Phonological Learning Bias in Tone Retention Patterns

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In many languages, vowel hiatus is prohibited and resolved by vowel deletion. However, in tonal languages, the deletion of a vowel does not necessarily imply the deletion of its tone. For instance, in Ogori, a Benue-Congo language of Nigeria, the second vowel is always deleted to resolve vowel hiatus at word boundary, but the tone that undergoes deletion is determined by the tone value, regardless of whether it was originally associated with the surviving or with the deleted vowel, as shown in (1).

(1) Ogori vowel deletion and tone retention

	Noun	Adjective	NP	Gloss	Tone Pattern
a.	ɔ̀tɛ́lɛ́	ɔ̀kɛ̀ka	ɔ̀tɛ́l**ɔ́**kɛ̀ka	'big pot'	H#L → H
b.	ìgìlà	óbòrò	ìgìl**ó**bòrò	'good yam'	L#H → H
c.	ɔ̄dɔ̄	óbòrò	ɔ̄d**ó**bòrò	'good rat'	M#H → H
d.	ɔ̄dɔ̄	ɔ̀nɛ́bɛ̄	ɔ̄d**ɔ̀**nɛ́bɛ̄	'that rat'	M#L → L

Since High tone (H) is always retained, it is said to have dominance over Mid tone (M) and Low tone (L) in this language. (1d) further shows that L is dominant over M. In other words, in Ogori, the dominance tonal hierarchy is H » L » M.

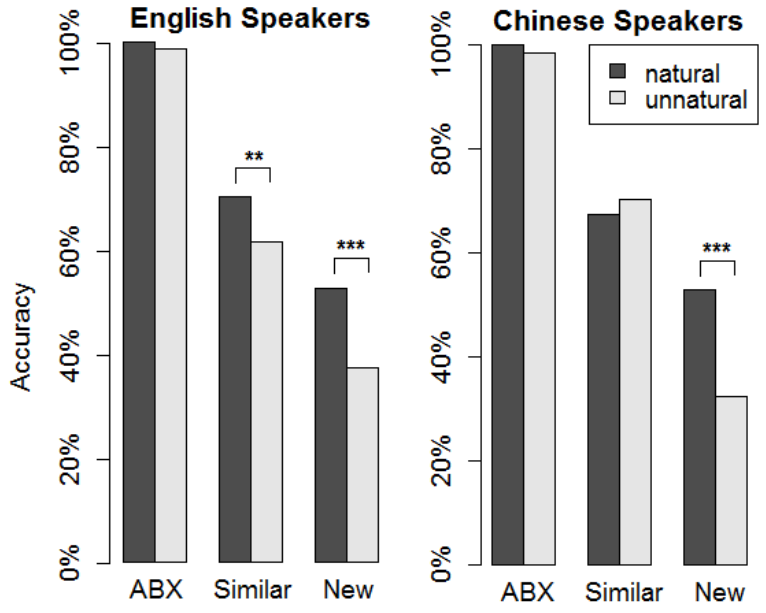
The exact same pattern can also be observed in Yoruba, where the dominance hierarchy is also H » L » M. With a variation in the ranking of M and L, the dominance tonal hierarchy in Ogoja Yala, a West Benue–Congo language of Nigeria, is H » M » L. Nonetheless, H is still at the top of the hierarchy, which in terms of markedness of tones, it is the most marked tone as argued by Maddieson (1972). The view of a universal markedness (Pulleyblank 1986, de Lacy 2002a) suggests that H is universally marked and L is universally unmarked across languages, and the fact that H is always retained across languages can be explained by de Lacy's claim that "marked elements are subject to greater preservation than less marked ones (2002b, p. 196)."

This asymmetry in typology may due to difficulties in perception or production, or some innate learning bias in learning certain patterns. In this study, an artificial grammar learning experiment was conducted with the objective to examine the learnability of the following two tone patterns: a natural pattern that follows Ogori tone rules (H#L → H and L#H → H), and an unnatural pattern that seems to be rare across languages (H#L → L and L#H → L). Mid tone was not considered in this experiment because its tone value is hard to distinguish in isolation.

The experiment was conducted with 94 English speakers and 52 Mandarin Chinese speakers who are familiar with tones but have no knowledge regarding this tone retention pattern. The participants first performed an ABX decrimination task to determine their ability to distinguish H and L. Then they were trained to learn nonsense words with a VCV structure. Each VCV word was associated with a picture of either an animal or a fruit, e.g. [ewe] 'monkey' with the tonal pattern [H.L] or [owu] 'banana' with [H.H]. Participants first heard the sound of the animal and the fruit along with the pictures, and then they were presented with possessive noun phrases, e.g. [ewowu] 'monkey's banana'. One group was trained with the natural pattern

(H#L→H) and the other group the unnatural pattern (H#L→L). They then carried out a forced choice task where they were tested on novel noun phrases.

The results are shown in the figure below. All participants performed at ceiling on the ABX discrimination task. For English speakers, significant differences were found between natural and unnatural conditions on 'Similar' items ($t(1126) = 3.0$, $p < 0.002$), and 'New' items ($t(1126) = 5.15$, $p < 0.001$). 'Similar' items follows the same tonal pattern of the items that the participants were exposed to during the training session while 'New' items have novel tone patterns. The results of English speakers show a learning bias toward the natural tone pattern.



For Mandarin Chinese speakers, a significant difference was found between the natural and unnatural condition on 'New' items ($t(622) = 4.71$, $p < 0.001$). Since no significant difference was found between the two naturalness conditions on 'similar' items, this indicates that the natural and unnatural tone patterns were equally learnable for Mandarin Chinese speakers.

The difference in the accuracy on 'New' items in both language groups shows that participants who were exposed to the natural pattern were able to generalize the knowledge to novel forms they were not exposed to during the training block.

This study investigates both the learnability of phonological patterns concerning tone, and the ability of extending phonological patterns to novel forms. The results support the view of analytic bias (Moreton 2008) that cognitive predispositions may facilitate the learning of tone retention patterns with preference for High tone over Low tone because the learners were more likely to extend natural tone patterns to novel forms.

References

de Lacy, Paul. 2002a. *The formal expression of markedness*. PhD dissertation, UMass, Amherst.

de Lacy, Paul. 2002b. The interaction of tone and stress in Optimality Theory. *Phonology* 19: 1–32.

Maddieson, Ian. 1972. Tone system typology and distinctive features. In Proceedings of the Seventh International Congress of Phonetic Sciences, ed. A. Rigault & R. Charbonneau. Mouton, The Hague. 957–961.

Moreton, Elliott. 2008. Analytic bias and phonological typology. *Phonology* 25: 83–128

Pulleyblank, Douglas. 1986. *Tone in lexical phonology*. D. Reidel.