



Equal Learning of Natural and Unnatural Phonotactics

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Background

- What role does **substantive bias** play in phonological learning and in shaping the phonological typology?
 - Substantive (a.k.a. naturalness) bias: learning bias against phonetically unnatural patterns
 - Evidence for substantive bias is mixed and has focused on alternations (Moreton & Pater 2012)
- **Research question:** Does phonetic naturalness bias phonotactic learning?
- **Approach:** Test whether learners reproduce a phonetically-motivated phonotactic implicational in an artificial grammar learning experiment
- **The implicational:** Word-final major place contrasts (e.g. /ap/ vs. /at/ vs. /ak/) → word-initial major place contrasts (e.g. /pa/ vs. /ta/ vs. /ka/), but not necessarily vice versa (Steriade 1994, 2001)

Method

- Expose subjects to 3-way place contrast word-initially or word-finally and test whether they extend contrast to other position
- Two training conditions, WordInitialContrast (WIC) and WordFinalContrast (WFC)
- 40 training items, 2 blocks of training (with images)
- 48 test items (same for all conditions): #P, #T, #K, P#, T#, and K# items (no images)
- Task: Say whether each word could also be a word of the language heard in training (Yes/No)
- 3 types of test item:

	#P	#T	#K	P#	T#	K#
WIC	✓	✓	✓	✗	✓	✗
WFC	✗	✓	✗	✓	✓	✓

- Sample training items for WordInitialContrast:

#P	#T	#K	P#	T#	K#
pínir	tínir	kínir		jáwit	
búnir	dánir	gírur		rujúd	
pilán	tajál	kilún		lurít	
bawán	dawán	gawán		nírad	
...	

➢ **Familiar Conforming:** place of articulation and position conform to trained pattern, and item heard in training (e.g. *pínir* in WordInitialContrast)

➢ **Novel Conforming:** place of articulation and position conform to trained pattern, but item not heard in training (e.g. *panúl* in WordInitialContrast)

➢ **Novel Nonconforming:** place of articulation and position combination not heard in training (e.g. *nálup* for WordInitialContrast)

Predictions

- Acceptance rates of Novel Nonconforming items (relative to Novel Conforming items) indicate whether subjects have extended place contrast to a new position in a given condition
- Bias toward phonetically natural systems → WFC subjects will accept Novel Nonconforming items more than WIC subjects (more extension of place contrast from word-final to word-initial position than vice versa)
- No bias toward phonetically natural systems → similar acceptance rates of Novel Nonconforming items in WIC and WFC since two training patterns of equal formal complexity

Acknowledgments

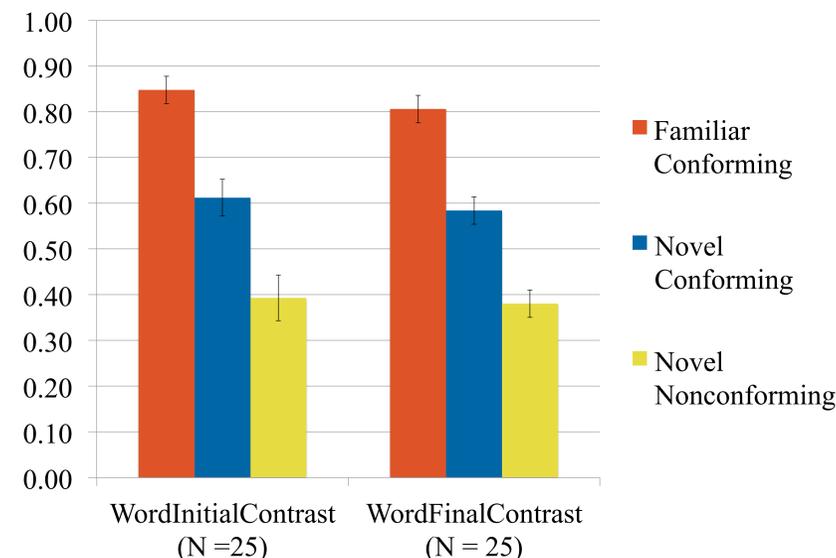
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References

- [1] Moreton, E. & Pater, J. (2012). Structure and Substance in Artificial-phonology Learning, Part II: Substance. *Language and Linguistics Compass*, 6(11), 702–718. [2] Steriade, D. (1994). Positional Neutralization and the Expression of Contrast. Ms. University of California, Los Angeles. [3] Steriade, D. (2001). Directional asymmetries in place assimilation: A perceptual account. In E. Hume & K. Johnson (Eds.), *The Role of Speech Perception in Phonology* (pp. 219–250). San Diego: Academic Press. [4] Greenberg, J. H. (1965). Some Generalizations Concerning Initial and Final Consonant Sequences. *Linguistics*, 3(18), 5–34.

Experiments 1 and 2: Place Contrasts

Exp. 1: Acceptance Rates of Test Items by Condition



Acceptance Rates

- **Familiar Conforming** > **Novel Conforming**
- **Novel Conforming** > **Novel Nonconforming**
- **Novel Conforming:** significantly **above chance**
 - Subjects correctly generalized to new words in their language
- **Novel Nonconforming:** significantly **below chance**
 - Subjects correctly rejected words not in their language
- No interactions → equal learning of natural and unnatural patterns

Experiment 2:

- Modifications: 20 all-sonorant fillers (e.g. *lanír*) added to training; training blocks increased to 3; no Familiar Conforming items in test
- Still no difference between conditions → natural and unnatural patterns still learned equally well

Experiment 3: Onset Complexity

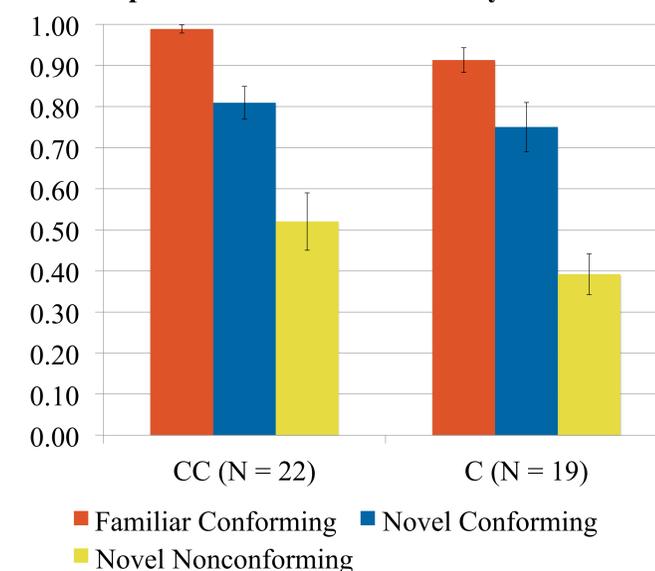
Design

- Phonotactic implicational: Complex onsets → simple onsets, but not vice versa (Greenberg 1965)
- Design analogous to place contrast experiments
- Two conditions: Complex Onsets (CC) and Simple Onsets (C)
- 18 training items (CCVC or CVC nonce words), 2 blocks
- 18 test items (4 Familiar Conforming, 5 Novel Conforming, 9 Novel Nonconforming)

Acceptance Rates

- **Familiar Conforming** > **Novel Conforming**
- **Novel Conforming** > **Novel Nonconforming**
- No interactions → complex onset-only and simple onset-only languages learned equally well

Acceptance Rates of Test Items by Condition



Conclusion

- Phonotactic implicational about position of place contrasts and onset complexity not reproduced
 - Place contrasts only word-initially and place contrasts only word-finally equally learnable
 - Only complex onsets and only simple onsets equally learnable
 - **No evidence for substantive bias**, in line with Moreton & Pater 2012
- If phonetic naturalness does not bias phonotactic learning, what accounts for asymmetries in the typology?
- Given elusiveness of substantive bias effects, a diachronic/channel bias account grows more appealing