Experimental Evidence for Biases in Phonological Rule Interaction

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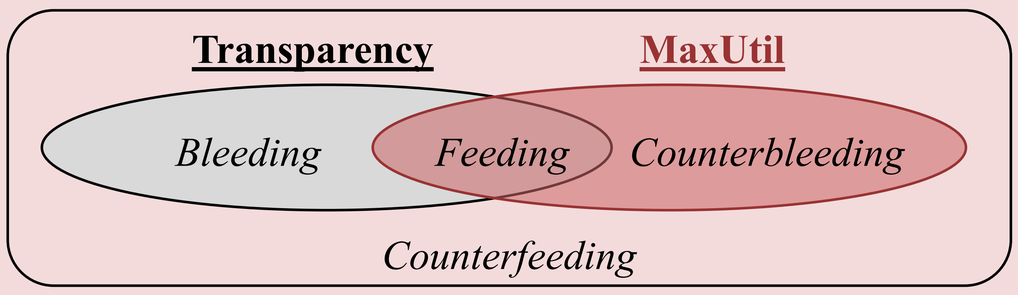
1) Introduction

- Kiparsky proposed two different factors affecting the learnability of phonological rule interactions:
  - ⇒ ***Maximal Utilization (MaxUtil; Kiparsky 1968)***
    Prefers all processes to be maximally utilized.
  - ⇒ ***Transparency (Kiparsky 1971)***
    Prefers all processes to be surface-true.
- These make different predictions for four interaction types:



- I looked for the effect of both on artificial language learning (see also Ettlinger 2008, Kim 2012, Brooks et al. 2015).

2) Design

- My artificial languages are adapted from Baković (2011) :

		Faithful	Deleting	Palatalizing	Interacting
Bleeding	/UR/	/ta/	/kia/	/ti/	/tia/
	Del: $V_1V_2 \rightarrow V_2$	-	ka	-	ta
	Pal: $t \rightarrow tʃ / \_i$	-	-	tʃi	-
	[SR]	[ta]	[ka]	[tʃi]	[ta]
Feeding	/UR/	/ta/	/kai/	/ti/	/tai/
	Del: $V_1V_2 \rightarrow V_2$	-	ki	-	ti
	Pal: $t \rightarrow tʃ / \_i$	-	-	tʃi	tʃi
	[SR]	[ta]	[ki]	[tʃi]	[tʃi]
Counter-bleeding	/UR/	/ta/	/kia/	/ti/	/tia/
	Pal: $t \rightarrow tʃ / \_i$	-	-	tʃi	tʃia
	Del: $V_1V_2 \rightarrow V_2$	-	ka	-	tʃa
	[SR]	[ta]	[ka]	[tʃi]	[tʃa]
Counter-feeding	/UR/	/ta/	/kai/	/ti/	/tai/
	Pal: $t \rightarrow tʃ / \_i$	-	-	tʃi	-
	Del: $V_1V_2 \rightarrow V_2$	-	ki	-	ti
	[SR]	[ta]	[ki]	[tʃi]	[ti]

3) Methods

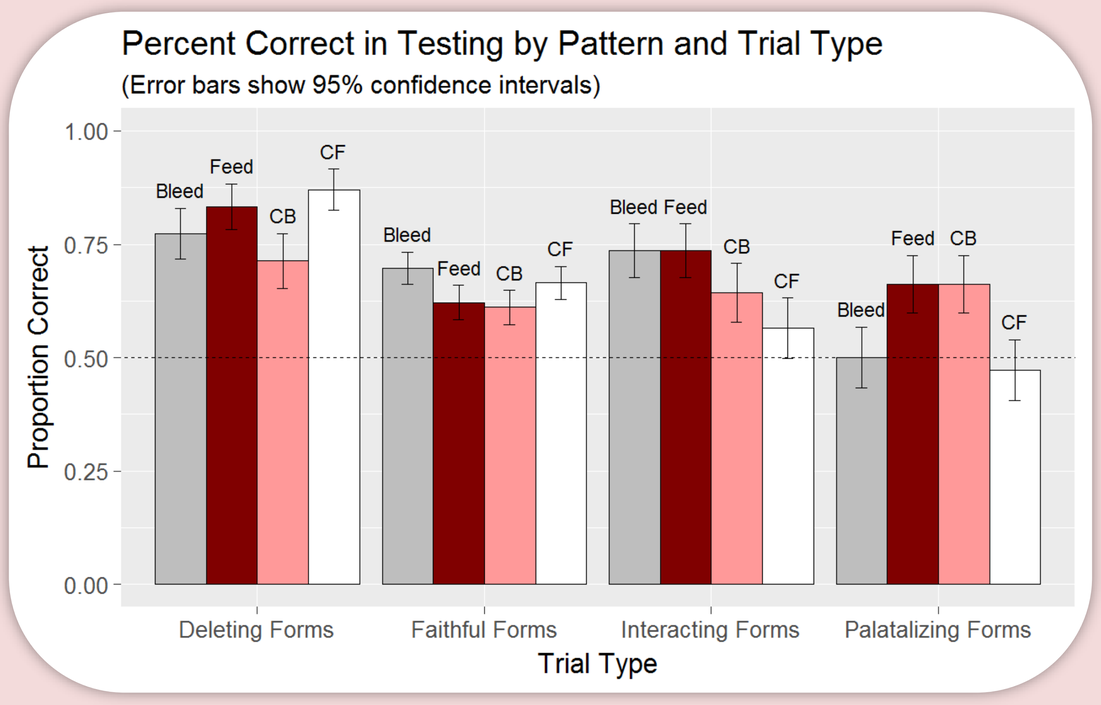
- Four trial types: Faithful, Deleting, Palatalizing, and Interacting
- Each trial, participants (N=48) were presented with:

1. A picture of a singular, full-sized noun and a recording of its stem.
   ⇒ Stems: {i, u}{m, n, l}{i, a, u}{t, k, d, g}, meanings randomly assigned
2. A picture representing either the diminutive, plural, or the diminutive-plural form of the noun (see Ettlinger 2008).
   ⇒ Suffixes: /i/ and /a/, meanings counterbalanced
3. A forced choice between a phonologically correct and incorrect affixed form of the noun.

- ***Training*:** Subjects saw all three forms for half of the stems (in a randomized order) and were given feedback on their choices.
- ***Testing*:** They saw all three forms for the remaining stems and were given no feedback.

4) Results

- The figure below shows subjects' average accuracy, broken down by pattern and trial type.



5) Analysis

- I also ran a logistic regression on the full dataset with the two different processes and two biases as fixed effects (subject and item were treated as random effects on the intercept).
  - ⇒ No significant main effects for MaxUtil (β=0.12, p=.26) or Transparency (β=0.03, p=.77).
  - ⇒ However, there was a significant effect of MaxUtil in Palatalizing trials (β=0.20447, p<.001 for MaxUtil*Palatalization).
  - ⇒ And a significant effect of Transparency in Interacting trials (β=0.08761, p=.017 for Transparency*Deletion*Palatalization).
- These results don't support the existence of a general bias for maximally utilizing or transparent languages.
- But both factors *do* affect learning in certain domains.

6) Discussion

- MaxUtil and Transparency do affect learning, supporting Kiparsky (1968, 1971).
- But the story's complicated since these factors only influence the learning of particular parts of a language (rather than the language as a whole).
- ***Future work:***
  - ⇒ The UR's for each stem were given to subjects. How did this affect the results?
  - ⇒ Which models capture these effects (e.g. Jarosz 2016, Nazarov and Pater 2017)?
  - ⇒ What about other kinds of opacity (Baković 2011)?

References

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