Analytic Bias in Phonotactic Learning: Extension of an Obstruent Voicing Contrast

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Background

- To what extent does analytic (synchronic) bias shape the phonological typology?
  - ➢ Complexity bias: bias against formally complex patterns ([1] [2])
  - ➢ Naturalness bias: bias against phonetically unnatural patterns ([4] [5])
- **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 obstruent voicing contrast → word-initial voicing contrast, but not necessarily vice versa ([3])

Method

- Expose subjects to obstruent voicing contrast word-initially or word-finally and test whether they extend the contrast to the other position
- Four training conditions, differing in *Trained Contrast Position* and *Trained Neutralization Value*

	#T	#D	T#	D#
DFinalContrast (*#T)	✗	✓	✓	✓
TFinalContrast (*#D)	✓	✗	✓	✓
InitialContrastD (*T#)	✓	✓	✗	✓
InitialContrastT (*D#)	✓	✓	✓	✗

- Sample training items for InitialContrastT:

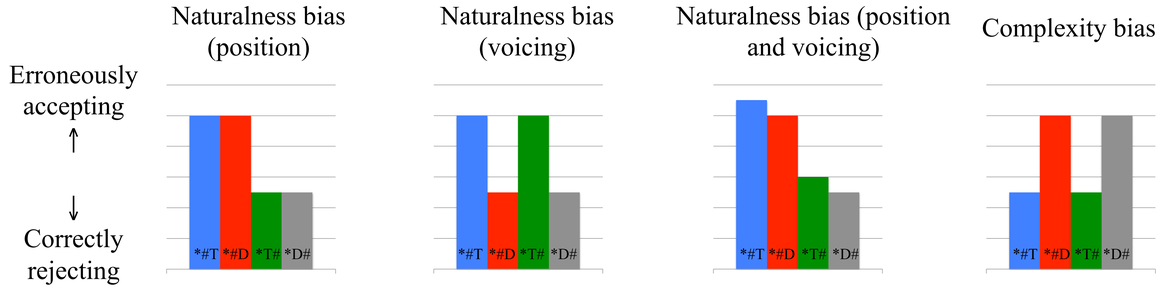
#T	#D	T#	D#	Fillers
pímir	**b**ímir	míwi**p**		mínir
tilár	**d**irín	laní**t**		níjal
kawám	**g**awám	nuwá**k**		winúm
…	…	…		…

- 72 training items, half fillers (with images)
- 72 test items (same for all conditions): #T, #D, T#, and D# items, one third fillers (no images)
- Task: Say whether each word could also be a word of the language heard in training (Yes/No)

- 3 types of critical test item:
  - ➢ **Familiar Conforming**: voicing and position conform to trained pattern, and item heard in training (e.g. ***p*ímir** in InitialContrastT)
  - ➢ **Novel Conforming**: voicing and position conform to trained pattern, but item not heard in training (e.g. ***p*írum** in InitialContrastT)
  - ➢ **Novel Nonconforming**: voicing and position combination not heard in training (e.g. ***nimáb*** for InitialContrastT)

Predictions: Acceptance of Novel Nonconforming Items

DFinalContrast (*#T) **TFinalContrast (*#D)** **InitialContrastD (*T#)** **InitialContrastT (*D#)**



- Complexity bias: Due to presence of sonorant Cs, constraint needed to exclude Novel Nonconforming items in T conditions more complex than constraint needed in D conditions
  - ➢ **InitialContrastD (*T#)**: winú**m** ✓míwi**b** ✓ míwi**p** ✗ → *[-voice]#
  - ➢ **InitialContrastT (*D#)**: winú**m** ✓míwi**b** ✗ míwi**p** ✓ → *[-son, +voice]#
- No bias: Similar acceptance rates of Novel Nonconforming items across all conditions

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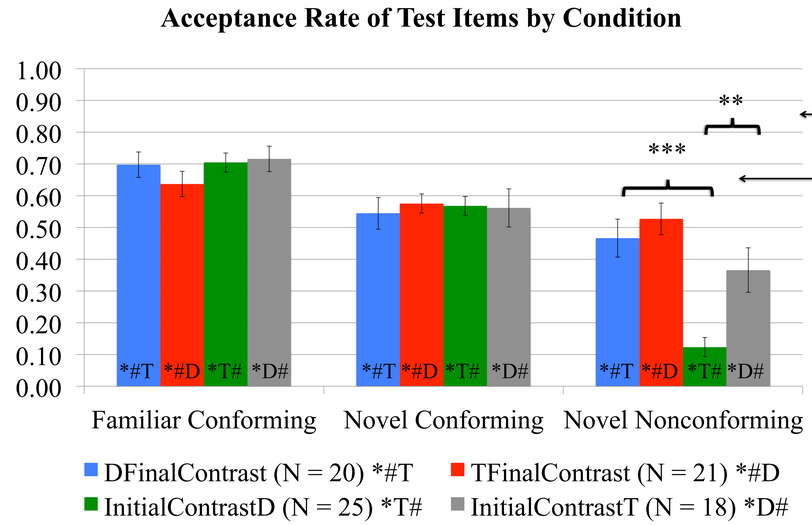
Exp. 1 Results



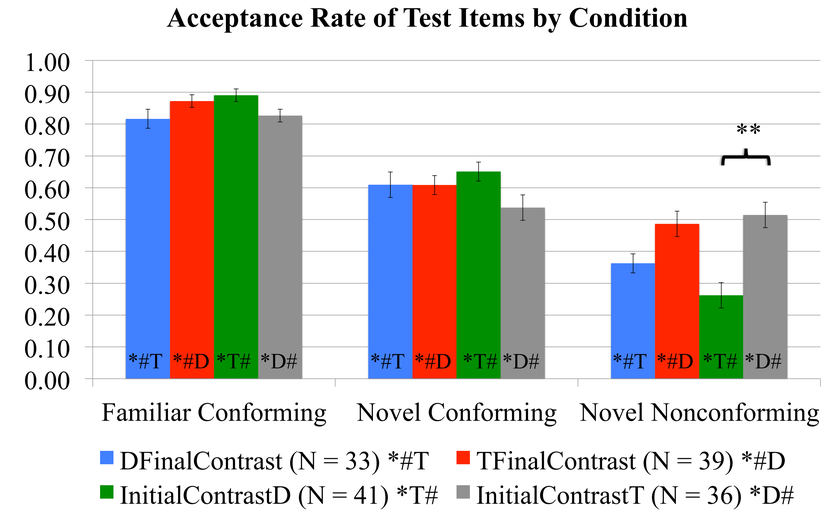
← Partial support for complexity bias

← Partial support for naturalness bias

- Results do not fully support either a naturalness bias or a complexity bias
- Acceptance rates of Novel Conforming items mostly not above chance
- General dispreference for final obstruents, especially T#, in Novel items

Exp. 2 Results

- To improve acceptance rates of Novel Conforming items, 2 blocks of training instead of 1
- To reduce general dispreference for obstruents, fillers eliminated



- Acceptance rates of Novel Conforming items now above chance
- No support for a naturalness bias
- Again, partial support for a complexity bias
- Difference in acceptance rate of Novel Nonconforming items between **DFinalContrast** and **TFinalContrast** in direction that would support complexity bias, but difference does not reach significance

Discussion

- Scant evidence for naturalness bias: partial support in Exp. 1 but no support in Exp. 2
- More support for complexity bias: evidence emerged in Exp. 1 and Exp. 2
  - ➢ But why should difference in learnability between simple and complex constraint emerge only in word-final position and not word-initial position?

References

[1] Moreton, E. (2008). Analytic bias and phonological typology. *Phonology*, *25*, 83–127. [2] Skoruppa, K. & Peperkamp, S. (2011). Adaptation to Novel Accents: Feature-Based Learning of Context-Sensitive Phonological Regularities. *Cognitive Science*, *35*, 348–366. [3] Steriade, D. (1997). Phonetics in phonology: The case of laryngeal neutralization. Ms. University of California, Los Angeles. [4] White, J. (2013). *Bias in phonological learning: Evidence from saltation*. Ph.D. dissertation. University of California, Los Angeles. [5] Wilson, C. (2006). Learning phonology with a substantive bias: An experimental and computational study of velar palatalization. *Cognitive Science*, *30*, 945–982.