

The time course of metalinguistic well-formedness judgments in a natural visual system

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Overview

- Chinese character “grammar”
- Evidence for its psychological reality
- Its time course

Chinese character “phonology”

- Duality of patterning: recurring elements

能 月 公 北

- Recursion (Sproat, 2000)

鱗 魚 → [米 ↓ [夕 → 牛]]

- Rules (Wang, 1983)

牛 → 特 cf. 牢

- “Prosody”: global shape constraints (Myers, 1996)

Reduplication patterns

- Binary horizontal reduplication

林 比 競 朋 弱 嚇 雙 選 窳 替 質 瑩

- Binary vertical reduplication

昌 呂 圭 菱 多 炎 哥 棗 芻 患 僵 漆

- Triangular reduplication (binary both ways)

品 心 鑫 蟲 晶 晶 森 聶 众 磊 轟 犇

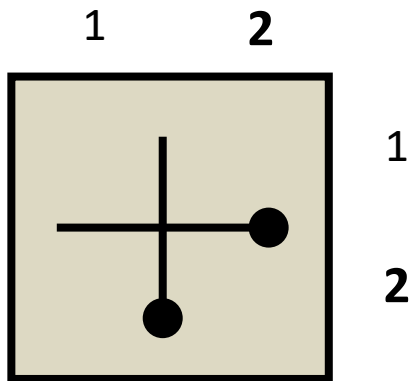
- These generalizations are (never) violated

Non-binarity: 三 巡 黑 州 靈

Inverted triangles: *  cf. 熒

Character prosody

- Global shape constraints (Myers, 2016)
 - Binariness, prominence on side (right and bottom)
- Similar to spoken/sign metrical feet
 - Universal biases in motor control, vision, cognition? (e.g., Gordon, 2002)



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Reduplication requires “rules”

- Reduplication is common in both spoken and signed languages
- It involves a general operation that may be applied productively to elements:
X → XX (or **[XX]** template)
- This suggests rules, not lexically-driven analogy (Berent et al., 2014)
- So 林 would be 木 + XX, not 木+木

The experiment

- Myers, J. (2016). Knowing Chinese character grammar. *Cognition*, 147, 127-132.
- Confirmed that the above reduplication patterns are an active part of the knowledge of readers of traditional Chinese characters

Sample test items

Sample test items.

	Lexical grammatical	Lexical ungrammatical	Nonlexical grammatical	Nonlexical ungrammatical
Horizontal	森	森	茈	蓰
Reduplication	林 <i>lín</i> 'woods'		NA	
Element	木 <i>mù</i> 'wood'		支 <i>zhī</i> 'branch'	
Vertical	侈	侈	徠	徠
Reduplication	多 <i>duō</i> 'more'		NA	
Element	夕 <i>xī</i> 'evening'		夫 <i>fū</i> 'husband'	
Triangular	晶	嫫	嫫	嫫
Reduplication	晶 <i>jīng</i> 'crystal'		NA	
Element	日 <i>rì</i> 'sun, day'		欠 <i>qiàn</i> 'owe'	

Acceptability results

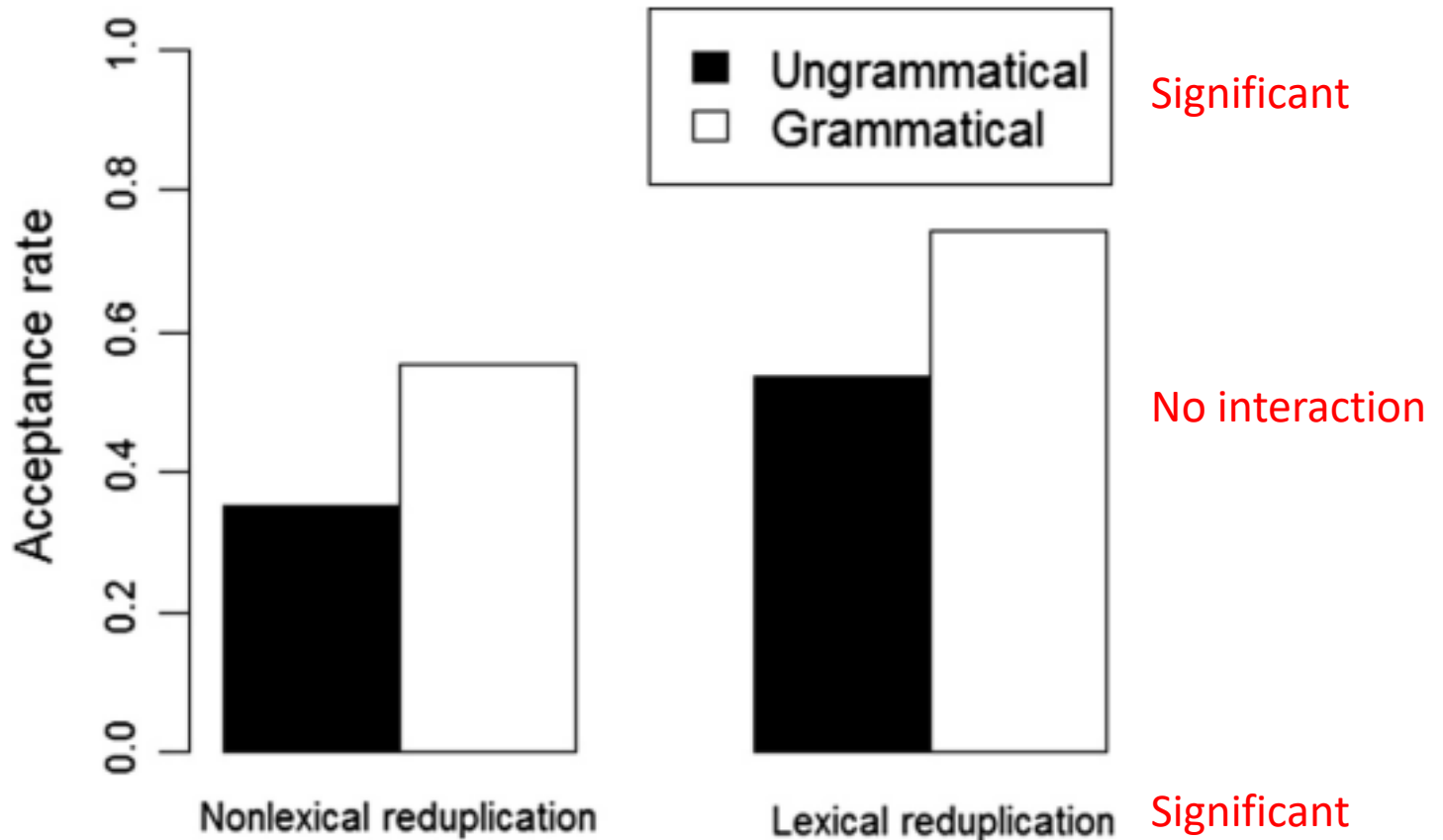


Fig. 1. Acceptance rates for fake characters containing lexical/nonlexical and grammatical/ungrammatical reduplicative configurations.

Reaction time results

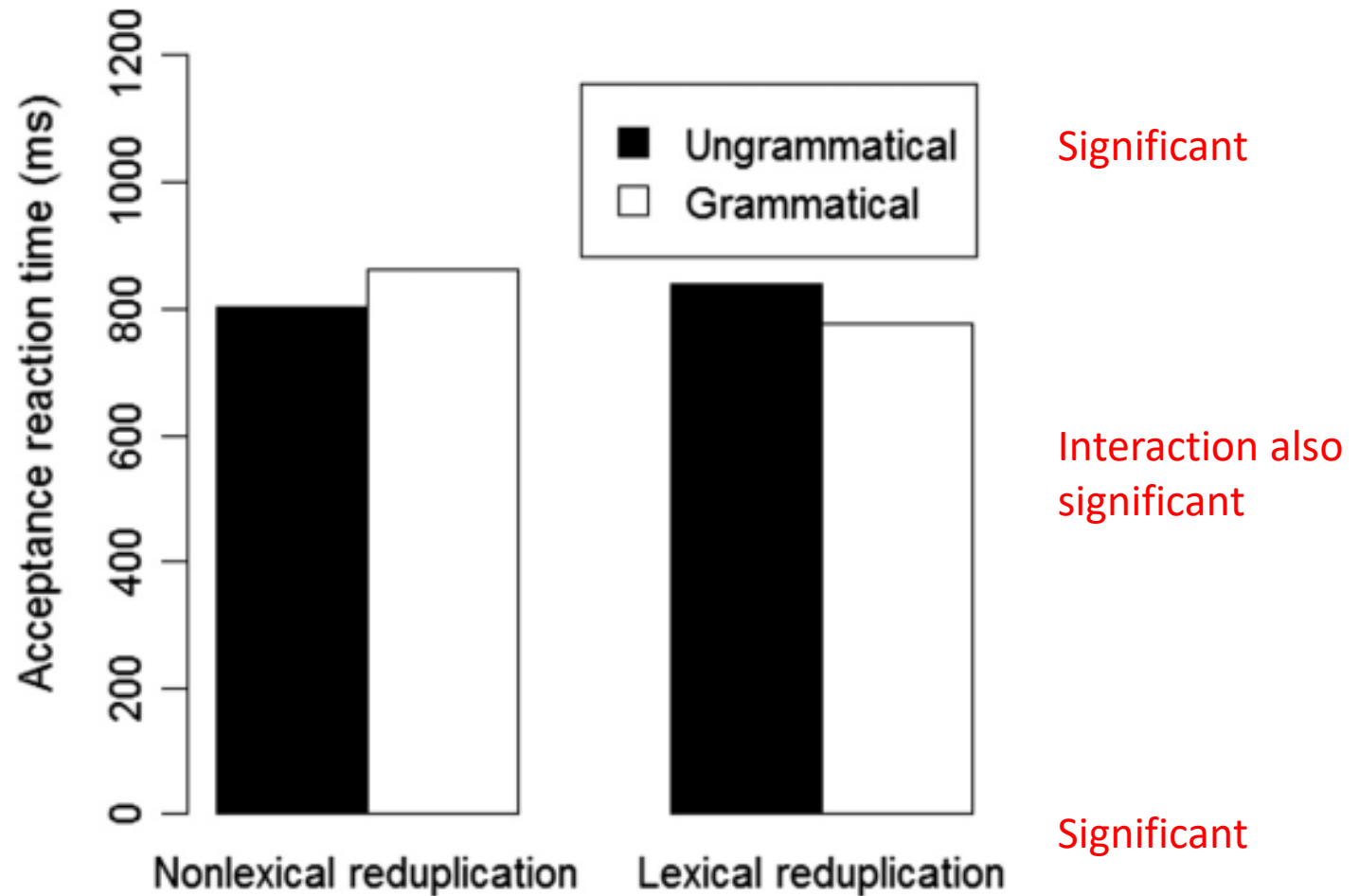


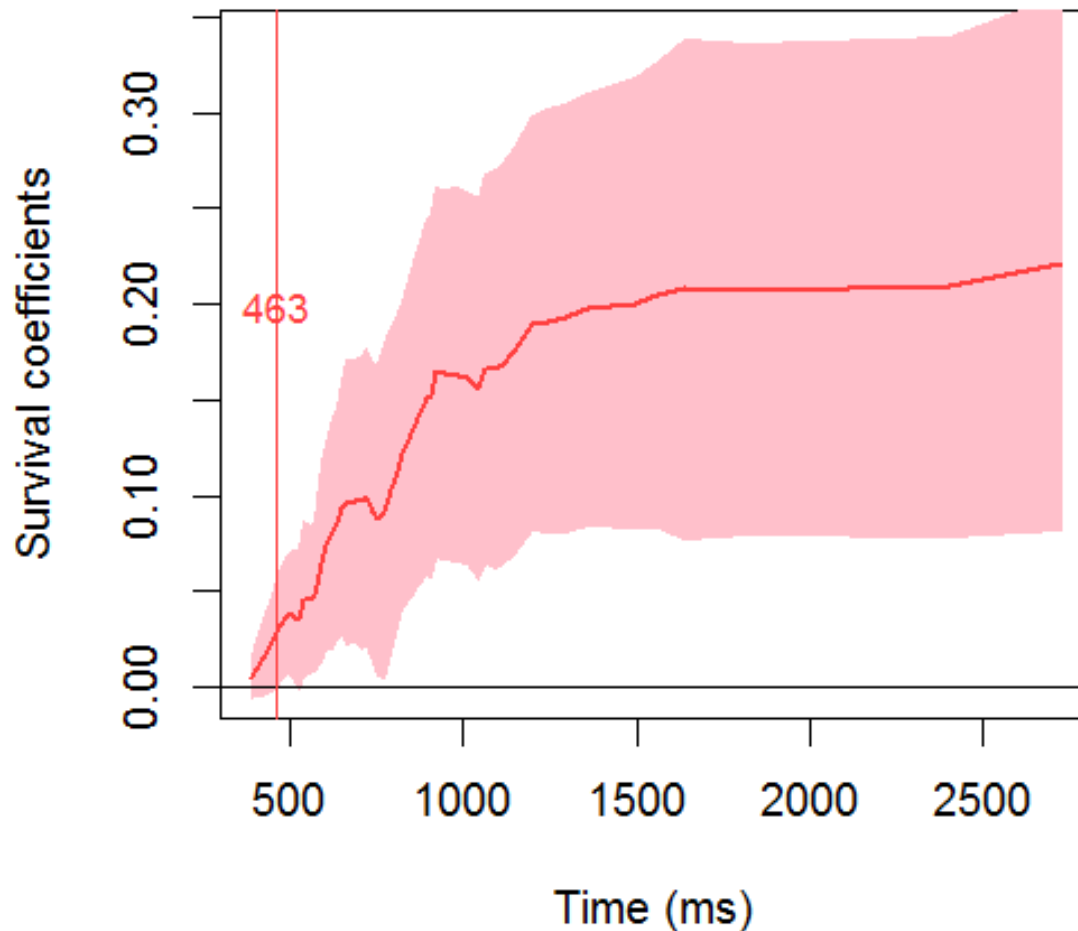
Fig. 3. Reaction times for accepting fake characters containing lexical/nonlexical and grammatical/ungrammatical reduplicative configurations.

Probing the time course

- Survival analysis can be applied to decision latencies (Baayen & Blanche, 2017)
 - How long do decisions “survive” until acceptance?
 - Dynamic analysis can plot the temporally evolving probability of a decision at any given instant
 - This lets us see when a predictor or an interaction has its first significant effect on responses
- Key question: Does grammar affect judgments at the same time as the lexicon, or only later?

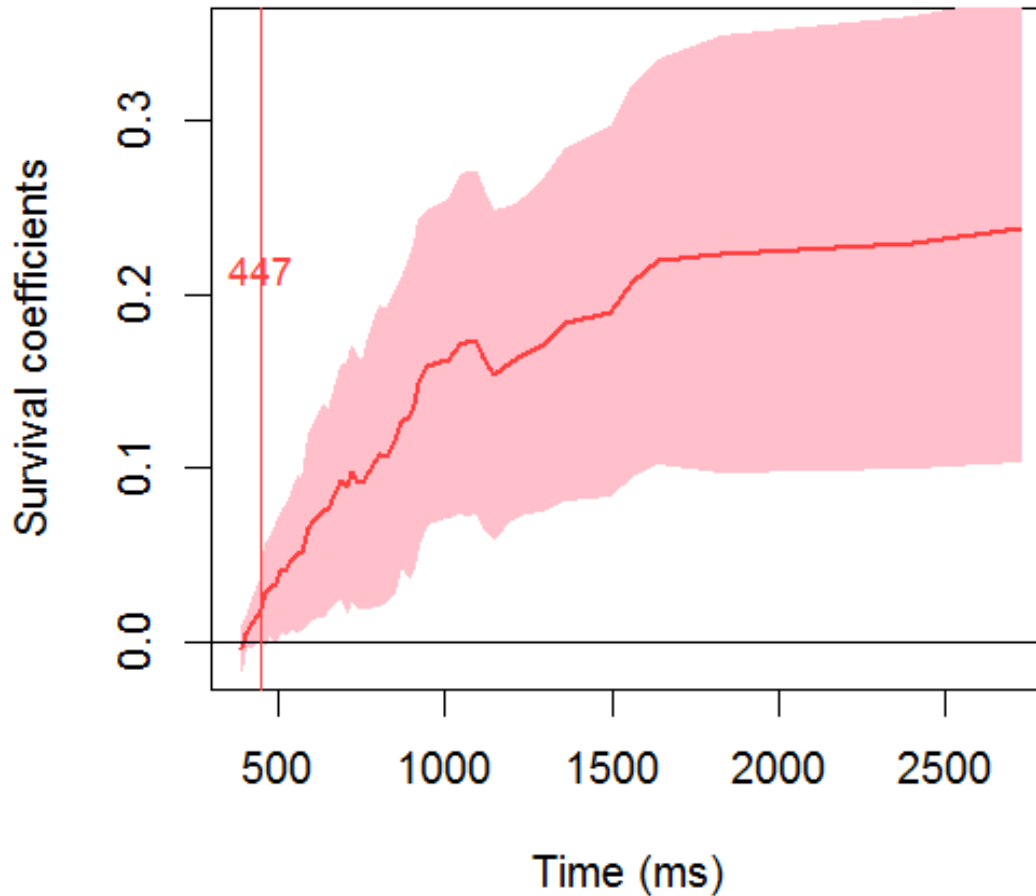
Time course for lexical effect

Cumulative incidence of acceptance
(Lexicon)



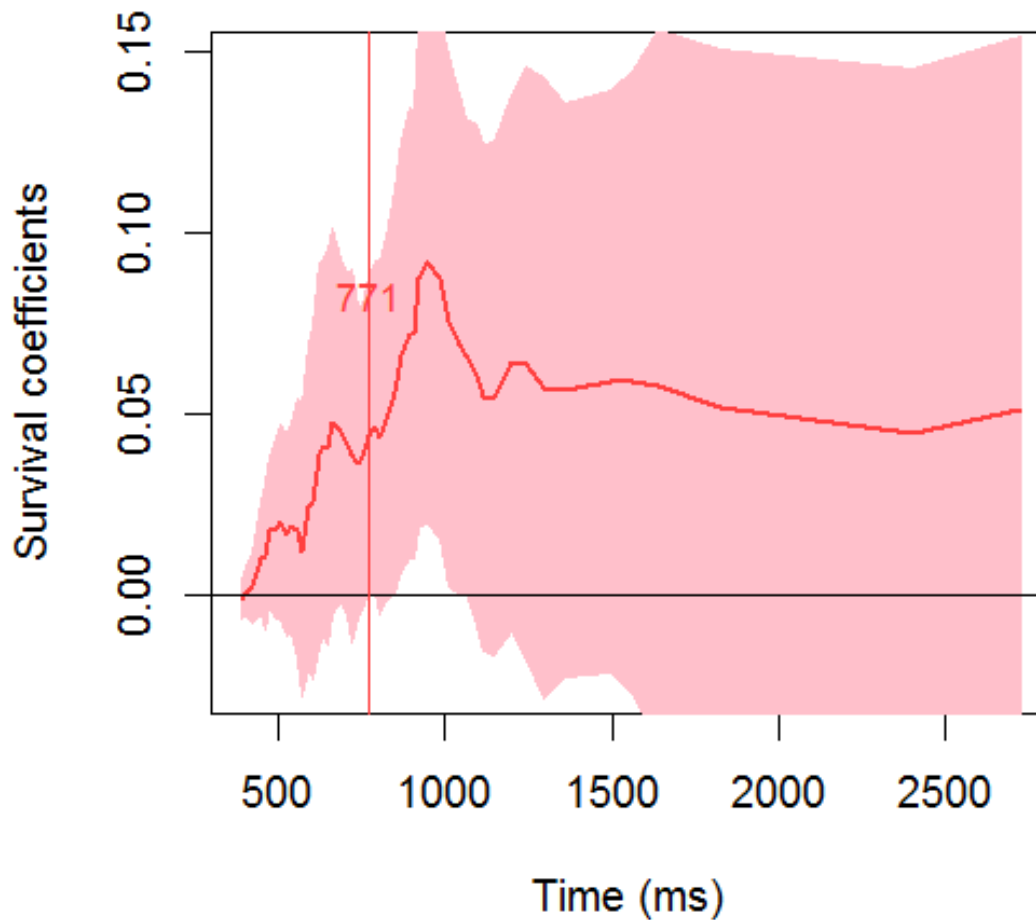
Time course for grammar

Cumulative incidence of acceptance
(Grammar)



Time course for interaction

Cumulative incidence of acceptance
(Lexicon x grammar)



Summary

- Chinese readers know non-functional formal patterns in Chinese characters
- These patterns are reminiscent of formal constraints in spoken and signed languages
- They seem to require abstract symbolic rules or constraints
- Grammar influences judgments too early to be derived from lexical analogy

References

- Baayen, H., & Blanche, P. (2017). Dynamic survival analysis. Talk presented at the Workshop on New Methods in Statistics, Tübingen, Germany, January 19-20.
- Berent, I., Dupuis, A., & Brentari, D. (2014). Phonological reduplication in sign language: Rules rule. *Frontiers in Psychology, 5*, 560.
- Gordon, M. (2002). A factorial typology of quantity-insensitive stress. *Natural Language & Linguistic Theory, 20*(3), 491–552.
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