Mandarin Tonal Adaptation: How English Loanwords in Mandarin Get Tone

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Loanwords and Loanword Adaptation

- **Loanwords:** words borrowed from one language into another
  - English borrowed *entrepreneur* from French
- **Loanword adaptation:** process by which borrowed words made to fit into grammar of borrowing language
- Phonological adaptation:
  - French [**ɑ̃**tʁəpʁənœʁ] → English [**ɑn**tɹəpɹənur] 'entrepreneur'
  - English [**kɹ**i**m**] → Hawaiian [k**a**lim**a**] 'cream'[1]

[1]Parker Jones 2009

Tonal Adaptation in Mandarin

- Mandarin is a lexical tone language
- Words borrowed from English into Mandarin must be assigned tones
- English lacks tone → tonal adaptation different
- On what basis should Mandarin assign tones to English loanwords?

Today's Talk

- Background on Mandarin tonal adaptation
- Corpus study of established English loanwords in Mandarin
- Loanword adaptation experiment

The Tones of Mandarin

- Mandarin has four lexical tones:

Tone	**Pinyin**	**Gloss**
High (1)	*mā*	‘mother’
Rising (2)	*má*	‘hemp’
Low (3)	*mǎ*	‘horse’
Falling (4)	*mà*	‘scold’

Mandarin Tonal Adaptation

- Tonal adaptation of English loanwords in Mandarin is famously complex and problematic
- Cf. relatively straightforward tonal adaptation in Cantonese
  - Stressed syllables → high tone, pretonic unstressed syllables → mid tone, posttonic unstressed syllables → low tone[1]

süt M ka H	'cigar'[2]
kit M tʰa H	'guitar'
pow M fey H	'buffet'

[1]Hao 2009, [2]Silverman 1992

Mandarin Tonal Adaptation

- Tonal adaptation of English loanwords in Mandarin is famously complex and problematic
- English loanwords in Mandarin:

bāsōng	'bassoon'
kēlóng	'cologne'
bùfěi	'buffet'
tǎbù	'taboo'

Mandarin Tonal Adaptation

- Numerous studies have sought to account for tones of English loanwords in Mandarin, but nearly all fail to fully explain the considerable variation
- Chang (2020): Tonal assignment mostly non-phonological, based on **lexical tone probabilities**[1, 2]
  - In running Mandarin text, probability of syllable *da* bearing falling tone is 0.653
  - So 65% of *da* syllables in English loanwords (e.g. ***dá****ěrwén* 'Darwin,' ***dǎ*** 'dozen') should have falling tone

[1]Chang 2020, [2]Zheng & Durvasula 2016

Mandarin Tonal Adaptation

- Other studies propose (sometimes conflicting) **phonological determinants**[1, 2, 3, 4, 5]
- "Stress-to-tone" effects
  - ➢Initial stressed syllables → high tone: ***kā**lǐ* 'curry' ✓
  - ➢Cantonese tonal adaptation exhibits stress-to-tone
- Onset effects: English or Mandarin sonority, voicing, aspiration, etc. favor adaptation with X tone
  - ➢Syllables with sonorant onsets → rising tone: ***mó**dēng* 'modern' ✓

[1]Zheng & Durvasula 2016, [2]Chang & Bradley 2012, [3]Wu 2006, [4]Mar & Park 2012, [5]Glewwe 2016

Mandarin Tonal Adaptation

- Phonological effects have many exceptions
- "Stress-to-tone" effects
  - ➢Initial stressed syllables → high tone: ***kǎnóng*** 'canon' ✗
- Onset effects
  - ➢Syllables with sonorant onsets → rising tone: ***màikè*** 'marker' ✗

Mandarin Tonal Adaptation

- Meanwhile, **standard syllables** interfere
  - ➢Chinese state institutions issue official adaptation guidelines for foreign words
  - ➢达 *dá* is the standard character/syllable for English /dɑː/, /dæ/, /dʌ/
  - ➢Standard syllable use is a confound in studies of Mandarin tonal adaptation
  - ➢**达**尔文 ***dá****ěrwén* ‘Darwin’

The Present Study

- Research question: What are the phonological determinants, if any, of tonal assignment in English loanwords in Mandarin?
- The data: Corpus of 2,644 syllables from 1,200+ loanwords drawn from dictionaries

Word	Syllable/ String	Stress	Onset Sonority	Onset Voicing	Onset Aspiration	Adapted Syllable	Tone
aspirin	æ	Stressed	NA	NA	NA	*ā*	High
aspirin	s	NA	Obstruent	Voiceless	NA	*sī*	High
aspirin	pə	Unstressed	Obstruent	Voiceless	Unaspirated	*pǐ*	Low
aspirin	rɪn	Unstressed	Sonorant	Voiced	NA	*lín*	Rising

How to Analyze?

- Analysis must be able to:
  - ➢Model (and thus control for) lexical tone probabilities
  - ➢Control for standard syllable use
  - ➢Handle variation

Maximum Entropy Harmonic Grammar (MaxEnt)[1,2]

candidates = 4 tones

English syllable: /ˈdɑː/		*Constraints*			Predicted Probs.
a. dā					
b. dá		*Violations*			
c. dǎ					
d. dà					

predicted probability of each tone

[1]Goldwater & Johnson 2003, [2]Hayes & Wilson 2008

Maximum Entropy Harmonic Grammar (MaxEnt)[1,2]

candidates = 4 tones

English syllable: /ˈdɑː/	STRESSED1 weight = ↑	…	…	Predicted Probs.
a. dā				
b. dá	1			↓
c. dǎ	1			↓
d. dà	1			↓

predicted probability of each tone

[1]Goldwater & Johnson 2003, [2]Hayes & Wilson 2008

Maximum Entropy Harmonic Grammar (MaxEnt)[1,2]

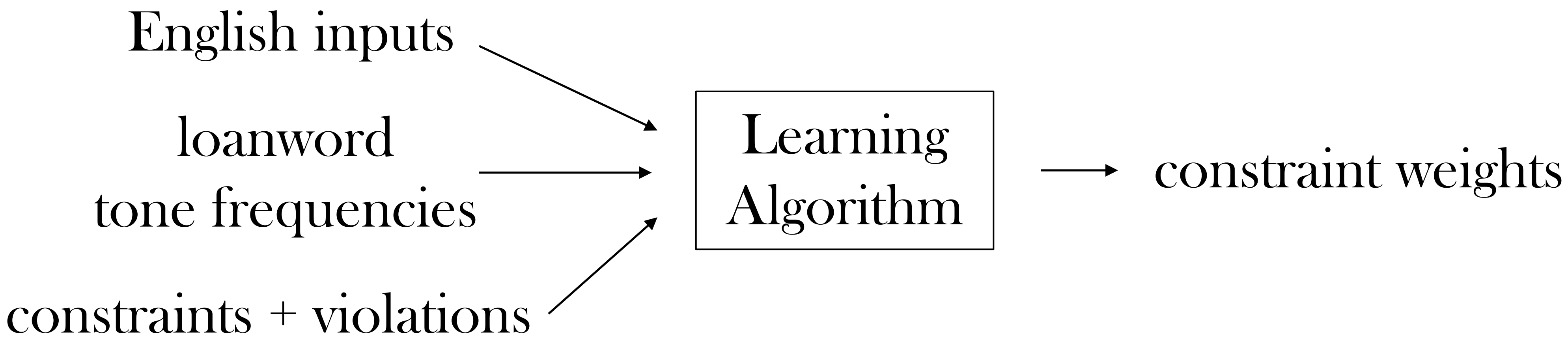
candidates = 4 tones

English syllable: /ˈdɑː/	STRESSED1 weight = ?	…	…	Predicted Probs.
a. dā				
b. dá	1			
c. dǎ	1			
d. dà	1			

should match corpus data

[1]Goldwater & Johnson 2003, [2]Hayes & Wilson 2008

Maximum Entropy Harmonic Grammar (MaxEnt)



- Learning algorithm determines constraint weights that yield best match between predicted and observed tone frequencies

Overview of Analysis

- Step 1: Establish model that predicts tones of loanword syllables based solely on lexical tone probabilities
- Step 2: Add constraints to capture additional effects of standard syllable use
- Step 3: Add constraints to uncover any phonological determinants of tone

MaxEnt Analysis

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus		*Constraints*			Predicted Probs.
a. dā	0					
b. dá	12		*Violations*			
c. dǎ	1					
d. dà	0					

- Input to model consisted of tableaux, each of which corresponded to one Mandarin segmental syllable (e.g. *da*) associated with various properties of the English input

达尔文 ***dá**ěrwén* 'Darwin' ([ˈ**dɑ**ːwɪn])

Step 1: Baseline Lexical Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	Lexical Tone Probs.	*DA1	*DA2	*DA3	*DA4	Predicted Probs.
a. dā	0	0.039	1				
b. dá	12	0.185		1			
c. dǎ	1	0.123			1		
d. dà	0	0.653				1	

- Lexical constraints' weights fit to **lexical tone probabilities**

Step 1: Baseline Lexical Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	Lexical Tone Probs.	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	Predicted Probs.
a. dā	0	0.039	1				0.039
b. dá	12	0.185		1			0.185
c. dǎ	1	0.123			1		0.123
d. dà	0	0.653				1	0.653

- Lexical constraints' weights fit to **lexical tone probabilities**
- Model's predicted probabilities exactly replicate lexical tone probabilities

Step 1: Baseline Lexical Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	Lexical Tone Probs.	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	Predicted Probs.	Predicted Counts
a. dā	0	0.039	1				0.039	1
b. dá	12	0.185		1			0.185	2
c. dǎ	1	0.123			1		0.123	2
d. dà	0	0.653				1	0.653	8

- Predicted probabilities converted to predicted counts
- Predicted counts compared to observed counts in corpus
- Across all syllables, square of the correlation (r^2) between observed counts and predicted counts = 0.585

Step 2: Standard Syllables Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2	Predicted Probs.	Predicted Counts
a. dā	0	1						
b. dá	12		1			1		
c. dǎ	1			1				
d. dà	0				1			

- How might use of standard syllables cause assigned tones to deviate from lexical tone probabilities?
- Added standard syllable constraints like DA2 (for standard syllable *dá*)

Step 2: Standard Syllables Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2	Predicted Probs.	Predicted Counts
a. dā	0	1						
b. dá	12		1			1		
c. dǎ	1			1				
d. dà	0				1			

- Standard syllable constraints' weights fit to **observed counts**

Step 2: Standard Syllables Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2 -3.276	Predicted Probs.	Predicted Counts
a. dā	0	1					0.007	0
b. dá	12		1			1	0.857	11
c. dǎ	1			1			0.022	0
d. dà	0				1		0.114	2

- Predicted counts vs. observed counts : $r^2 = 0.952$
- Suggests lexical tone probabilities and standard syllable use explain nearly all tonal assignment in corpus

Step 3: Phonological Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2 -3.276	VCD OBS2	…	Predicted Probs.	Predicted Counts
a. dā	0	1								
b. dá	12		1			1	1			
c. dǎ	1			1						
d. dà	0				1					

- How might phonological determinants further shape tonal adaptation?
- Added phonological constraints like VOICEDOBS2 to test various phonological effects

Step 3: Phonological Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2 -3.276	VCD OBS2	…	Predicted Probs.	Predicted Counts
a. dā	0	1								
b. dá	12		1			1	1			
c. dă	1			1						
d. dà	0				1					

- Phonological constraints' weights fit to **observed counts**

Step 3: Phonological Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2 -3.276	VCD OBS2 -2.425	…	Predicted Probs.	Predicted Counts
a. dā	0	1							0.004	0
b. dá	12		1			1	1		0.933	12
c. dǎ	1			1					0.008	0
d. dà	0				1				0.055	1

- Predicted counts vs. observed counts : $r^2 = 0.967$
- Adding phonological constraints significantly improves model's fit

Top Phonological Constraints

- Three phonological constraints that contributed most to model:

Constraint	Weight
VOICEDOBS2	-2.425
VOICED2	-0.799
VOICELESS1	-0.857

- Reveals a voicing effect

The Voicing Effect

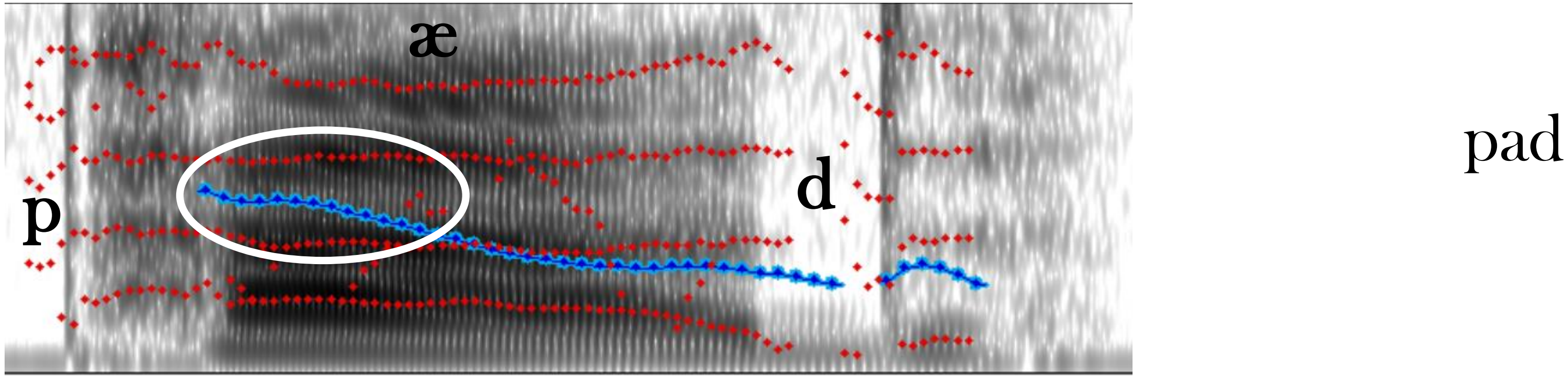
- VOICELESS1
  - ***tūn****ná* ‘tuna’

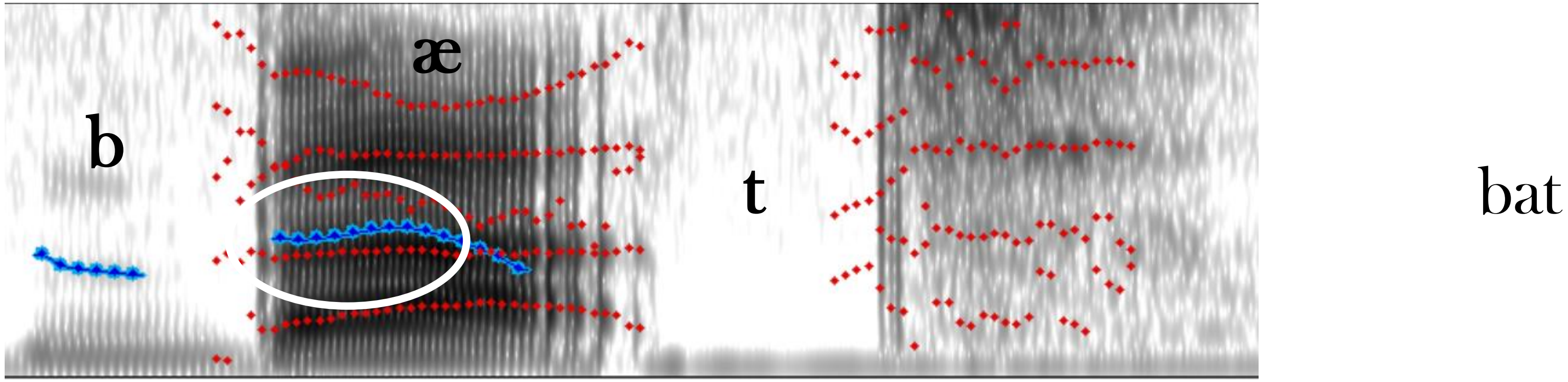
- VOICED2
  - ***mó****dēng* ‘modern’

- VOICEDOBS2
  - ***bái****tuō* ‘butter’

Source of the Voicing Effect

- F0 (pitch) is higher after voiceless obstruents than after voiced obstruents in English





Source of the Voicing Effect

- F0 (pitch) is higher after voiceless obstruents than after voiced obstruents in English
- Voicing effect = perceptual mapping from English pitch perturbations to Mandarin tone
  - ➢Higher F0 after voiceless consonants → high tone
  - ➢Lower F0 after voiced consonants → rising tone

Corpus Study Takeaways

- Final MaxEnt model explains almost all tonal assignment in corpus
- Lexical tone probabilities and standard syllable use account for vast majority of patterning
- Small but significant phonological effect of English voicing

A Loanword Adaptation Experiment

- Participants: 15 native Mandarin speakers from mainland China
- 80 made-up English words: [ˈtʃʰɑbə], [bəˈpʰi]…
- Participants listened to each word and produced their adaptation out loud
- Oral responses recorded and transcribed by native Mandarin speakers
- Data: 2,182 syllables

Analysis of the Experiment

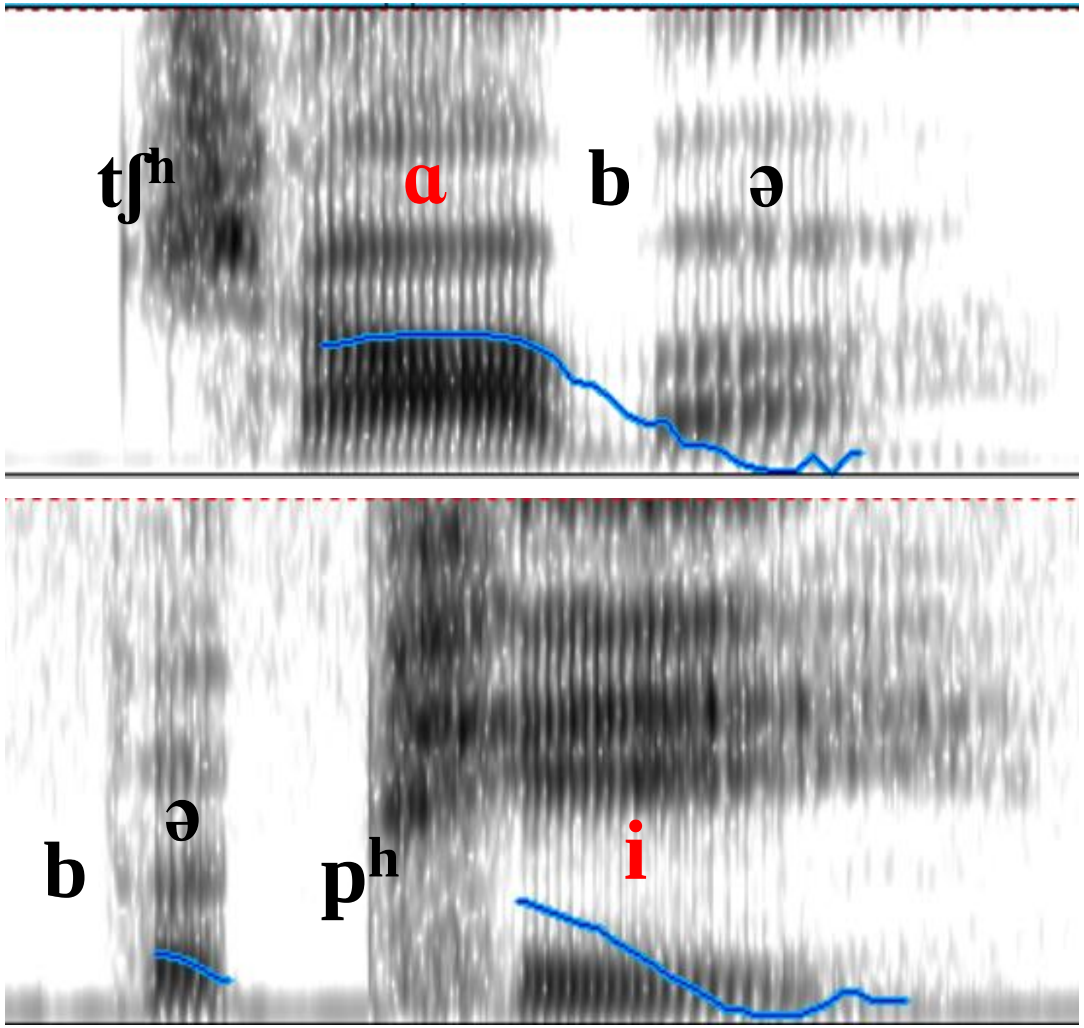
- Step 1: Baseline Lexical Model
  - $r^2 = 0.574$
- Step 2: Standard Syllables Model
  - $r^2 = 0.722$
- Step 3: Phonological Model
  - $r^2 = 0.837$

Top Phonological Constraints

Constraint	Weight
INITIAL1	-0.823
STRESSEDINITIAL1	-1.112
STRESSEDFINAL4	-0.997

- Initial syllables → high tone
- Stressed initial syllables → high tone
- Stressed final syllables → falling tone
- Stress-to-tone!

Source of Stress-to-Tone



[ˈtʃʰɑbə]

initial stressed syllables → high tone

[bəˈpʰi]

final stressed syllables → falling tone

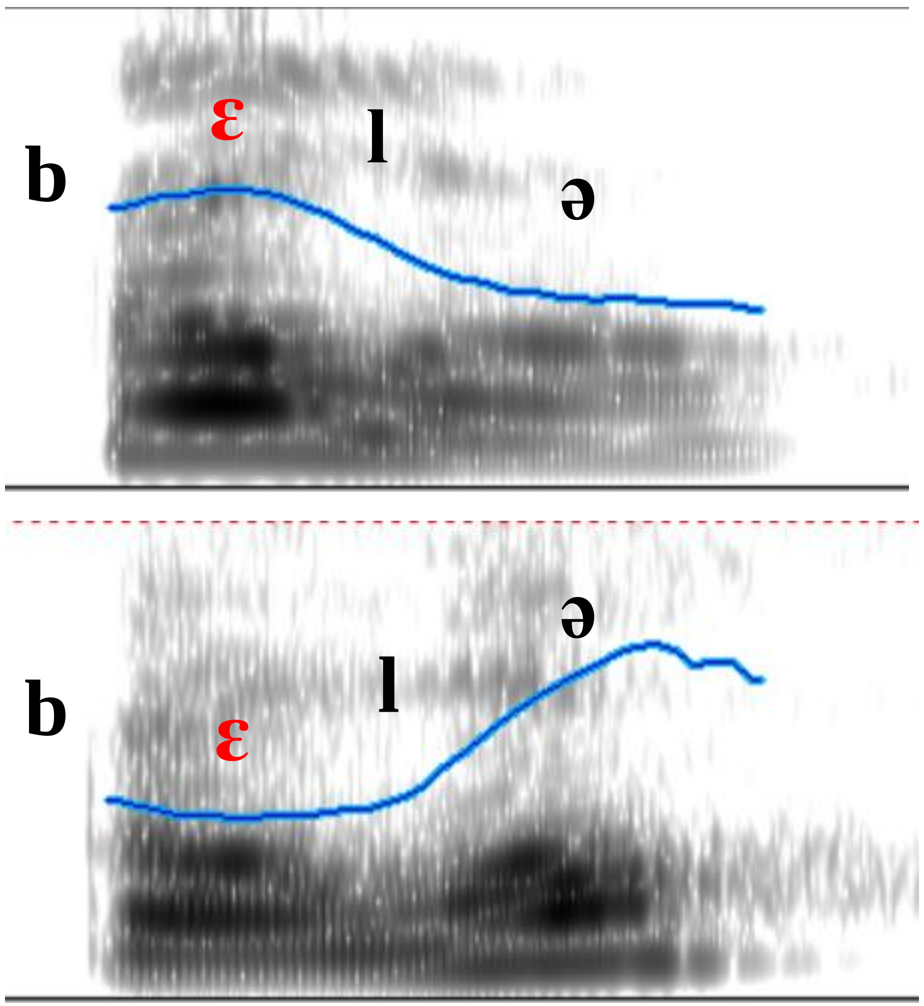
Experiment Takeaways

- Lexical tone probabilities and standard syllable use influence Mandarin speakers' live adaptations of English words
- But phonological effects play a larger role
- Mandarin speakers choose tones based on English stress

Established Loanwords vs. Live Adaptations

- Established loanwords: minor pitch perturbations → tone
- Live adaptations: overall intonation (driven by stress) → tone
- Pitch perturbations more consistent than pitch contours associated with stress
    - ➢Pitch lower after voiced obstruents than after voiceless obstruents across contexts
    - ➢Pitch contours associated with stress vary with context

Variable Pitch Contours on Stressed Syllables



Citation form: *Bella* [ˈ**bɛ**lə]
initial stressed syllable = high pitch

Question: *Bella?* [ˈ**bɛ**lə]
initial stressed syllable = low pitch

Established Loanwords vs. Live Adaptations

- In experiment, made-up English words all in citation form
- Stressed syllables had consistent pitch contours participants could map to Mandarin tones
- In real life, stress-pitch link inconsistent while onset voicing-induced pitch perturbations consistent
- Pitch perturbations = reliable pattern on which to base mapping to tone

Cantonese vs. Mandarin

- Cantonese established loanwords exhibit stress-to-tone
- Why Cantonese but not Mandarin?
- Different borrowing contexts:
  - Cantonese: British colonial rule of Hong Kong → English and Cantonese in direct, sustained contact
  - Mandarin: 19th c. translation of English written works and late 20th c. opening to the West
- Close contact needed to extract canonical stress-driven pitch patterns
  - Stress-to-tone: Cantonese ✓ Mandarin ✗

Is More Stress-to-Tone in Mandarin's Future?

- Lettered words: English loanwords that remain in Latin alphabet even in written Chinese (e.g. *NASA*, *wi-fi*)[1, 2]
- Tonal assignment in lettered words exhibits more robust stress-to-tone
- Closer contact between English and Mandarin → more stress-to-tone in next wave of borrowings

Thank you!

[1]Ding & Li 2020, [2]Wang 2020

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Step 1: Baseline Lexical Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	Lexical Tone Probs.	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	Harmony Scores	Predicted Probs.	Predicted Counts
a. dā	0	0.039	1				2.815	0.039	1
b. dá	12	0.185		1			1.263	0.185	2
c. dǎ	1	0.123			1		1.669	0.123	2
d. dà	0	0.653				1	0	0.653	8

- $r^2 = 0.585$

Step 2: Standard Syllables Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2 -3.276	Harmony Scores	Predicted Probs.	Predicted Counts
a. dā	0	1					2.815	0.007	0
b. dá	12		1			1	-2.014	0.857	11
c. dǎ	1			1			1.669	0.022	0
d. dà	0				1		0	0.114	2

- $r^2 = 0.952$

Step 3: Phonological Model

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	*DA1 2.815	*DA2 1.263	*DA3 1.669	*DA4 0	DA2 -3.276	VCD OBS2 -2.425	…	Harmony Scores	Predicted Probs.	Predicted Counts
a. dā	0	1							0.050	0.004	0
b. dá	12		1			1	1		-5.421	0.933	12
c. dǎ	1			1					-0.673	0.008	0
d. dà	0				1				-2.595	0.055	1

- Predicted counts vs. observed counts : $r^2 = 0.967$

Improvement in Model Predictions

da-NON-FINAL-STRESSED-VOICED STOP/AFFRICATE ONSET (representing /ˈdæ/, /ˈdɑː/, /ˈdʌ/, etc.)	Observed Counts in the Corpus	Predicted Counts (Baseline Lexical)	Predicted Counts (Standard Syllables)	Predicted Counts (Phono-logical)
a. dā	0	1	0	0
b. dá	12	2	11	12
c. dǎ	1	2	0	0
d. dà	0	8	2	1

76 Phonological Constraints

- STRESSED1-4
- UNSTRESSED1-4
- NONFINAL1-4 (INITIAL1-4)
- FINAL1-4
- STRESSEDNONFINAL1-4
- UNSTRESSEDNONFINAL1-4
- STRESSEDFINAL1-4
- UNSTRESSEDFINAL1-4
- OBSTRUENT1-4
- SONORANT1-4
- VOICED1-4
- VOICELESS1-4
- ASPIRATED1-4
- UNASPIRATED1-4
- MANDARINASPIRATED1-4
- MANDARINUNASPIRATED1-4
- VOICEDOBSTRUENT1-4
- VOICED&MANDARINASPIRATED1-4
- TONE1-4

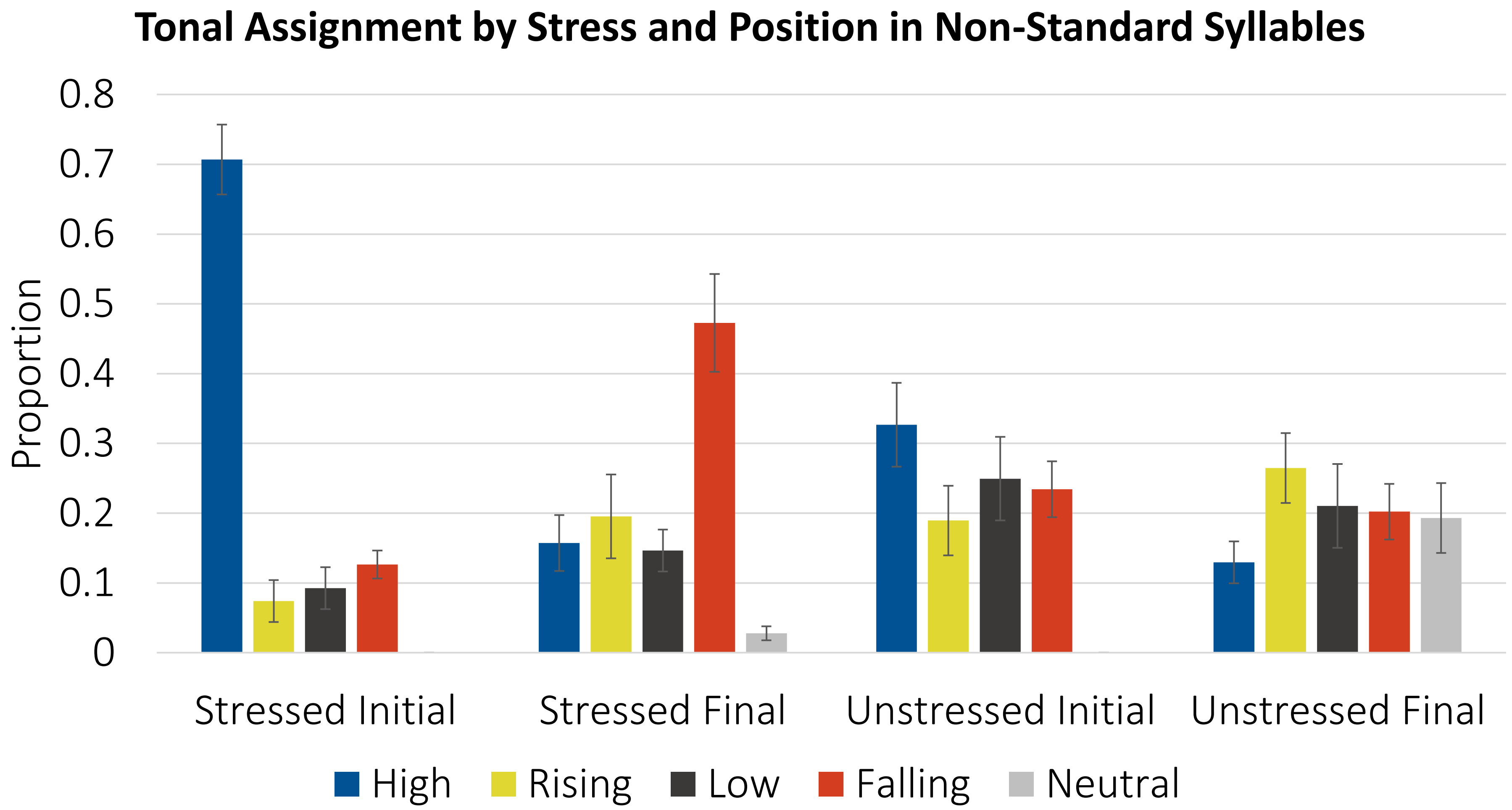
Phonological Constraints of Pruned Phonological Model – Corpus

	Constraint	Weight	Delta Log Likelihood	Predicted Rate: Standard Syllables Model	Predicted Rate: Phonological Model	Observed Rate
1.	VOICEDOBS2	-2.425	134.496	35.7%	44.4%	44.9%
2.	VOICED2	-0.799	40.931	38.3%	40.8%	41.1%
3.	VOICELESS1	-0.857	19.627	39.0%	43.1%	42.4%
4.	MANDUNASP1	-0.973	18.972	40.2%	39.4%	38.5%
5.	UNASP4	-1.085	17.376	18.1%	17.3%	16.3%
6.	OBS3	-0.806	16.959	16.0%	15.5%	15.3%
7.	TONE4	-0.354	16.682	27.0%	27.1%	27.7%
8.	VOICED1	-0.752	14.272	19.3%	18.5%	18.6%
9.	OBS1	-0.577	13.331	38.6%	38.9%	38.3%
10.	VOICELESS4	-0.582	11.964	23.9%	26.4%	27.5%
11.	SON1	-1.078	10.562	9.3%	10.9%	11.3%
12.	MANDUNASP3	-0.975	9.739	11.1%	10.5%	11.0%

Phonological Constraints of Pruned Phonological Model – Corpus

	Constraint	Weight	Delta Log Likelihood	Predicted Rate: Standard Syllables Model	Predicted Rate: Phonological Model	Observed Rate
13.	VOICELESS3	-0.749	9.647	20.0%	20.2%	19.6%
14.	SON4	-0.305	8.734	31.0%	29.3%	30.5%
15.	MANDUNASP4	-0.914	6.960	19.3%	20.8%	20.8%
16.	MANDASP2	-0.957	5.781	22.9%	22.0%	20.8%
17.	VOICED3	-0.561	5.771	16.5%	16.7%	15.6%
18.	STRESSED4	-0.242	5.059	26.0%	25.9%	26.7%
19.	TONE2	-0.184	4.680	28.7%	28.0%	28.4%
20.	STRESSED1	-0.252	3.761	28.8%	30.6%	30.6%
21.	STRESSEDNONFINAL1	-0.211	2.915	29.9%	31.7%	32.4%
22.	FINAL4	-0.260	2.749	27.1%	28.6%	28.9%
23.	SON3	-0.530	1.940	20.0%	21.0%	19.2%

Experiment Results



Phonological Constraints of Pruned Phonological Model – Experiment

	Constraint	Weight	Delta Log Likelihood	Predicted Rate: Standard Syllables Model	Predicted Rate: Phonological Model	Observed Rate
1.	UNASP2	-1.084	59.789	25.6%	29.9%	29.5%
2.	INITIAL1	-0.823	47.695	28.4%	46.6%	45.9%
3.	STRESSEDINITIAL1	-1.112	46.635	30.9%	63.6%	62.2%
4.	STRESSEDFINAL4	-0.997	45.552	23.2%	32.7%	32.4%
5.	UNASP4	-1.003	36.667	23.6%	17.7%	16.1%
6.	VOICEDOBS1	-0.622	30.839	46.3%	48.1%	50.0%
7.	UNSTRESSED3	-0.768	30.527	15.8%	23.5%	23.9%
8.	OBS1	-0.444	30.371	34.8%	39.5%	39.9%
9.	STRESSED1	-0.582	25.073	32.9%	46.9%	46.2%
10.	VOICED3	-0.480	15.370	16.5%	18.3%	19.2%
11.	TONE2	-0.292	13.737	28.8%	27.8%	27.9%
12.	VOICEDOBS3	-0.617	11.685	7.0%	10.5%	11.3%
13.	ASP4	-0.599	9.500	14.7%	14.0%	15.4%
14.	MANDASP2	-0.411	9.087	52.1%	48.4%	48.2%

Phonological Constraints of Pruned Phonological Model – Experiment

	Constraint	Weight	Delta Log Likelihood	Predicted Rate: Standard Syllables Model	Predicted Rate: Phonological Model	Observed Rate
15.	VOICED1	-0.237	7.040	34.5%	38.3%	39.4%
16.	UNSTRESSEDFINAL3	-0.640	6.465	17.1%	25.2%	25.0%
17.	STRESSED2	-0.227	6.167	28.1%	21.7%	22.4%
18.	OBS3	-0.329	6.117	12.1%	13.4%	13.7%
19.	VOICELESS4	-0.343	6.097	21.3%	18.4%	18.7%
20.	MANDUNASP2	-0.354	5.298	18.1%	19.3%	19.5%
21.	ASP3	-0.879	4.625	10.9%	12.2%	11.1%
22.	INITIAL2	-0.179	3.764	29.2%	23.4%	24.0%
23.	UNSTRESSED2	-0.267	3.744	29.7%	34.4%	33.8%
24.	TONE3	-0.198	3.737	16.2%	17.0%	17.4%
25.	SON2	-0.317	3.413	26.1%	26.6%	26.6%
26.	FINAL2	-0.217	2.941	28.4%	32.2%	31.7%
27.	MANDUNASP4	-0.439	2.857	26.4%	20.2%	17.9%
28.	SON4	-0.395	2.266	27.4%	20.6%	20.1%