Pitch variability cues perceptions of Singlish:

A perceptually-guided approach to sociophonetic variation

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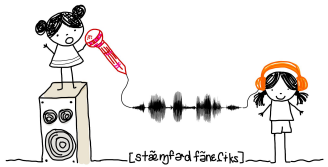


Singlish


Tamil
Mandarin (我们)
Cantonese (拍拖)
English
Dey, wǒ men paktor always makan at kopitiam one.
Malay
English
Malay
Hokkien/ Hakka (店)
???
GET IT RIGHT STICKY NOTES
Switch / Turn Off the light.
Got problem call me can?
Please let me know if you need help.


ENGLISH VS SINGLISH
PHRASES
YOU THEN LAH!!
I think it was you who did it

How do listeners map variation to variety?

- Dialect Recognition

  How is variable speech categorized as Singlish?

- Linguistic Cues

  What role, if any, does prosody play in listeners' categorizations of Singlish?

Methods

Speeded Forced-Choice Task

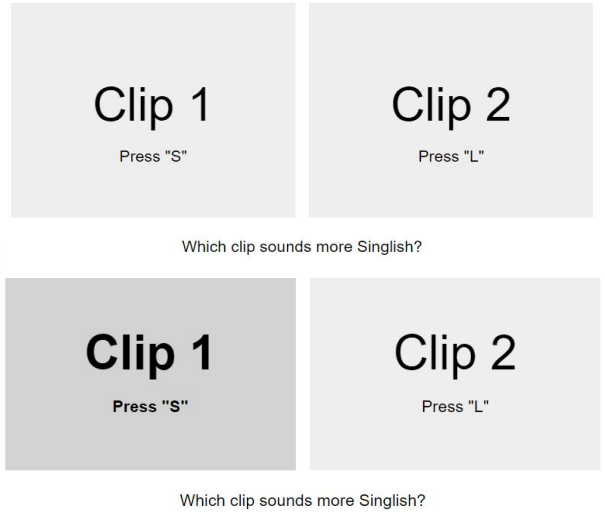
- Stimuli:
  - 40 natural-speech audio clips from podcasts
  - 5 male, 5 female talkers, 4 clips/talker
  - 1.4 to 2.6 seconds long, one IP
  - Semantically neutral
  - Syntactically and lexically similar to Standard English

- Listeners:
  - 132 participants
  - 121 Chinese, 2 Malay, 6 Indian, 1 Other
  - 67 Female, 62 Male, 2 Non-binary, 1 Prefer not to answer
  - Born between 1956 to 2004

Speeded Forced-Choice Task

- In each trial:
  - Hear two clips
  - “Which clip sounds more Singlish?”
  - 500 milliseconds between clips
  - 2 seconds to respond

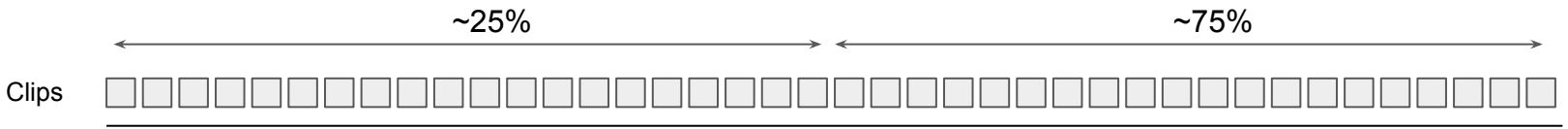
- 6 blocks of 20 trials each
- Two clips per trial
- Randomization within each block



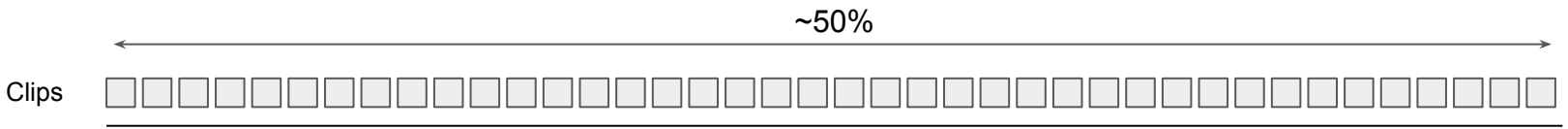
Follow-up questionnaire: Demographic background, Language attitudes, “List three attributes to describe the speakers who sounded more Singlish.”

Possible Outcomes

- Some clips almost always chosen; other clips almost never chosen
  - Two relatively discrete groups of clips



- All clips chosen about half of the time
  - Task design, ambiguous stimuli, …

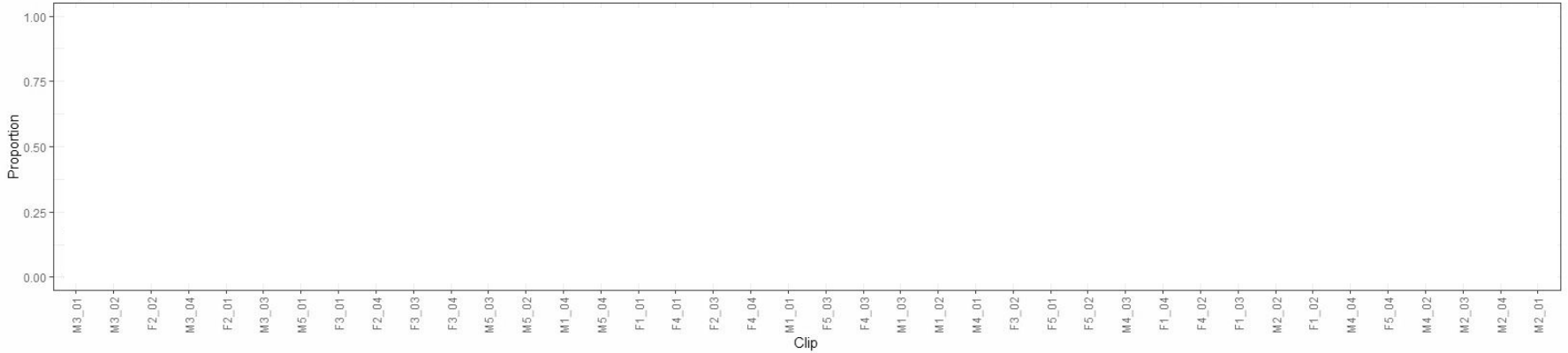


Results

Results

- Clear trend from least to most Singlish
- Categorizations were gradient

Proportion Singlish for each clip averaged across each participant



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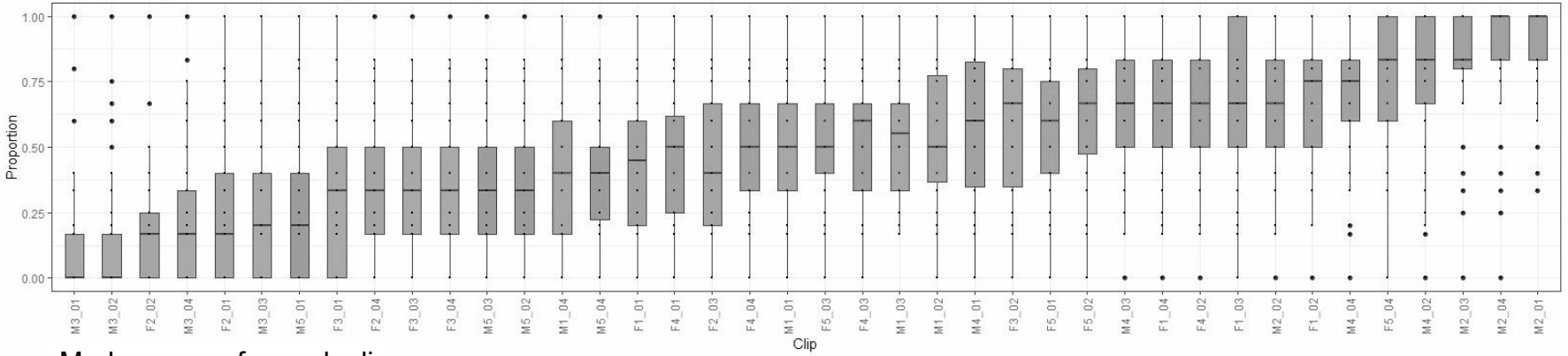
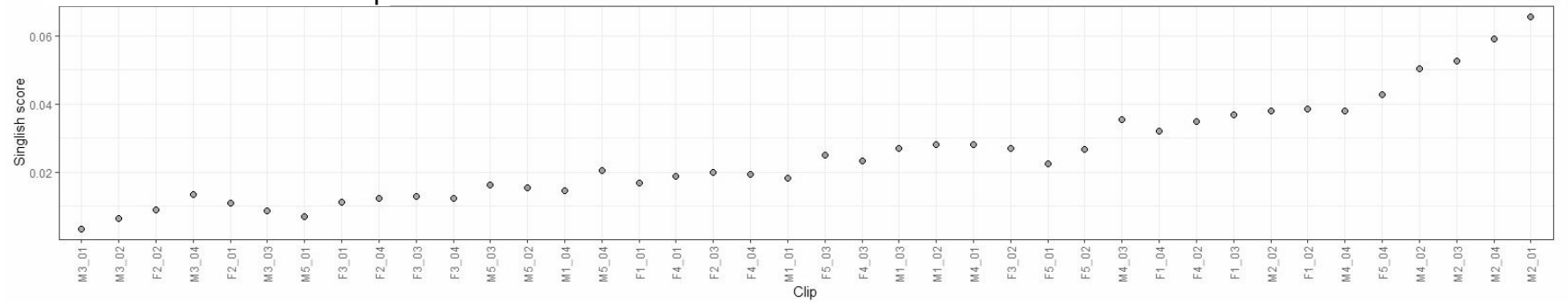


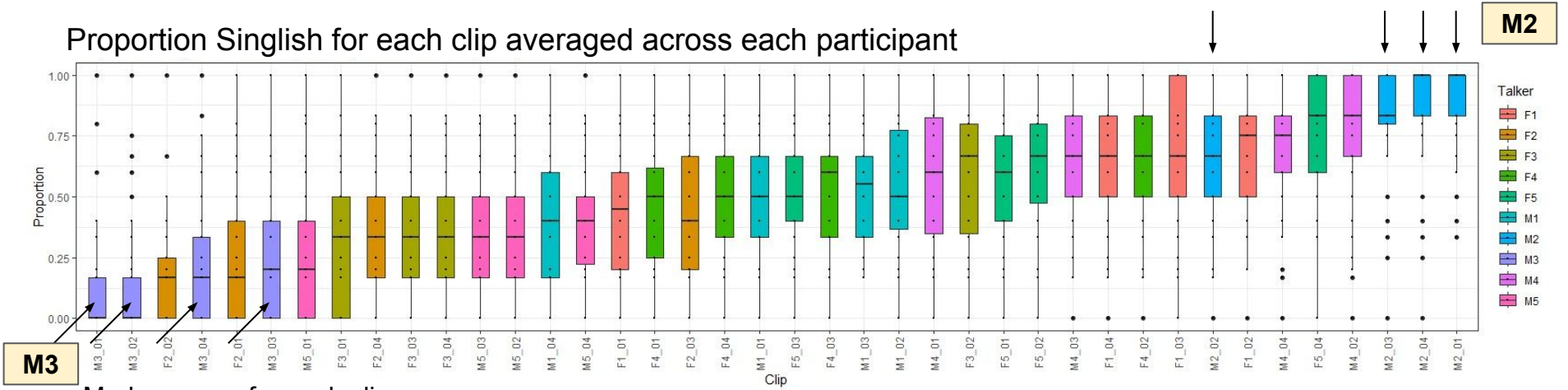
Markov score for each clip



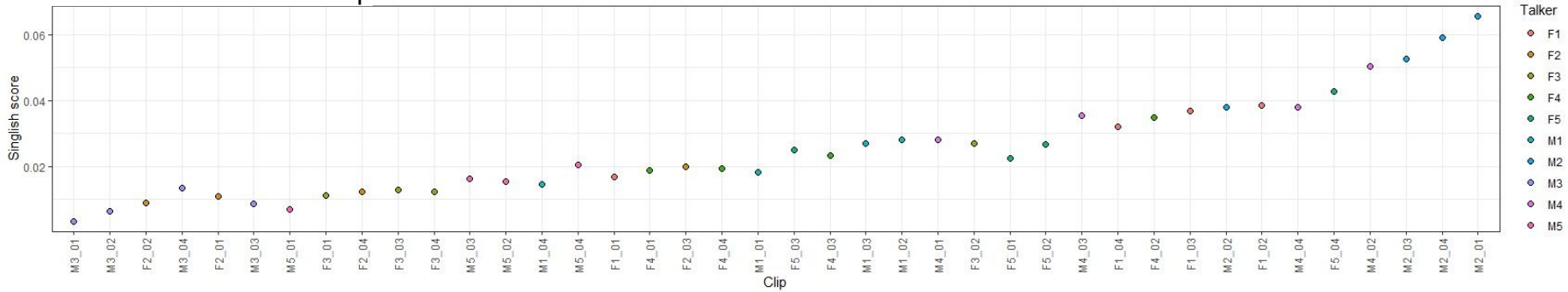
Results

- Talker-specific patterns were observed

Proportion Singlish for each clip averaged across each participant

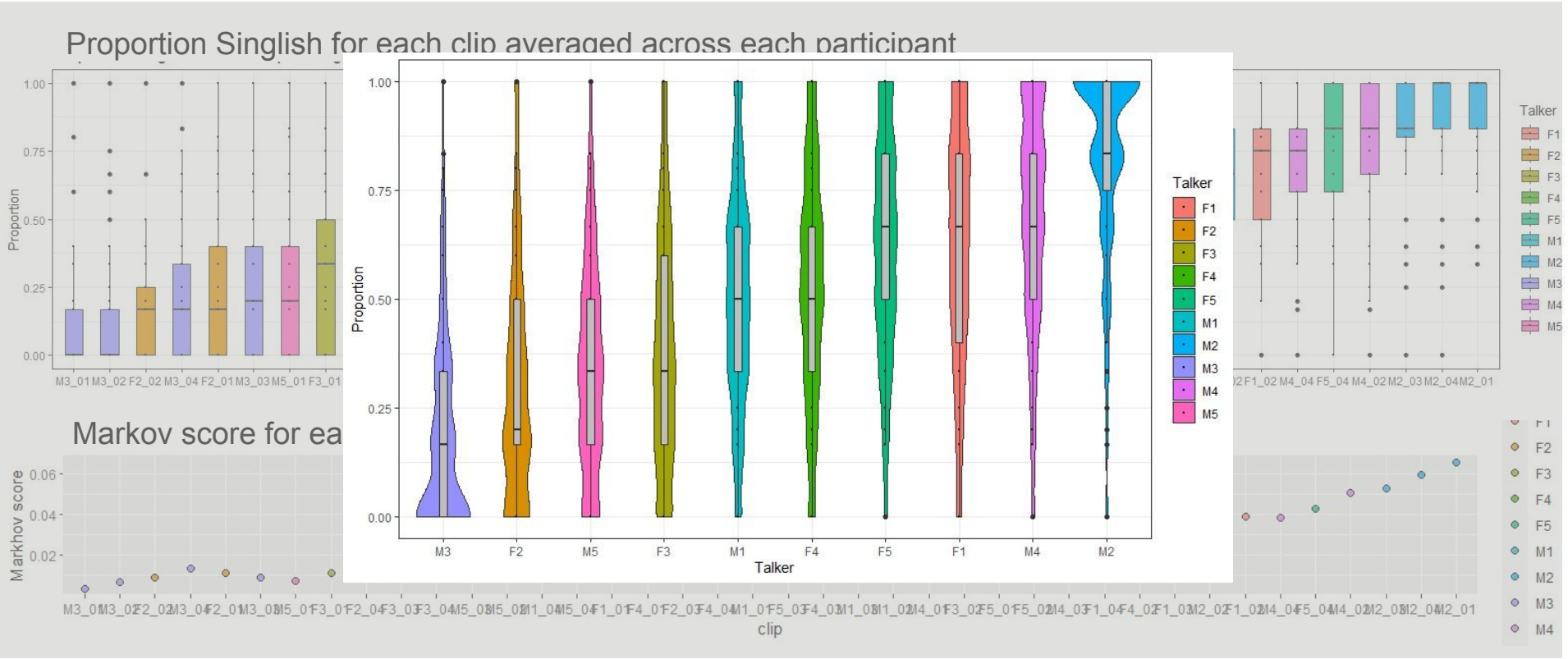


Markov score for each clip



Results

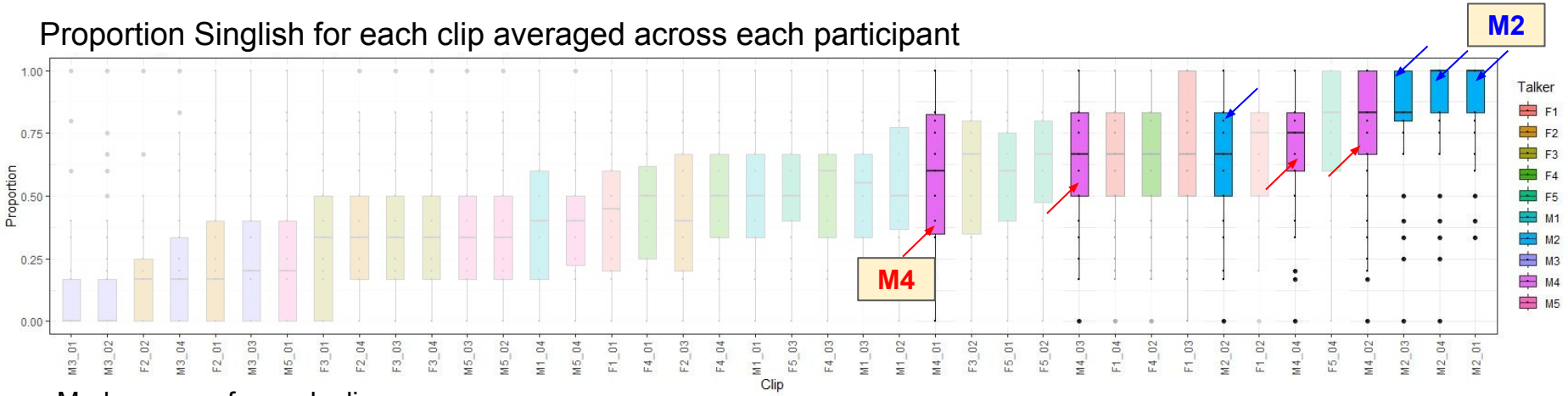
- Between-talker variability was gradient



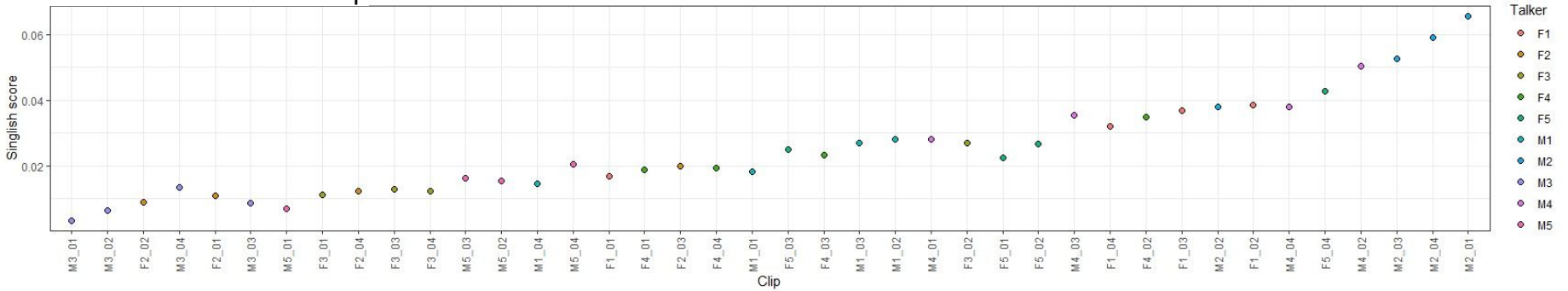
Results

- The ‘Most Singlish’ talkers also demonstrated within-talker variability

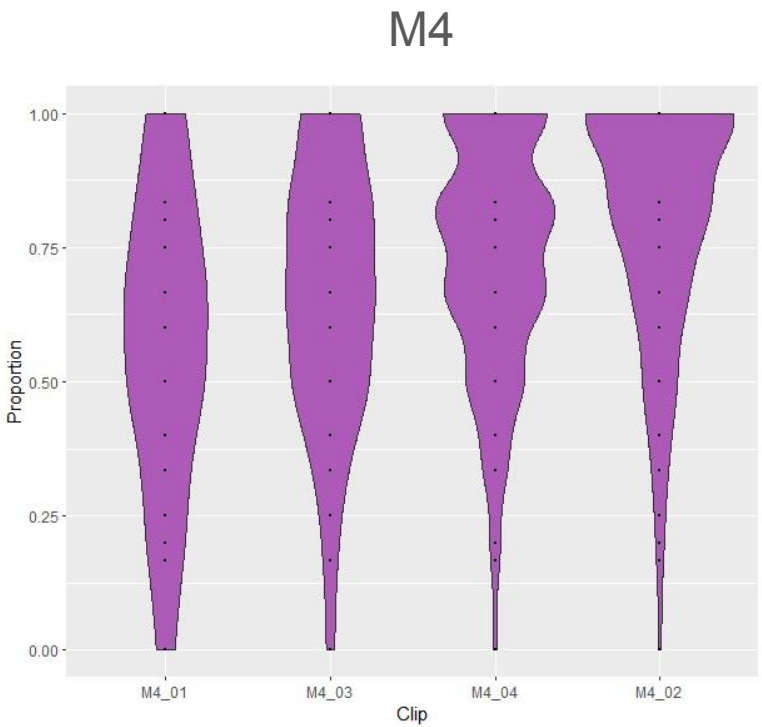
Proportion Singlish for each clip averaged across each participant

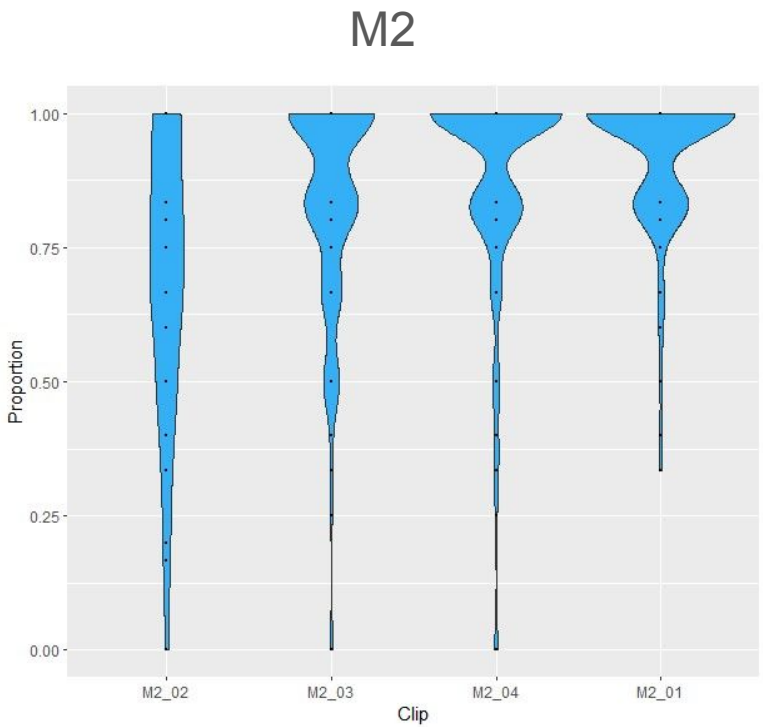


Markov score for each clip



Results


M4
1.00
0.75
0.50
0.25
0.00
Proportion
M4_01
M4_03
M4_04
M4_02
Clip


M2
1.00
0.75
0.50
0.25
0.00
Proportion
M2_02
M2_03
M2_04
M2_01
Clip

Interim Summary

- Listener categorizations of Singlish were gradient
- Between- and within-talker variability was observed

How were these categorizations made?

Results

“List three attributes to describe the speakers that sounded more Singlish.”

- *tune (rhythmic like in mandarin)*
- *variety in intonation*
- *monotonous*
- *flat tone*
- *speaking too fast*
- *fast speaking*

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- ***variety in intonation***
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- *speaking too fast*
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Results

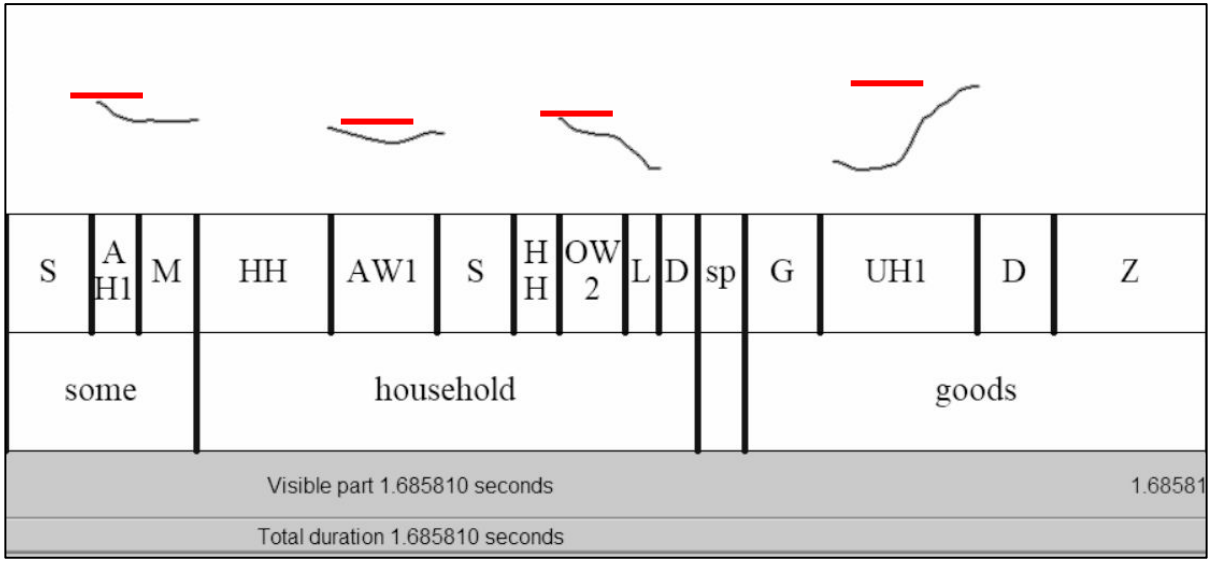
Following from participants' responses, we analyzed:

1. Pitch PVI
2. Pitch variance
3. Durational PVI
4. Articulation rate

Results

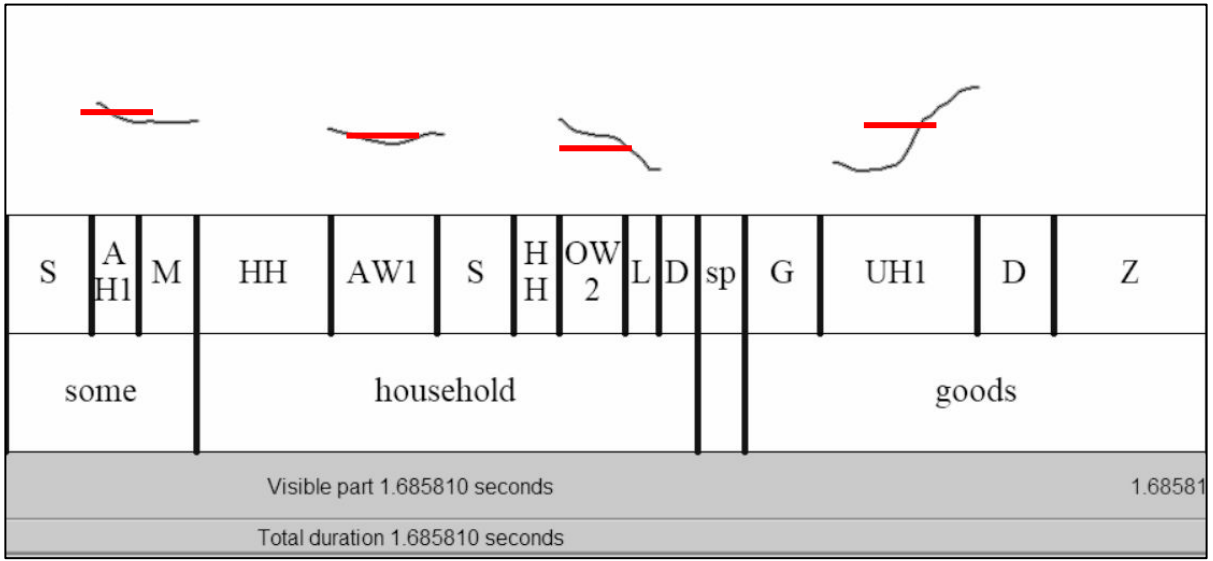
$$\mathrm{nPVI} = 100 \left[\sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{(d_k + d_{k+1})/2} \right| / (m-1) \right]$$

1. Pitch PVI
    - Comparisons of adjacent vowels' maximum semitones



Results

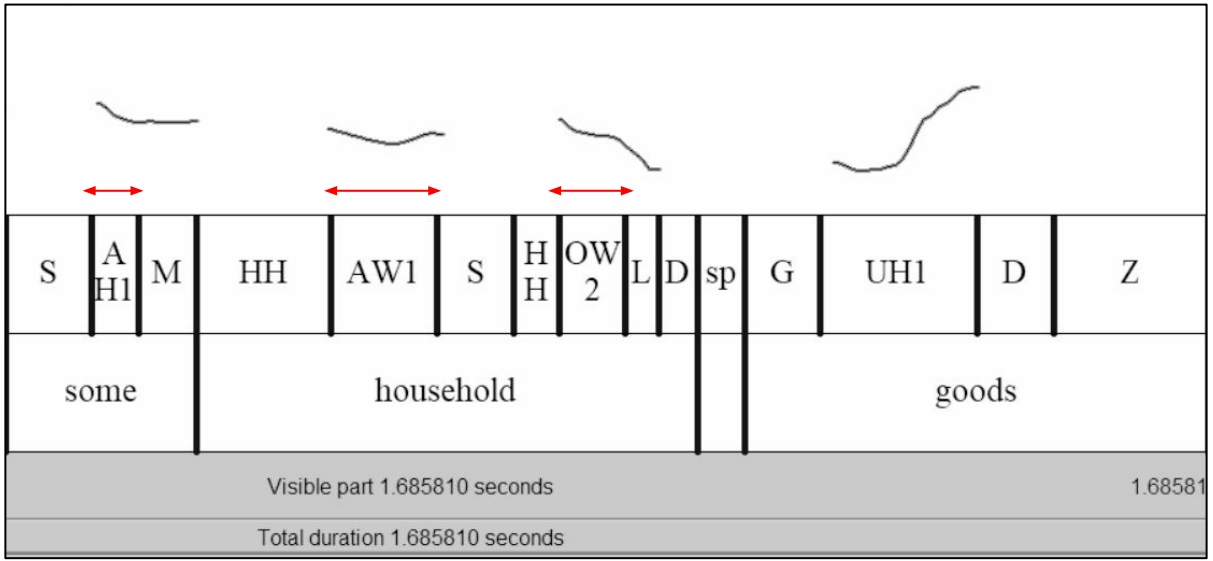
2. Pitch variance
    - Standard deviation of the mean semitone of each vowel



Results

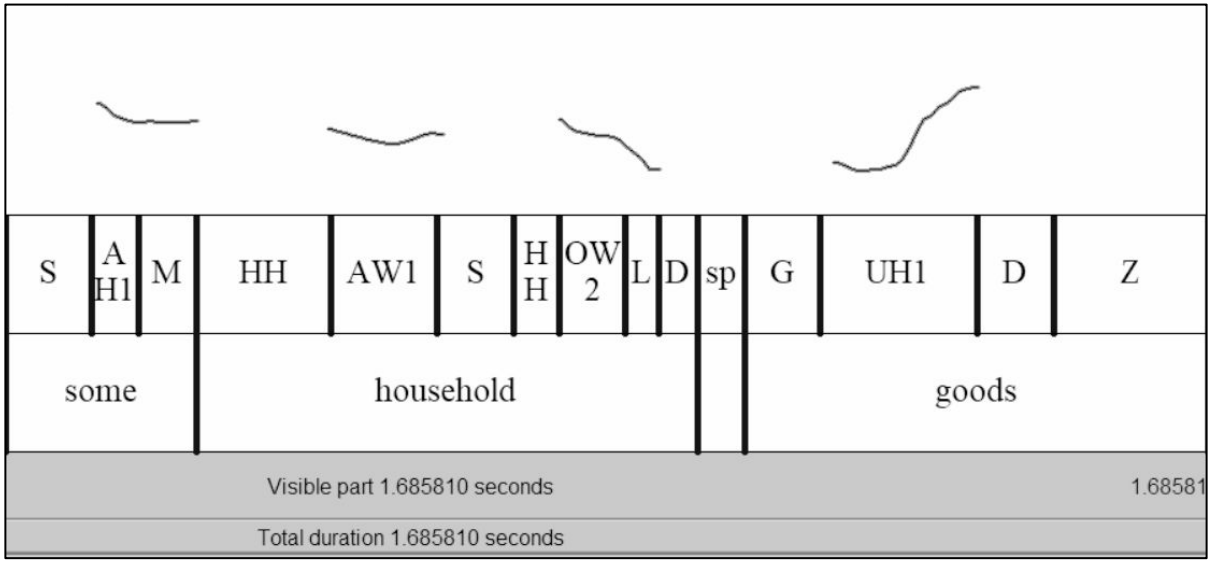
$$\mathrm{nPVI} = 100 \left[\sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{(d_k + d_{k+1})/2} \right| / (m-1) \right]$$

3. Durational PVI
    - Comparisons of the duration of adjacent vowels



Results

4. Articulation rate
    - Syllables per second



Results

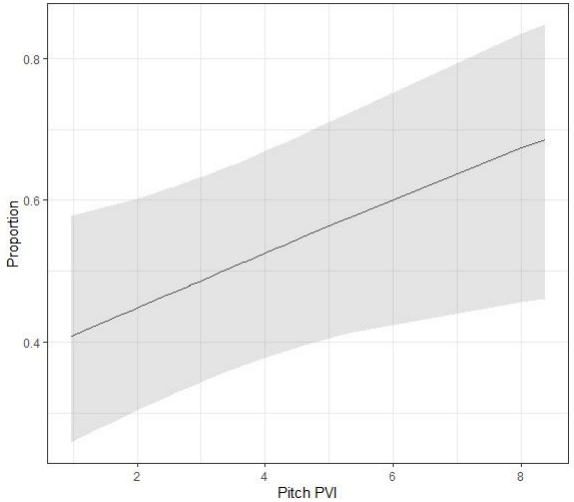
- Logistic mixed effects regression model
  - Dependent variable: Singlish (1/0)
  - Fixed effects: pitch PVI, pitch variance, durational PVI, articulation rate
  - Random effects: clip, participant, speaker

	Estimate	Std. Error	z-value	p-value
(Intercept)	-0.936	0.708	-1.323	0.1859
Articulation Rate	0.186	0.0973	1.908	0.0563 .
Pitch PVI	0.155	0.0735	2.112	0.0347 *
Pitch Variance	-0.176	0.0772	-2.276	0.0228 *
Durational PVI	-0.000	0.006	-0.094	0.9254

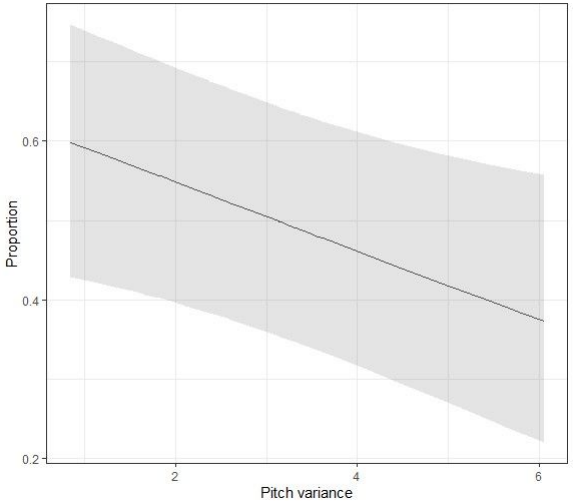
Results

A clip was more likely to be chosen as the more Singlish clip if it had:

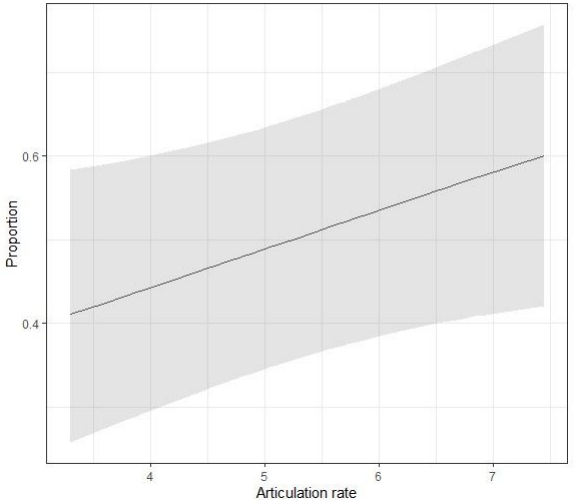
- Higher pitch PVI



- Lower pitch variance



- Faster articulation rate

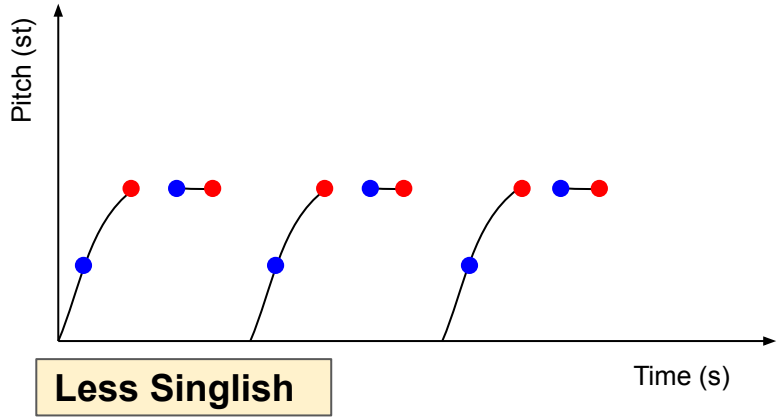


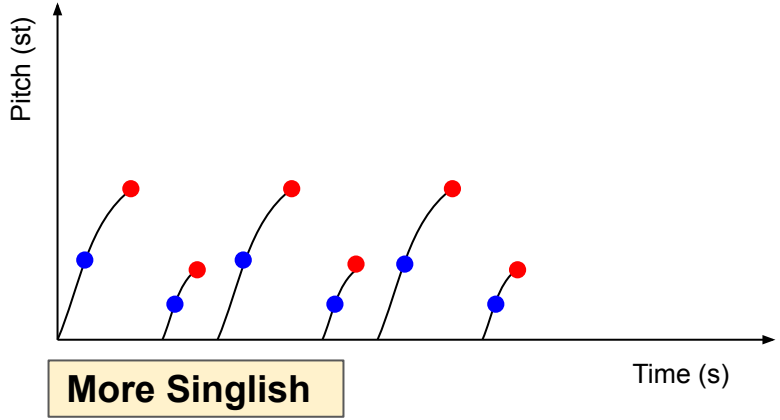
Discussion

- Perception:
  - Listener categorizations of Singlish were **gradient**, with between- and within-talker variability

- Prosodic Variation:
  - Clips more likely to be chosen as ‘more Singlish’ were associated with **more local pitch variability** but **less global pitch variability**
    - Ties into listeners’ open-ended responses

Max: Greater difference between max pitch of adjacent vowels for More Singlish than Less Singlish
Mean: Smaller SD of mean pitch for More Singlish than Less Singlish





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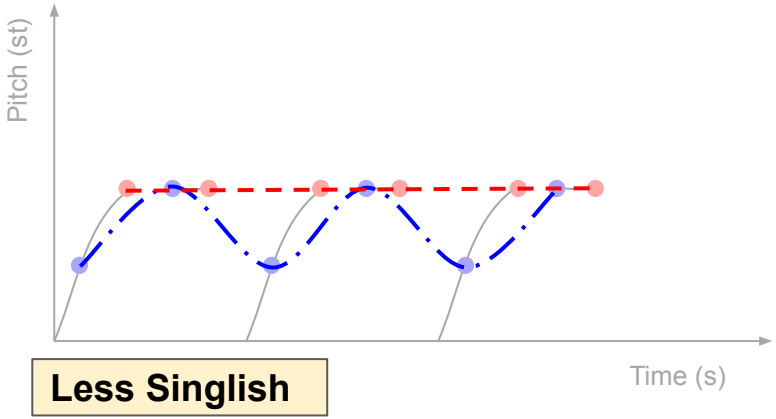

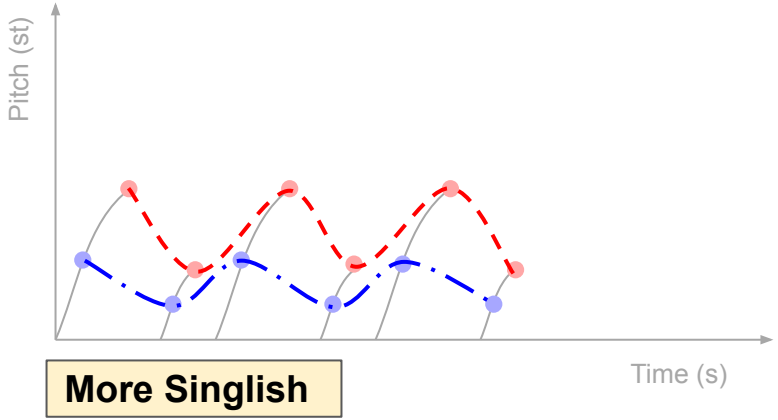

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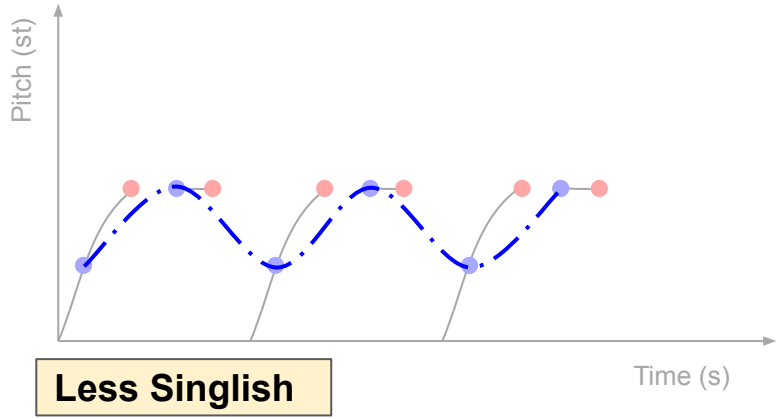
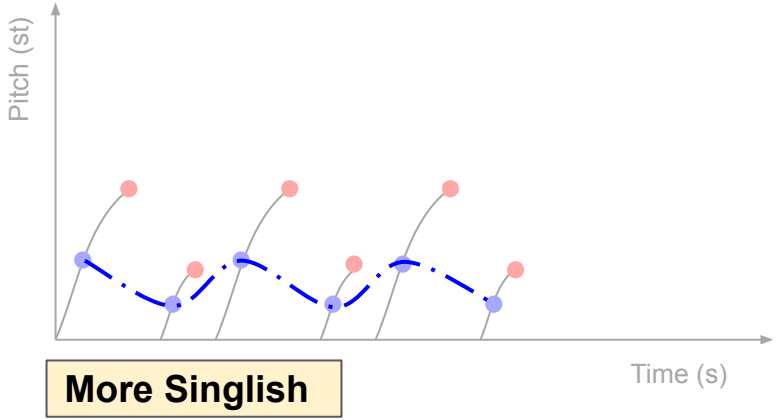
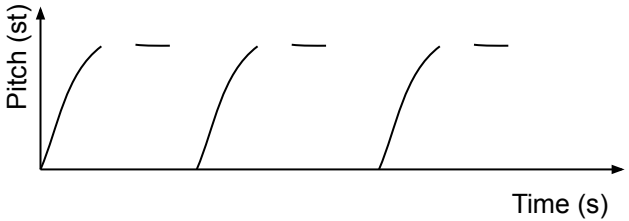
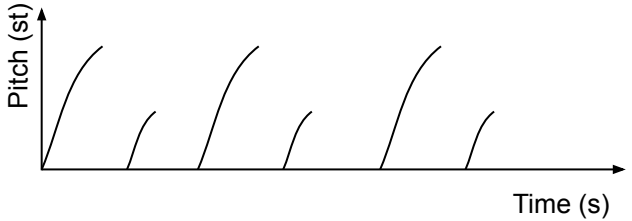


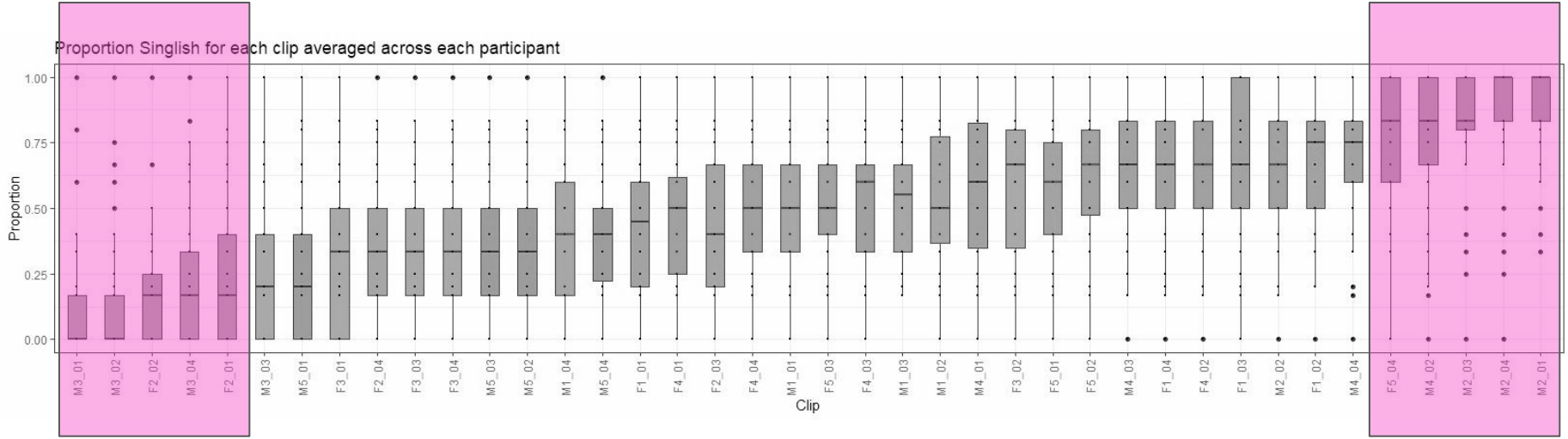


Predictions



- Acoustic analysis of specific clips
- Perception experiment with low-pass filtered stimuli
- Production experiment





Implications

- Exploratory methodology and listener-driven analyses for sociophonetic investigation
  - Both implicit and explicit decisions were involved in this study

- Gradient categorizations of Singlish support models of Singapore English that are more continuous than binary

- A comparison/counterpart for Singlish

Conclusion

- Pitch variability is a primary prosodic cue for categorizing variable speech as Singlish
  - A feature that can be further explored in future work

- Listeners map variation to a variety in a gradient, systematic manner, even when there is no explicitly provided counterpart for the variety
  - Suggests that listeners' categorizations of variation is gradient

Thank you!

Questions? Email us!

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