The Productivity of the Lexical Tone Sandhi in Wenzhou Wu Chinese

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Introduction

- **Tone sandhi in Chinese** [1]
  - Tone sandhi as a **phonological** process referring to the tonal alternation influenced by adjacent tones in connected speech
  - Phonological complexity & phonological transparency
  - Sandhi domain: morphosyntactic-structure-related prosodic units

- **Productivity and learnability of tone sandhi**
  - **Standard Mandarin T3 sandhi** [2, 3]
    - Simple and transparent; **fully productive** (even with accidental gaps)
    - Phonetically incomplete application in wug words
  - **Taiwanese Southern Min circular sandhi chain** [4, 5]
    - Phonologically complex and opaque
    - Difficulty in application with accidental gap syllables
    - **Debate on the productivity** of tone sandhi
  - **Wuxi Wu 'pattern substitution' sandhi** [6]
    - Involving both circular substitution and left-dominant spreading
    - Opaque substitution **unproductive** (applied in real words only)
    - Transparent spreading **fully productive**
    - Influenced by the phonetic similarity between base and sandhi tones

- **Tone sandhi in Wenzhou Wu** [7, 8, 9]
  - **Complex lexical tone sandhi patterns** (disyllabic):

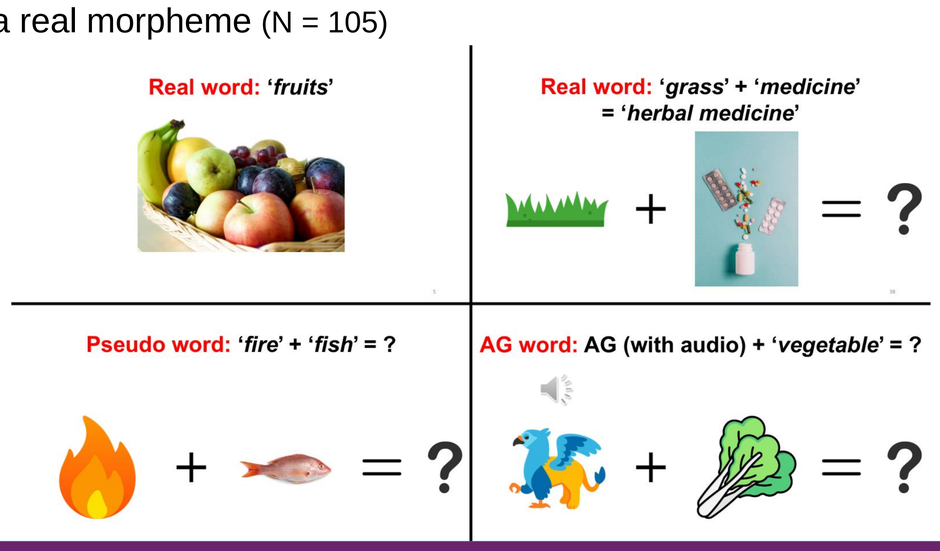
		σ2							
		T1 (33)	T2 (31)	T3 (34)	T4 (24)	T5 (52)	T6 (11)	T7 (323)	T8 (212)
σ1	T1 (33)	22+33	22+13	42+35		22+42		35+213	
	T2 (31)								
	T3 (34)	42+33	42+21			42+21	42+11		
	T4 (24)								
	T5 (52)		22+13						
	T6 (11)		42+21						
	T7 (323)	1+33	22+13	1+35		1+52	1+11	1+213	
	T8 (212)								

    - **Right-dominant neutralization** rules in general
    - Non-structure-preserving (sandhi tone not in the citation tone inventory)
    - Exact processes obscured by intervening historical changes
    - **L (σ1) + citation (σ2)**, same as right-dominant phrasal sandhi
  - **Simple phrasal tone sandhi rule**: only one tonic nucleus, all other syllables atonic (a **L** (low) tone assigned by default)
  - E.g. /tsʰuɔ³⁴/ '*to fry*' + /va¹¹/ '*rice*' → [tsʰuɔ⁴² va¹¹] '*fried rice*' (lexical sandhi)
    → [tsʰuɔ¹ va¹¹] '*to fry rice*' (phrasal sandhi)

- **The current study:** To investigate the speakers' phonological knowledge (productivity) of **disyllabic lexical tone sandhi** in Wenzhou Wu by **wug tests**

Method

- **Participants:** 12 middle-aged (45-61 yrs old) native speakers
- **Experiment design:** **Picture-naming with 4 types of stimuli**
  - All disyllabic lexical sandhi patterns tested with only high register tones (T1, T3, T5, T7) used in σ1
  - 1) **Real words** in a single picture *(42 tokens)*
  - 2) **Real words** in two pictures (one for each syllable/morpheme) (N = 42)
  - 3) **Pseudo words** compounding two existing morphemes (N = 63)
  - 4) **AG words** combining an accidental gap ('AG') syllable (with the audio) and a real morpheme (N = 105)



Results

- **Lexical sandhi ≠ right-dominant phrasal sandhi (Fig. 1)**
  - Productive in nearly all **real words** and most **pseudo words**
  - Significant decrease in correct sandhi application in **AG words** ($p < .001$)

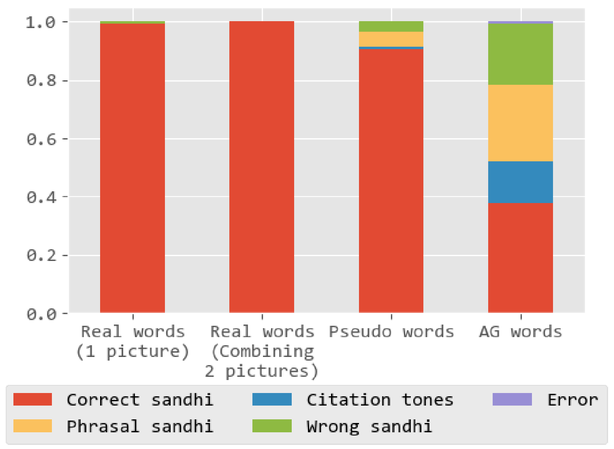


Figure 1

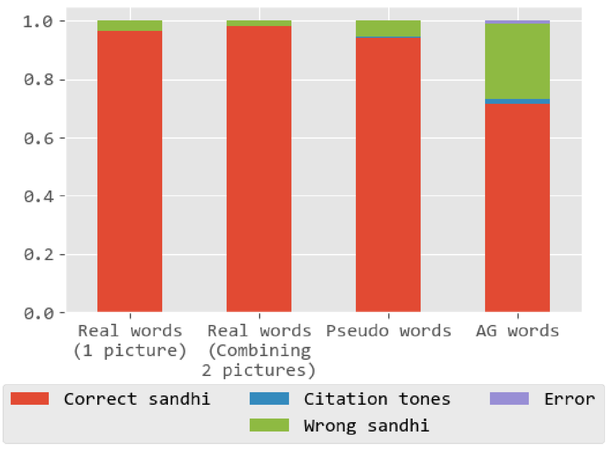


Figure 2

- **Lexical sandhi = right-dominant phrasal sandhi (Fig. 2)**
  - Similar effect of stimulus type: **Real & pseudo words vs. AG words**
  - Comparing the **AG word** data in Fig. 1 & 2:
    - More productive when the lexical sandhi is the same as the right-dominant phrasal sandhi ($p < .001$)

- **Error patterns**
  - **Citation tones** for both syllables **highly disfavoured**
  - Either a wrong (but attested) sandhi pattern or the simple right-dominant phrasal sandhi applied

- **Effect of phonetic similarity in AG words**
  - **Matching contours** between the base and sandhi tones facilitating correct sandhi application (e.g., T5 + T3, T3 + T7)
  - **Opposite contours** correlated with higher rates of keeping citation tones of both syllables (e.g., T3 + T3, T5 + T7)

	Citation contour of σ1	Sandhi contour of σ1	Correct sandhi (%)	Citation tones (%)
T1+T3	→		31%	19%
T3+T3	↗	↘	19%	**31%**
T5+T3	↘		**63%**	6%
T1+T7	→		44%	6%
T3+T7	↗	↗	**75%**	13%
T5+T7	↘		63%	**19%**

Conclusion

- Violation of **phonotactic constraints** (AG words) would intervene in the lexical sandhi application in Wenzhou Wu.
- Tone sandhi rules are still highly productive even **lacking lexical representations** (pseudo words).
- **Phonological complexity** of the sandhi patterns (even within the same language) has a significant effect on their respective productivity.
  - The **simple** sandhi rules involving no neutralization (the same as the right-dominant phrasal sandhi) are **more productive**.
- The **phonetic similarity** between the base tone and the sandhi form is also an important factor, despite the neutralization nature of the lexical tone sandhi in Wenzhou Wu.
- The form with citation tones on both syllables is highly marked. The native speakers know that **tone sandhi is obligatory for disyllabic words**, even though they may encounter difficulties in specific rule application.

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