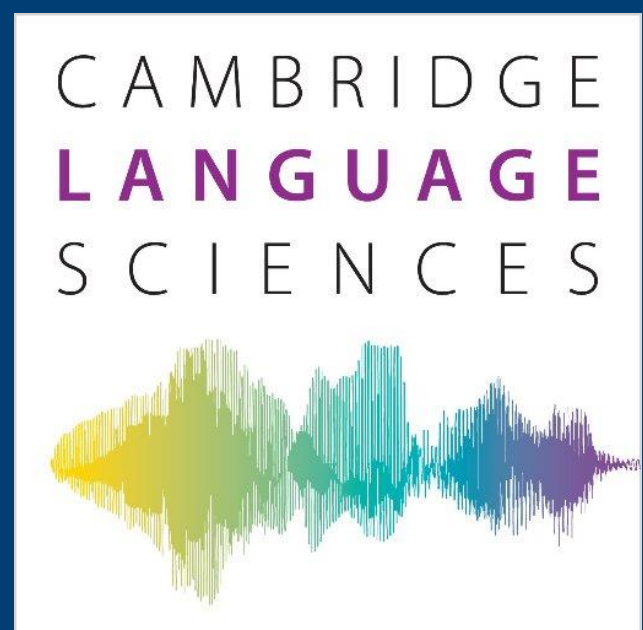


Mental Representation of Kunming Chinese Tone Sandhi: Episodic or Abstract?

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Introduction

Tone sandhi phenomena¹

- Tone has its citation value, but it can also undergo phonological alternation conditioned by the adjacent tones or phonological environment (tone sandhi) that could change it into a different tone (sandhi tone).

Mental representation and spoken word recognition

- Mismatch between acoustic inputs and the stored mental representation poses challenge for spoken word recognition.
- The surface realisation of a tone sandhi word differs from its underlying form due to phonological alternation.

The mental representation of tone sandhi²

- Abstract representation view

Words are abstractly represented as underlying forms in the mental lexicon. Sandhi words are represented as morphemes carrying the corresponding citation tones.

- Surface representation

Episodic details of speech sounds retained in the mental lexicon as exemplars. Sandhi words represented as their surface realisations, carrying the sandhi tones.

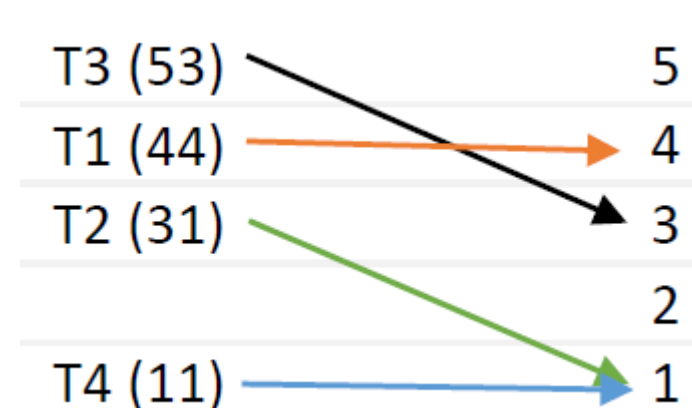
Opacity of tone sandhi rule and its representation

- Zhang⁶: Opacity plays a crucial role in determining the representation of tone sandhi.
- Transparent tone sandhi: Underlying form stored in the mental lexicon.
 - Driven by surface-true phonotactic generalizations;
 - Sandhi output does not undergo another sandhi rule.
- Opaque tone sandhi: Surface form stored in the mental lexicon.
 - Violate any one of the above-mentioned rules.

Tone and tone sandhi in Kunming⁵

Citation tone (T = tone)

	Citation tone	Sandhi tone
T1	/44/	[35]
T2	/31/	
T3	/53/	[55]
T4	/11/	



Tone 1 sandhi

- T1 changes from a level tone (44) to a rising tone (35) in nonfinal position, except when followed by another T1, e.g. /fǎ⁴⁴ - fu11/ → [fǎ³⁵ - fu11] 'to make sb. do sth.'.
- Opaque: T1 undergoes tone sandhi in most cases but remains flat when it is followed by T1. It also violates the Obligatory Contour Principle: consecutive identical tones are banned.

Tone 3 sandhi

- T3 changes from a falling tone (53) to a level tone (55) when it is in nonfinal position, e.g. /kǎ⁵³ - cje11/ → [kǎ⁵⁵ - cje11] 'to thank'.
- Transparent: surface true phonotactic generalization → contour simplification in nonfinal position.

Research questions

- In Kunming Chinese, whether the surface forms or the underlying forms of sandhi words are stored in the mental lexicon and are accessed during spoken word recognition?
- Whether the recognition of disyllabic word could be more facilitated by a monosyllabic prime that shares the underlying tone or the sandhi tone with the first syllable of the disyllabic words?

Hypothesis

- T1 sandhi: Opaque → recognition of disyllabic target more facilitated by the surface forms (carrying sandhi tone).
- T3 sandhi: Transparent → recognition of disyllabic target more facilitated by the underlying forms (carrying citation tone).

Methodology

Participant

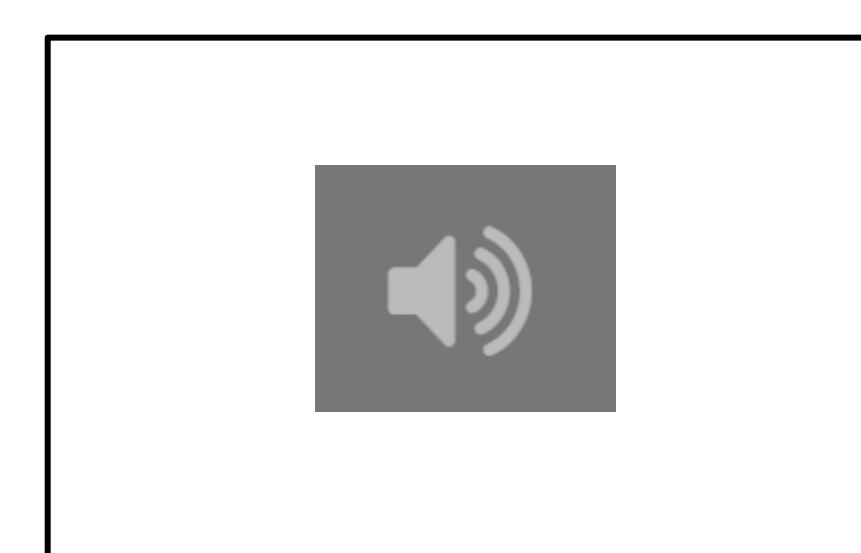
36 native speakers of Kunming (mean age 28).

Materials

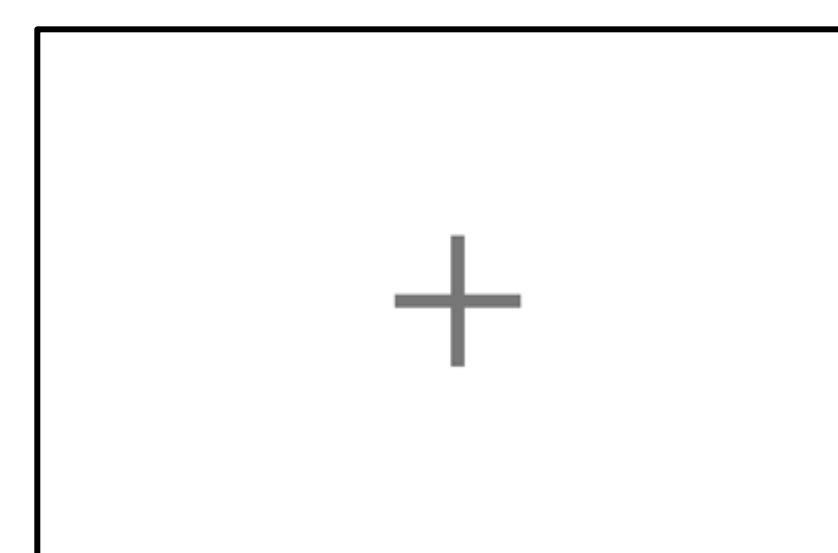
- Critical items: 36 common disyllabic words (18 undergo T1 sandhi; 18 undergo T3 sandhi); each critical item preceded by one of the 3 types of primes: surface, underlying and control.
- 60 real words as fillers; 90 nonwords.

Auditory-auditory priming lexical decision task (Online experiment using Gorilla)

T1	Monosyllabic prime		Disyllabic Target
	Surface prime	/k ^h ɛ35/	
	Underlying prime	/k ^h ɛ44/	
	Control prime	/k ^h ɛ11/	

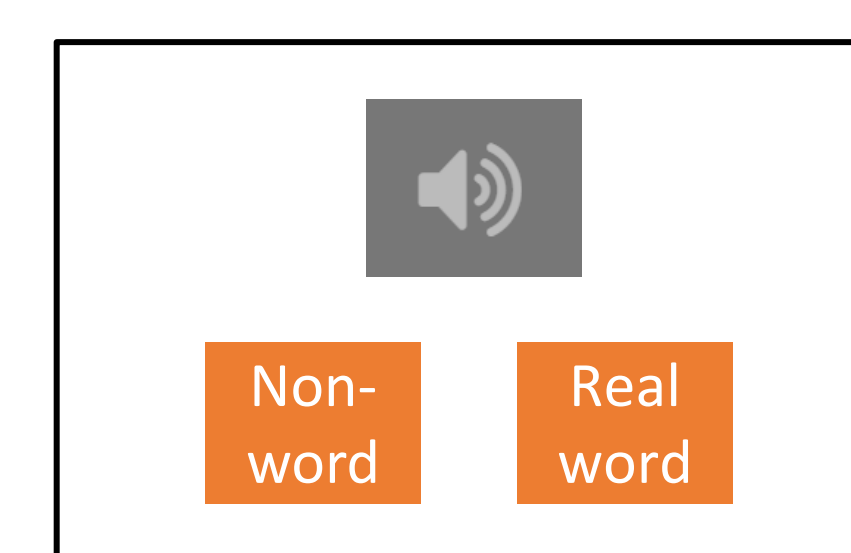


Monosyllabic prime
(One of the three primes)



Inter-stimulus Interval
(250ms)

T3	Monosyllabic prime		Disyllabic Target
	Surface prime	/tɕ ^h i55/	
	Underlying prime	/tɕ ^h i53/	
	Control prime	/tɕ ^h i31/	

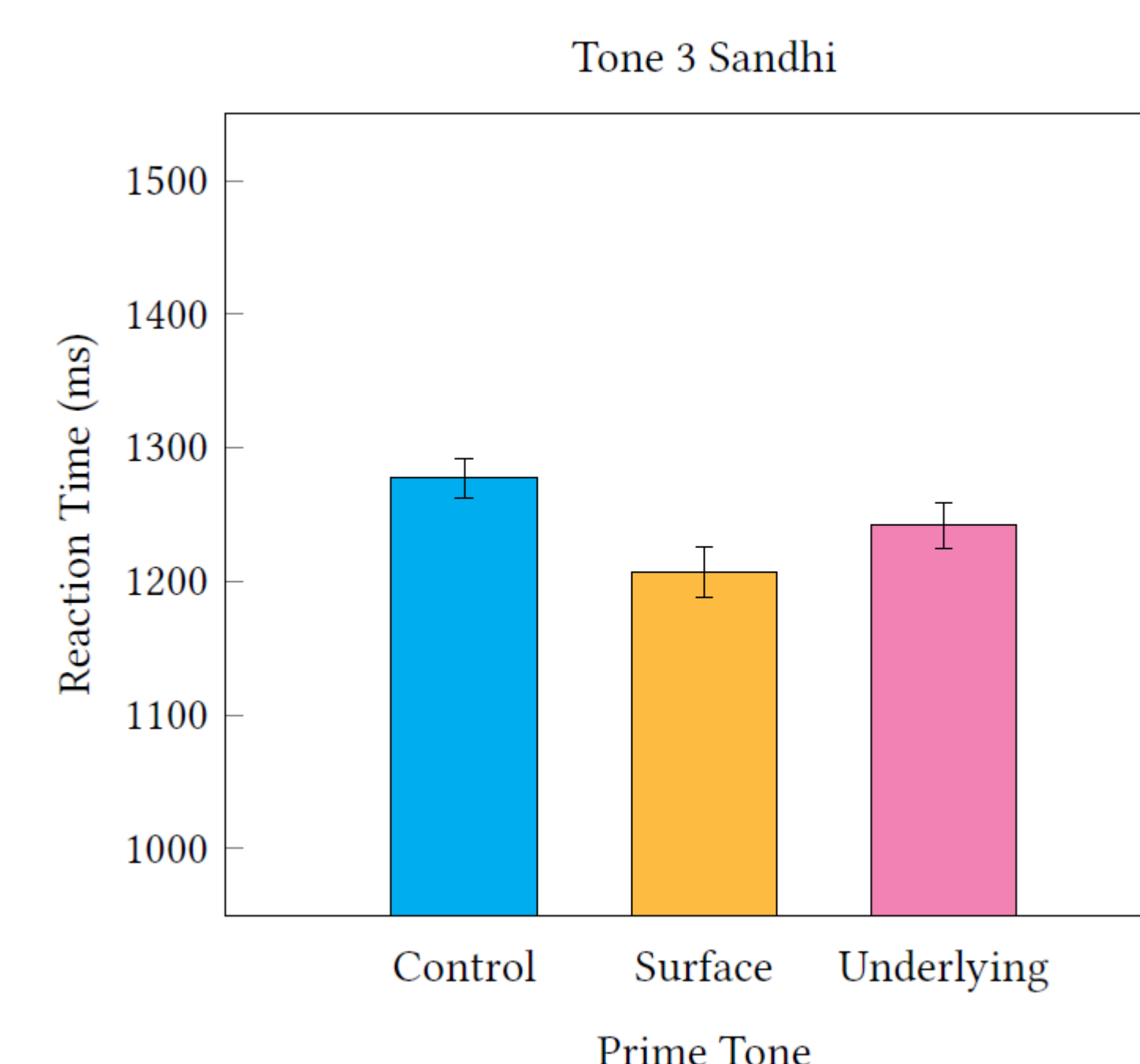
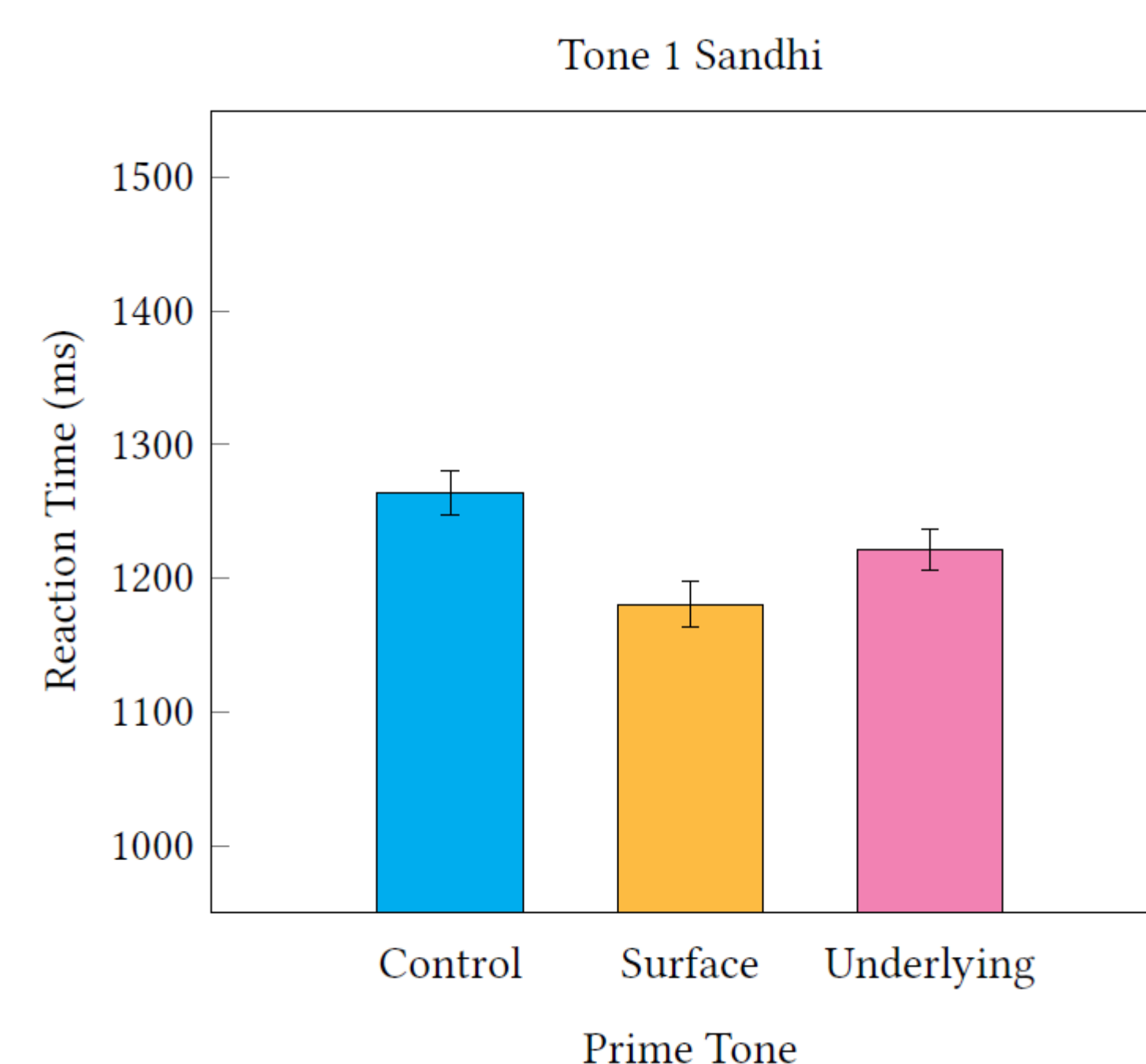


Lexical decision
(Disyllabic target)



Inter-trial Interval
(3000ms)

Results



- Linear Mixed-effects Model: Prime type (control/surface/control) and sandhi type (T1/T3) as independent variables; log-transformed reaction times (RTs) as dependent variables.
- T1 sandhi: surface primes elicited significantly faster RTs compared with the control primes ($\beta = -.029$, $SE = .007$, $t = -4.420$, $p < .001$); RTs of targets with underlying primes were not significantly different from those with control primes ($\beta = -.013$, $SE = .007$, $t = -1.902$, $p = .0575$).
- T3 sandhi: surface primes significantly speeded up the reaction time compared with the control primes ($\beta = -.027$, $SE = .007$, $t = -3.950$, $p < .001$); RTs of targets with underlying primes were not significantly different from those with control primes ($\beta = -.013$, $SE = .007$, $t = -1.897$, $p = 0.0581$).

Discussion and Conclusion

- For both T1 and T3 sandhi words in Kunming, surface allomorphs are stored in the mental lexicon.
- T1 sandhi (opaque) conformed to the prediction of Zhang⁶.
- T3 sandhi (transparent) ran counter to Zhang's account⁶
- Posing challenge to Zhang's claim. Opacity is not the only and sufficient indicator of the mental representation of tone sandhi in different languages.

Also need to consider...

- There was a trend for underlying form to facilitate recognition compared to control prime.

Representation of sandhi patterns may not be all-or-none but complementary⁴. Possible that both surface and underlying forms are stored in the mental lexicon of Kunming but with contribution of different extent.

- Critical items may be too frequently used: familiarity rating with a mean of 4.79 (5 being very often heard and used).

→ the surface forms are stored as episodic memories due to frequent usage / surface representation are weighed more heavily and are easily accessed in the mental lexicon.

Future direction

- Productivity may be a better predictor of the representation of sandhi words? e.g. sandhi rules of high/low productivity are represented differently in Taiwanese³. Test the productivity of sandhi rules in Kunming.
- Test words with high and low frequencies in Kunming, whether contribution of surface and underlying representation changes?

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