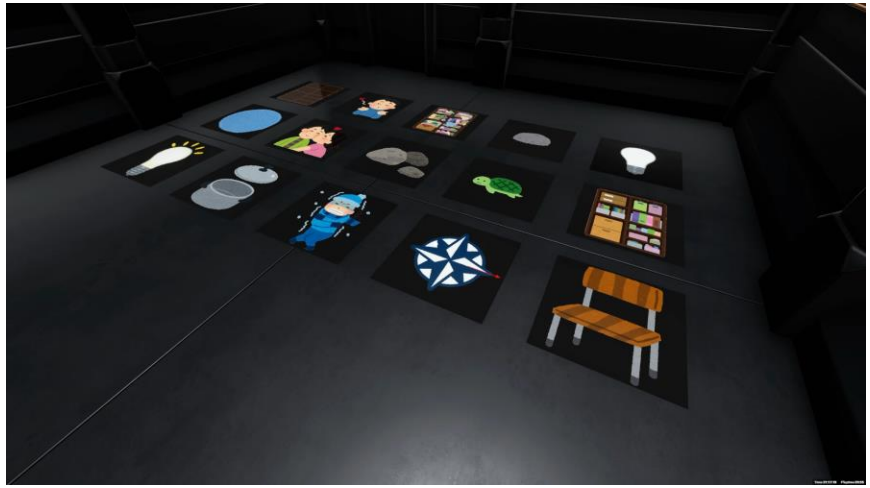
NM: Oh, lights, right? (**common ground reached, word no longer ambiguous)** Are you talking about the light that's on?

M: That's right.

NM: Okay, then take that light that's on, and now let's put it to the left of the chair.

M: Okay, I've placed it.

NM: Okay, good.



Yes, we have a playable demo

Summary

- Novel solution aided by a video game
- Tasks allow for unscripted, natural-like interactions between two interlocutors
  - However, lack of script may allow participants to go off-topic
- Can help determine if a non-imitation task can also reverse a tone merger
- Future research includes:
  - Testing if a noisy environment would further promote adaptation
  - If a reversed merged tone would linger, and if so, for how long post-task

Acknowledgements

We would like to thank the members and collaborators of the Language and Brain Lab at Simon Fraser University, including Dr. Yue Wang, Dr. Dawn Behne, Jetic Gu, Elise McClay, Janitta Wong, Samantha Gryz, and Sylvia Cho for their guidance, critical and constructive comments, and suggestions throughout.

References

Baker, R. & Hazan, V. (2011). DiapixUK: Task materials for the elicitation of multiple spontaneous speech dialogs. Behavior Research Methods 43(3), 761-770. https://doi.org/10.3758/s13428-011-0075-y

Dias, J. W., & Rosenblum, L. D. (2011). Visual influences on interactive speech alignment. *Perception (London)*, *40*(12), 1457–1466. https://doi.org/10.1068/p7071

Fung, R. S. Y., & Lee, C. K. C. (2019). Tone mergers in Hong Kong Cantonese: An asymmetry of production and perception. *The Journal of the Acoustical Society of America*, *146*(5), EL424–EL430. https://doi.org/10.1121/1.5133661

Lee, Y., Gordon Danner, S., Parrell, B., Lee, S., Goldstein, L., & Byrd, D. (2018). Articulatory, acoustic, and prosodic accommodation in a cooperative maze navigation task. *PloS One*, *13*(8), e0201444–e0201444. https://doi.org/10.1371/journal.pone.0201444

Levitan, R., & Hirschberg, J. (2011,). Measuring acoustic-prosodic entrainment with respect to multiple levels and dimensions. *Proc. Interspeech 2011*, 3081-3084. https://doi.org/10.21437/Interspeech.2011-771

Lin, Y., Yao, Y., & Luo, J. (2021). Phonetic accommodation of tone: Reversing a tone merger-in-progress via imitation. *Journal of Phonetics, 87*, 101060. https://doi.org/10.1016/j.wocn.2021.101060

Mok, P. P. K., Zuo, D., & Wong, P. W. Y. (2013). Production and perception of a sound change in progress: Tone merging in Hong Kong Cantonese. *Language Variation and Change*, *25*(3), 341–370. https://doi.org/10.1017/S0954394513000161

Pardo, J. S. (2006). On phonetic convergence during conversational interaction. The Journal of the Acoustical Society of America, 119(4), 2382–2393. https://doi.org/10.1121/1.2178720

Pardo, J. S., Urmanche, A., Wilman, S., & Wiener, J. (2017). Phonetic convergence across multiple measures and model talkers. Attention, Perception & Psychophysics, 79(2), 637–659. https://doi.org/10.3758/s13414-016-1226-0

Pine Studio. (2021). Escape Simulator (Version 1.0.24338r) [Video Game]. Samobor, Croatia. https://pinestudio.com/games/escape-simulator/

Soo, R., and Babel, M. (2020, July 6). *Lexical competition affects Cantonese tone mergers in word recognition* [Poster]. 17th Conference of the Association for Laboratory Phonology (LabPhon17), University of British Columbia, Vancouver, British Columbia, Canada. https://labphon.org/sites/default/files/previous_conferences/LP17/abstracts/LabPhon_17_paper_242.pdf

Thank you!
Questions?

Presented by Ivan Fong and Samuel To
For all inquiries, please contact Ivan Fong (ivan_fong@sfu.ca)