Borrowing Tones:
Word-level tone in Colloquial Singaporean English

E-Ching Ng
e-ching.ng@yale.edu
Yale University

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In this talk I will be describing the tone transcriptions that have been proposed for Colloquial Singaporean English, but my focus is really on tonogenesis, specifically a link to Malay.

Outline

- Background
  - Distinctive prosody
  - Substrate: Chinese vs. Malay?
- CSE word-level tone
- High boundary tone
- Conclusions

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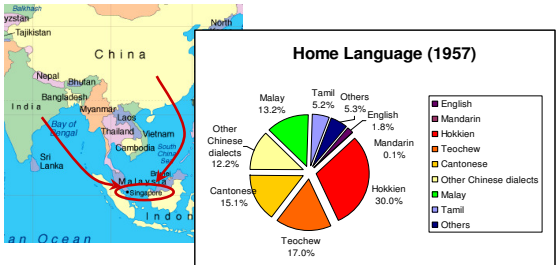
•First I'll give a bit of background on Singapore and Singaporean English, then I'll describe the tone generalisations, and I'll focus on one surprising phenomenon, the high boundary tone, before I conclude.

•I think some of you will not have heard full-blown colloquial Singaporean English before. It's very hard for me to do in a formal non-Singaporean setting like this, but I'll try to do a watered-down version for the next slide just to give you a taste of the prosody.

Singapore: Home language



(Kuo 1980: 41)

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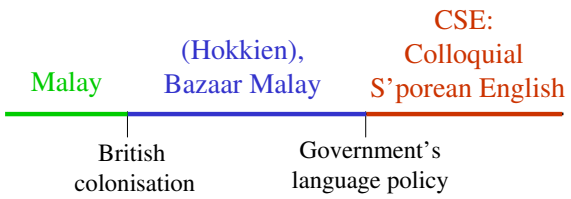
•<NEXT> Singapore there ah, everyone speak Malay. Malaysia also, Indonesia also. 1819 the British come and colonise, so got many immigrants come and work, from southern China got a lot <NEXT>, also small percentage from India <NEXT>.

•<NEXT> Today I talk about Chinese Singaporean. We are the majority, but Chinese also got different kind one. Hokkien is like Taiwanese. Teochew very similar, also in the southern Min family. Cantonese, ah, not the same already. But one thing quite similar lah. All got very rich tonal phonology, at least three level tone.

•So that's Singaporean English. Was that understandable? I was sticking to English lexical items. I'm told that if you don't, it's not intelligible to other English speakers. But since it's not as distant from English as many other creoles, it's been termed a creoloid rather than a full-blown creole.

•Now one thing this pie chart doesn't show you is how all these people communicated with one another. <NEXT>

Singapore: Lingua franca



Will focus on **CHINESE** bilinguals (for now)

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•The different lingua francas will turn out to be important, so let me go through them briefly.

•Malay was already a regional lingua franca before British colonisation. Among the Chinese, Hokkien was the lingua franca between different dialect groups. But between different ethnic groups, the lingua franca was Bazaar Malay, which has been described as a pidgin. Then from the 1960s onwards English became increasingly the language of administration and education, and that is the lingua franca among younger Singaporeans - especially the basilect, the Low form, or the informal register, Colloquial Singaporean English.

•I should also say that I am focusing on Chinese speakers.

Singaporean English

- You told me earlier I would have got some people for you also.
- It's also different from Singapore Mandarin. So Singaporeans will also know. If you speak to a Malaysian.
- Especially being a teacher in Singapore now you need to do a lot – many other things than teaching right?

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Distinctive prosody: Stress

- Stress less strongly marked than in BrEng
  - Syllable-timed, not stress-timed
  - Less vowel reduction on unstressed syllables
    - Brown (1988), Low et al (2000), Deterding (2001)
- But stress seems to be present
  - High agreement on stress transcriptions
    - Tongue (1974), Platt & Weber (1980), Bao (1998)
  - Significant difference: duration and intensity
    - See appendix for preliminary analysis

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•As you will have noticed, Singaporean English prosody is quite distinctive. One general theme is that stress is not very strongly marked. CSE tends towards syllable-timing more than stress-timing. Also, there doesn't seem to be much vowel reduction. And just anecdotally, I taught high school literature for five years, and when you ask students to scan poetry you get the strangest transcriptions.

•On the other hand, among linguists, there seems to be very high agreement on stress transcriptions. The search for phonetic correlates of stress has been more difficult according to Tan Ying Ying's dissertation, but in fact my mini-analysis had extremely significant results for duration and intensity once I controlled for a number of factors.

•So I would say that there is stress, though it is not as salient as in British English.

Distinctive prosody: Intonation

- Consistent with the presence of tone
  - Level tone predominant (Goh 1998)
  - Final high (Tongue 1974; Low & Grabe 1999; Zhu 2001; Lim 2008a)
  - Tone on discourse particles (Lim 2008b)
  - Impressionistically described as monotonous, but empirically greater pitch range than BrEng (Low 2000)

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•Singaporean English also has a number of features which are reminiscent of tone.

•Christine Goh found that intonation is characterised by quite level tones on each syllable.

•A number of different studies have found that there can be a high on the final syllable. Very often it's not there, most often it's only slight, but sometimes it's very audible, like "Working!"

•Most of the work on discourse particles now presumes that they carry lexical tone.

•And finally, although early impressionist descriptions said CSE was rather monotonous, Low Ee Ling has found that it actually has a greater pitch range than British English.

•The combination of these features would be difficult to explain if CSE was purely a stress-accent language.

CSE substrate: Chinese vs. Malay?

- Both influential
  - Lingua franca: Hokkien (Ch.), Bazaar Malay (Platt 1980)
  - Principal substrate: Bazaar Malay, Baba Malay. But their substrate was Hokkien (Gupta 1998)
- Features present in >1 indigenous language more likely to be adopted (Deterding 2007)
  - Discourse particle *lah*, null subject, topic prominence
- Some features may be from a single source
  - Hokkien → Reduplication, triplication (Ansaldo 2004)
  - Malay → Final lengthening (Deterding 2007)

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•Finally, since I'm discussing the interaction of Chinese and Malay with English, a a bit of background on that.

•Clearly they were both important, since practically all the Chinese spoke both and they used to form more than 70% of the population.

•But Anthea Fraser Gupta says that the principal substrate of Singaporean English was not Chinese; it was non-native speakers' Malay. She points to two different varieties. Bazaar Malay was at best a pidgin spoken by new settlers (Peter Bakker). Baba Malay was spoken by the older Chinese families and is usually described as a creole.

•I believe not everyone in the audience accepts this argument for Malay primacy. And I must say that Gupta's argument seems to be ethnographic rather than linguistic.

•In practice, it's usually very difficult to figure out the source of any one feature of Singaporean English. Both Malay and Chinese use the discourse particle *lah*, and they're both null subject and topic-prominent.

•There are convincing arguments only for a couple of features, such as the reduplication/triplication distinction, and very significant final lengthening. So it hasn't been that clear how important Malay was as a contact language.

Outline

- Background
- CSE word-level tone
  - Contrast and consistency
  - Stress-tone relationship
- High boundary tone
- Conclusions

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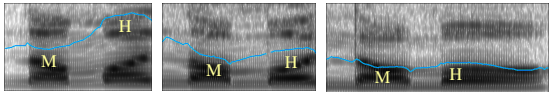
•Now to describe the tonal phenomena that have been proposed for Colloquial Singaporean English.

Word-level tone

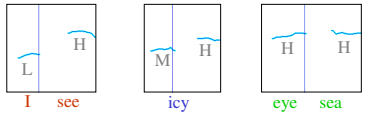
(Wee 2008, Ng 2008a, Siraj 2008)

- Different contexts



initial medial final

- Minimal triplet



I see icy eye sea

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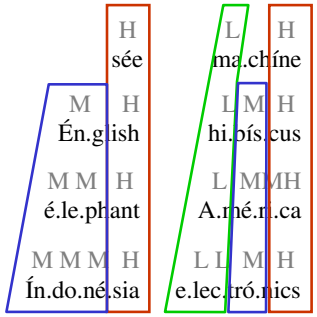
•Three people independently proposed that CSE has word-level tone last year. Wee Lian Hee and I have identical transcriptions. Siraj has very similar transcriptions; if you'd like to know more, please ask during Q&A.

•Let me give examples from my recordings. I asked my consultants to pretend they were brand names and read controlled sentences like "NEVER order Colgate from Katong lah."

•You can see the level tones very clearly in sentence-initial position. They're almost always quite clear in sentence-medial position too. In sentence-final position we often get a flat pitch contour, especially in laboratory speech, but as we saw earlier, many other studies have found that this slight high also occurs. This is not something you can easily make sense of with the usual analyses of English prosody.

•So that suggests that there are two level tones. But in fact if you consider more words, you can see a consistent distinction between three level tones. Notice that these three phrases also have different stress patterns. It turns out that there is a very elegant relationship between stress and tone.

Stress-tone relationship



High tone on word-final syllable

Mid tone starts on first stress

Low tone on initial unstressed syllables

(See analysis in handout)

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•If you limit yourself to morphologically simple forms, you can see that high tone appears on the last syllable, mid tone begins on the first stress, and low tone appears on any initial unstressed syllables. So it might be appropriate to speak of CSE being a pitch-accent language. An Optimality Theory analysis is outlined in the appendix.

•<READ>

•Electronics is not morphologically simple but has been included to show that low tone can span more than one syllable.

•I should make it clear that other pronunciations are not regarded as ungrammatical, they're just regarded as "un-Singlish".

Stress-tone relationship

- Stress prefers higher tone (De Lacy 1999)
  - Chinese Englishes (Cheung 2008, Zhang et al 2008)
  - Nigerian English (Gut 2005)
  - West African creoles (Devonish 2002)
  - Why does CSE stress carry mid tone?
- Phrase boundary tones are known, but
  - CSE's word boundary tone is unusual, especially a high!

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•Now the odd thing about all this is the role of the high tone. Cross-linguistically, the highest tone possible is usually associated with stress in some way. This seems to be true wherever stress-accent languages contact tonal languages, both Sino-Tibetan and African. So why does CSE stress seem to be associated with mid tone? It's as if the high tone is being saved for the word boundary.

•But that is also strange, because boundary tones are usually anchored to the phrase. I've never heard of a word boundary tone before. So where could CSE's word-final high tone have come from?

Outline

- Background
- CSE word-level tone
- High boundary tone
  - Phrase-final in Malay/Indonesian
  - Word-final in Bazaar Malay
  - Bazaar Malay ≠ CSE
- Conclusions

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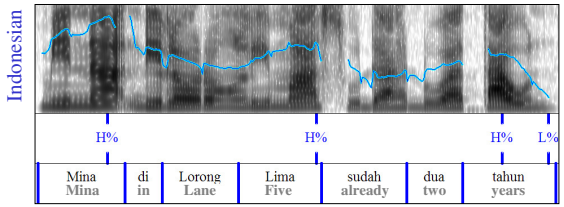
The possibility that I have explored so far is that the source is Malay. But most Singaporeans don't speak Malay proper, so I looked at whether Bazaar Malay is the missing link.

High boundary tone: Malay

- Marks right edge of subject (Wolff et al 1992)
- ☞ Marks right edge of phrase (Lorentz 1997)



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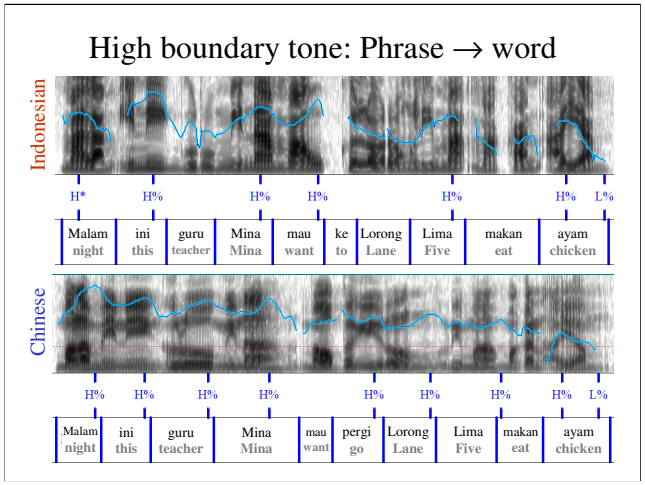
•There is a high boundary tone in Malay, but the existing literature is not very clear on its nature. Jon Wolff says that high tone marks the end of the subject, but Ove Lorentz says that it marks the end of a phrase.

•So I did some recordings. The end of the utterance has a high-low, which is also described by Ove Lorentz, but we can see two very distinct high targets, and it's clear that it doesn't just appear on the subject. So my recordings generally support Lorentz's observation.



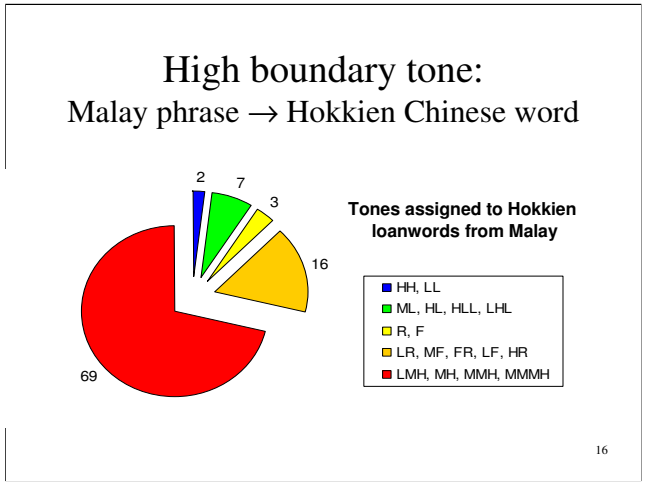
•Let's compare the Indonesian speaker with a Chinese speaker of Bazaar Malay. The Indonesian has a high on the first syllable. I treated this as a nuclear accent but it doesn't really matter what you call it, if we agree that it is not word-final. So where does she have final high boundary tones? Usually at the end of noun phrases: *tonight*, *Mina's teacher*, *Lane 5*.

•Now this next speaker is ethnically Chinese and his intonation is quite different from the Indonesian speaker's. Practically every two-syllable word has a high boundary tone. The only one which doesn't is *makan*. The high on *Lima* is realised a bit late, but it definitely belongs to *Lima.*

•Now I'm showing these speakers because they form a nice pair, but they're not quite like the other speakers. Most of the Chinese speakers don't have high-low on the last word, they just have a final high, like on the other words. So this man is atypical, probably because he grew up in a Malay neighbourhood and his Malay is much better than his Chinese.

•Another interesting thing about the Singaporean Malay speakers that I should have expected, but didn't was that they didn't just have phrase-final rises like this Indonesian speaker. They also quite frequently had slight word-final rises. Also, the last word had a final high instead of a high-low. So sometimes they behave like the Indonesian speaker and sometimes they behave like the Chinese. So it looks like they were influenced by the Chinese. Which shouldn't have surprised me, because Singapore was more than 70% Chinese for so long.

•So, summing up this slide, it looks like Malay originally had a phrase-final high, but Chinese speakers have a word-final high.



Another kind of evidence that the phrase-final high was perceived as a word-final high is what happened when Chinese borrowed Malay words. This is very preliminary work - my parents keep thinking of more loanwords, and my father's Malay is so good that it may be affecting his pronunciation. But the pattern is really quite clear: the majority of these loanwords have tone patterns that look just like Singaporean English.

High boundary tone: Phrase → word

- Chinese speakers' Bazaar Malay pidgin
  - Tends to have a rise on word-final syllable
  - 44 exceptions out of 148 tokens (see handout)
- Chinese borrowings from Malay
  - Tend to have a high on word-final syllable (also Huang (2007) on Teochew)
  - 8 exceptions out of 82 tokens (see handout)

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So to recap what we just saw:

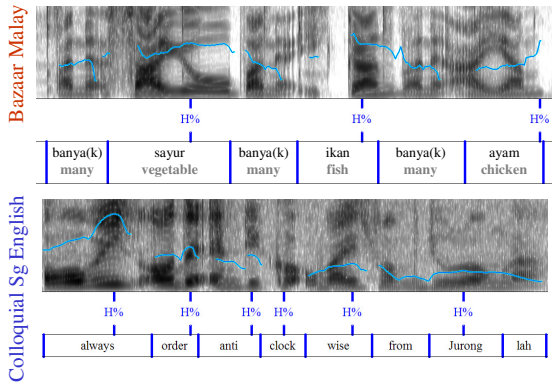
•Chinese speakers' Bazaar Malay tends to have a rise on the word-final syllable. I haven't done statistical analysis on my whole corpus yet, but just to give you some numbers, over three minutes' speech one 59 year old woman had these a final rise on about 70% of the words. Most of the exceptions are NP- or VP-internal or part of utterance-final lowering.

•Similarly, Chinese loanwords from Malay tend to have a high on the word-final syllable, either as a level tone or part of a contour tone. For Hokkien my preliminary data has about 90% falling within this group. My findings are similar to Huang Zhipeng's results for Teochew. And I believe there will soon be a formal description of this loanword phonology by Tan Ying Ying.

Bazaar Malay data: CF13, omitting monosyllables.

Chinese data: CM8, my father. Hokkien because it's the inter-ethnic lingua franca.

Bazaar Malay ≠ CSE



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One thing I did not expect is that the Bazaar Malay pattern is much less regular than the Singaporean English pattern. The high boundary tone is very often omitted NP-internally. I haven't done a statistical analysis yet, but in CSE it seems pretty rare to omit the high boundary tone. In fact you even get it with compounds, prefixes and stressed suffixes.

Bazaar Malay ≠ CSE: Why?

- Predominant pattern in pidgin Bazaar Malay → Regularised in creole CSE?
- Reinforced by other contact varieties?
  - Baba Malay: "step-up" _ – _ – (Wee 2000)
  - Indian English: L*+H?
  - Irish English: nuclear rise-plateau (Grabe et al, to appear)

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•So why is the word-final high so regular in CSE when it's really not universal in Bazaar Malay? I suppose it could just be that Bazaar Malay is a pidgin or second language variety, while CSE is a much more stable creole or creoloid. It would be natural to take a predominant pattern and regularise it.

•However, it is also possible that it is more regular in CSE because it was reinforced by other contact varieties besides Bazaar Malay. The following were all represented among the early students and teachers of English.

•The most promising contact variety is Baba Malay. It turns out that I don't really need to a lot of work here because Gabriel Wee has already found low-mid-high patterns for both Baba Malay and Baba English. I must say that in my own recordings, the pattern seems even less regular than Bazaar Malay, so it's probably not the full story. However it does help to explain why educated Singaporean English also has so many word-final highs.

•Another promising contact variety to look at is Indian English. At least some of the time there seems to be a L*+H accent on content words. I am just starting to read in this area, so I really don't know how much this will help. Again, it doesn't seem to be as consistent as in CSE.

•Finally, there were some Irish missionaries in Singapore, and Irish English has a rise on the first stress in the sentence, and then a high plateau till the end. But my impression is that this probably wouldn't result in the CSE high, which specifically appears on the final syllable.

Outline

- Background
- CSE word-level tone
- High boundary tone
- Conclusions
  - Implications
  - Future work

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So here are my in-progress conclusions.

Conclusions

- The most unusual aspect of CSE prosody is the word-final high.
- It can probably be traced to the Malay phrase-final high, via Bazaar/Baba Malay tendency towards a word-final high.
- However, the CSE pattern is more regular than the Bazaar/Baba Malay tendency.

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Summing up,

Implications?

- For creoles: transfer and simplification
  - "[A] mixture of Hokkien and Malay ... would have, if not seven or eight tones like Min, then at least three or four" (McWhorter 2008)
- For Singaporean English:
  - Confirms importance of Baba/Bazaar Malay
  - Exposes CSE stress, morphology (Ng 2008b)

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•I would say that CSE doesn't really constitute evidence for or against the complexity hypothesis, because a three-way tonal distinction may look very complex, but it's a lot simpler than the Hokkien tone inventory. In fact CSE's tone inventory was actually predicted by John McWhorter.

•However, I think that CSE tone does provide crucial evidence showing that CSE proso.,;dy cannot be explained by contact with just Chinese or Malay. If it were just Chinese, we'd have high tone on stresses. If it were just Malay, we'd have high tone only phrase-finally. The fact that high tone is word-final is a strong argument for Gupta's stand that Chinese speakers' Malay was the principal substrate.

•Word-final high tone is also a very useful tool in phonetics and phonology. In my mini-analysis of stress, I was only able to get highly highly significant results for intensity and duration because I was controlling for tone. Also, it's now possible to learn a lot more about CSE morphology, since it occurs multiple times in morphologically complex words.

Future research

- Statistical analysis of data collected
- More data on Malay/Indonesian intonation
- Role of Baba Malay, Indian/Irish English
- Do CSE tones behave exactly like Chinese tones, e.g. in utterance-final neutralisation?
- Do speakers of Malay and Indian heritage also have CSE tone patterns?

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Future research: need to know vs. nice to know.

•I have only partially analysed my data. (Pitch contours are not the simplest things to analyse statistically, and fitting in fieldwork around second-year coursework is very ... interesting.)

•If I want to complete the link between CSE and Malay, I don't just need Bazaar Malay data, I also ought to go to the Riau Islands and get Malay without too much Chinese influence.

•As aforementioned, there are other possible contact varieties to consider.

•Jeff Good shows that Saramaccan lexical tone and pitch accent don't behave the same way. It would be interesting to see if we have the same distinction for CSE words of Chinese vs. English origin.

•Finally, we know that Singaporeans can tell apart Chinese, Malay and Indian speakers from just ten seconds' conversation, and we know that for Malay speakers prosody is a very important cue, which is what we would expect. It will be interesting to see the results from Selvarani Suppiah's dissertation on the empirical differences between ethnic groups' pronunciation.

Many thanks to

- Darya Kavitskaya, my advisor;
- Gaja Jarosz and Jelena Krivokapić;
- Wee Lian Hee, Pasha Siraj, Diana Apoussidou, Mary Beckman, Low Ee Ling, Julie McGory, Tom Conners, Uri Tadmor, Devyani Sharma, Sakina Suffian Sahuri and K. P. Mohanan;
- Erich Round, Leandro Bolanos, Scott McClure and other fellow Yale linguistics students;
- The 21st Century Center of Excellence for access to the Multilingual Spoken Corpus (Malay), Lisa Lim for access to the GSSEC, and Raffles Junior College for the use of their music facilities.
- Lim Tse Yang, Huang Zhipeng, my extended family, and my many consultants.

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Appendices to *Borrowing Tones: Word-level tone in Colloquial Singaporean English*

10 Jan 2009

E-Ching Ng (e-ching.ng@yale.edu), Yale University. Changes to original handout indicated in red. **SPCL, San Francisco**

Contents

1. Data collection

- *Please note* that only part of the data has been analysed so far.
- *Register:* Informal but clear, as if to a deaf aunty.
- *Discards and repetition:* Speakers were free to repeat tokens if they had stumbled the first time, but were asked not to emphasise the correction.
- *Focus:* Speakers were instructed to emphasise only the words in capitals.
- *Equipment:* Marantz PMD671 solid state recorder, Shure SM10A microphone.
- *Phonetic analysis* was carried out using Praat.

1.1. Speakers

- Speakers cited here are ethnic Chinese and lifelong Singapore residents except: Both Hokkien speakers lived in the UK and Hong Kong for several years as adults (one also recorded Bazaar Malay). Another Bazaar Malay speaker attended a UK university. One Teochew/Bazaar Malay speaker left Malaysia at age five.
- *CSE:* 14 (6m, 8f): 6 context script, 8 morphology script.
- *Bazaar Malay:* 9 (5m, 4f): 4 context script, 6 translation, 6 spontaneous speech.
- *Malay/Indonesian:* 5 (2m, 3f), incl. 1 Indonesian. 4 script A, 2 script B.
- *Hokkien:* 2 (1m, 1f). Compared with *Teochew*: 2 (both female).

1.2. CSE and Bazaar Malay: Context script

- *Target words* were presented as imaginary brand names.
- *Presentation:* PowerPoint slides, replying to experimenter's prompt.
- *No. of targets/tokens:* 14 words, 3 conditions (sentence-initial, -medial, -final). CSE 6 repetitions (except 1 spkr: 3 repetitions). Bazaar Malay 12 repetitions.

Sample
6. ALI say cannot order. Money deliver from Katong no standard one.
7. ALI say cannot order Minimum deliver from Katong one. No standard.
8. ALI say cannot order Tikam-tikam. Deliver from Katong no standard one.

1.3. CSE: Morphology script

- *No. of targets/tokens:* 5 speakers read all 238 target words twice, 2 read it once.
- *Most target words* were presented as imaginary brand names. Speakers were asked to pretend they were common brands such as Colgate.
- *Idioms* were presented in conversation fragments.
- *Presentation:* Paper script, replying to experimenter's prompt.

Sample
1. NEVER order IC from Katong lah.
2. ALWAYS order Helpful from Punggol lah.
3. BETTER order Locate from Jurong lah.

1.4. Bazaar Malay: Translation

- *No. of targets/tokens:* 12 sentences, repeated only in cases of disfluencies.
- *Presentation:* English or Mandarin, oral unless speaker preferred to read also.

Sample
4. I don't like to eat fried banana.
5. Malay people know how to speak Malay.
6. My older brother has a lot of children.

1.5. Bazaar Malay: Spontaneous speech

- *Topics:* Conversations where you usually speak Malay, e.g. at work/shopping; Conversations you might have as a tourist in Malaysia or Indonesia.

1.6. Malay/Indonesian: Script A

- *No. of targets/tokens:* 30 sentences, 6 repetitions.

- *Presentation:* PowerPoint slides, replying to experimenter's prompt.

Sample
7. ALI cakap, Omar minum air panas.
8. ALI cakap, Omar minum air panas setiap hari.
9. ALI cakap, Omar minum air panas yang kat atas meja.

1.7. Malay/Indonesian: Script B

- *No. of targets/tokens:* 43 sentences, 3 repetitions.
- *Presentation:* Paper script.

Sample
10. Dua orang dan lima anjing.
11. Guru baik sekali.
12. Sudah dua tahun Mina di Lorong Lima.

2. CSE stress - Preliminary analysis

- *Data source:* CSE morphology script.
- *Number of tokens:* 41 tokens over three speakers (two male, one female).
- *Measurements:* Average & maximum intensity, consonant & vowel duration. Vowels judged by periodicity. Voice onset time considered part of consonant.
- *Conditions held constant:* tone (mid), syllable structure (CV), vowel (within the pair), word (adjacent syllables were paired).
- *Criterion for classification as stressed vs. unstressed:* Tone patterns. If the initial syllable was M, the first and third syllables were classified as stressed, and the second as unstressed. If L, the opposite. Tones verified from pitch tracks.

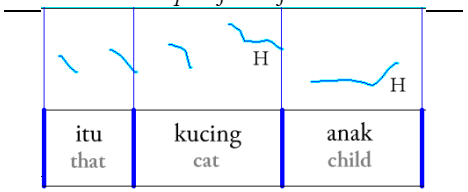
Words used				
e**cono**my	**mini**mum	psy**cholo**gy	tech**nolo**gy	**photo**graphy
e**cono**mics	**mini**mise	psy**cholo**gical	tech**nolo**gical	wi**kipe**dia
e**cono**mical	**mini**misation	psy**cholo**gically	tech**nolo**gically	

- *Results:* A paired t-test finds that stressed and unstressed syllables differ significantly in average and maximum intensity ($p = 0.000$), as well as vowel duration ($p = 0.000$) and consonant duration ($p = 0.004$).

3. Bazaar Malay word-final rise - Preliminary analysis

- *Data source:* Translations and spontaneous speech (on going to the market).
- *Speaker:* 1 female Teochew speaker, age 59, left Malaysia at age 5.
- *Number of tokens:* Total 148 words over ~3 min (omitting monosyllables).
- *Criteria for classification as rising on final syllable:* Pitch track, disregarding jitter from stop release bursts. Classified as non-rising if pitch track showed a rise but the auditory impression was flat tone.

Example of classification



- *Results:* 70.3% of 148 total tokens had the expected rise on the final syllable.
- *Breakdown of the 44 exceptions:* 22 phrase-internal, 16 within utterance-final pitch lowering (not mutually exclusive categories), 7 others.

4. Hokkien loans from Malay - Preliminary analysis

- *Data source, speakers:* Brainstorming, 2 Hokkien speakers, ages 59 (m) and 56 (f).
- *Number of tokens:* 82 loanwords in total.
- *Criteria for counting lexical items: Pasar* and *pasar malam* counted separately, since both exist in Malay and *malam* is not used in other contexts in Hokkien. *Matakiã* was not counted as it is derived from *mata* and a Hokkien suffix.
- *Omitted* English loans via Malay, e.g. E. *puncture* → M. *pancik* → H. *pan33.tʃik5*.
- *Criteria for transcribing tone patterns:* Auditory impressions.

Words used (Malay forms)
agak - agar-agar - atap - **baba** - balek - bangsat - baru - batu - bau - botak - **buah bangsat** - buah ciku - buah duku - buaya - cantik - cempeda - cendol - cuba-cuba - cuti - durian - incik - jalan-jalan - jamban - **janji** - kaki - kampung - kangkong - kari - karung guni - kawin - kaya - kebun - kedai - kena - kentang - **kepala** - keropok - kopi - kueh - kuning - laku - lawa - lelong - lemak - macam - makan - makan angin - mata - mee siam - nasi lemak - nyonya - otak - pantang - pantat - **pasar** - pasar malam - patut - ponteng - pukul - pun - rambutan - rojak - roti - roti prata - sabun - **saksi** - **salah** - sapu - satay - sayang - selah - sial - sombong - sotong - suka - suku - **tahan** - tapi - tingkat - tolong - tongkat - tumpang

Tones	R	F	HH	LL	ML	HL	HLL	LHL
Tokens	1	2	1	1	4	1	1	1

Tones	LMH	MH	MMH	MMMH	HR	LR	MF	FR	LF
Tokens	16	41	4	8	4	3	5	1	3

- *Results:* 90.2% of 82 tokens had a high tone of some kind on the final syllable (exceptions in **bold type**). 79.6% out of 79 tokens (omitting monosyllables) had a rise of some kind on the final syllable (exceptions underlined).
- *Note:* Pronunciations in a second session were sometimes different.

5. Tone assignment - Optimality Theory analysis

5.1. Constraints

- **H]$_{PW}$ *or* ANCHOR (PWD, H, R):** Each prosodic word right edge must be signalled with a high tone.
- **OCP:** Identical adjacent specified tones are forbidden.
- ***TBU/H:** Assign one violation per syllable linked to a high tone.
- **$_{PW}$[T *or* ANCHOR (PWD, T, L):** Each prosodic word left edge must be signalled by the initiation of a tone.
- ***NHDL/T *or* *ANCHOR (NON-HD, T, L):** A tone may not be initiated on an unstressed syllable.
- **HD/M,H:** Each stressed syllable must be linked to a mid or a high tone.
- **NHD/L:** Each unstressed syllable must be linked to a low tone.
- SPEC: Each syllable must be linked to a tone.

5.2. Notation

- **Ø**: lack of tone. **>**: spreading with strict locality.
- These transcriptions do not distinguish primary and secondary stress.

5.3. Tableau

1. (mó.ney)	**H]$_{PW}$**	**OCP**	***TBU/H**	**$_{PW}$[T**	***NHDL/T**	**HD/M,H**	**NHD/L**	**SPEC**
☞ (MH)			*		*		*	
a. (HL)	W*		*		*		L	
b. (H>)			W**		L		*	
2. (é.le.phant)	**H]$_{PW}$**	**OCP**	***TBU/H**	**$_{PW}$[T**	***NHDL/T**	**HD/M,H**	**NHD/L**	**SPEC**
☞ (M>H)			*				**	
1. (MØH)			*				**	W*
3. (im.pór.tant)	**H]$_{PW}$**	**OCP**	***TBU/H**	**$_{PW}$[T**	***NHDL/T**	**HD/M,H**	**NHD/L**	**SPEC**
☞ (LMH)			*		**		*	
2. (M>H)			*		**		W**	
3. (L>H)			*		**	W*	*	
4. (ØMH)			*	W*	L*		W**	W*
4. (in.for.má.tion)	**H]$_{PW}$**	**OCP**	***TBU/H**	**$_{PW}$[T**	***NHDL/T**	**HD/M,H**	**NHD/L**	**SPEC**
☞ (M>>H)			*		*		**	
a. (MLMH)			*		W**		L*	
5. (póst)(mán)	**H]$_{PW}$**	**OCP**	***TBU/H**	**$_{PW}$[T**	***NHDL/T**	**HD/M,H**	**NHD/L**	**SPEC**
☞ (H)(>)			**	*				
a. (H)!(H)		W*	**	L				