

Underlearning in the Face of Opacity: The Case of Bengali Vowel Harmony

Traci Nagle, Indiana University, Bloomington

Opaque morphophonological alternations, such as synchronic chain shifts, pose difficulties for surface-based theoretical analyses because they require contradictory generalizations about marked features (e.g., Kirchner, 1996; Moreton, 2004). Recent research has shown that opaque patterns resist generalization to nonce words, particularly when these patterns are phonetically arbitrary (e.g., Zhang, Lai, & Sailor, 2009) or are variably implemented (e.g., Ettlinger, 2009; Sanders, 2003). A lack of phonetic motivation has also been shown to inhibit generalization of transparent alternation patterns to nonce words (e.g., Becker, Ketrez, & Nevins, 2011; Zhang & Liu, 2016). Bengali presents an interesting test of these findings, because its opaque chain-shift pattern involves phonetically motivated vowel harmony and is reportedly exceptionless, exhibiting no variation (Thompson, 2010). The present research shows that the phonetic naturalness in the more transparent part of the chain shift (where a verb-stem vowel fully harmonizes in height with an affix vowel) plays no facilitating role for rates of implementation of the opaque pattern.

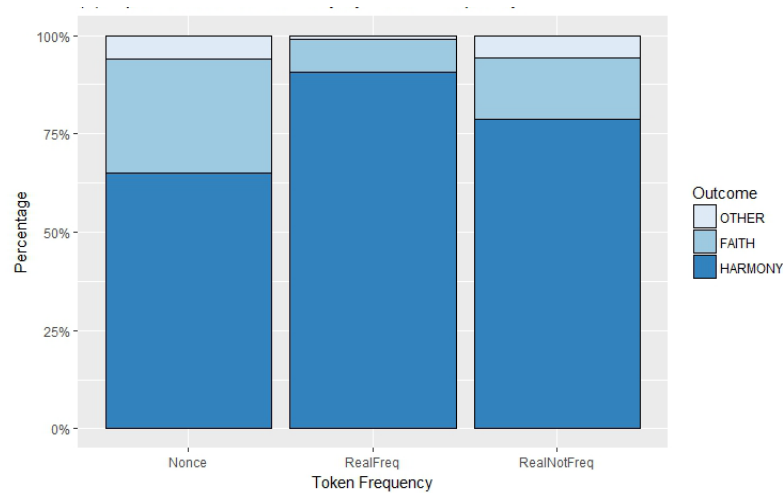
In Bengali, low-mid and mid vowels in monosyllabic verb stems alternate with mid and high vowels, respectively (æ~e, e~i, ɔ~o, o~u), while /a/ does not alternate. This pattern has typically been analyzed as a morphophonological process of raising (Dey, 1979; Lahiri, 2000) or lowering (Murshid, 1992; Sarkar, 2004) of the stem vowel when it precedes a high suffix vowel, as shown in the partial paradigm in (1).

(1) Bengali verbs, selected present tense inflections			
1 st person indicative		2 nd person (informal) indicative / imperative	
rak ^h -i	<i>'I/we put'</i>	rak ^h -o	<i>'you put'</i>
dek ^h -i	<i>'I/we see'</i>	dæk ^h -o	<i>'you see'</i>
jik ^h -i	<i>'I/we learn'</i>	jek ^h -o	<i>'you learn'</i>
kor-i	<i>'I/we do'</i>	kɔr-o	<i>'you do'</i>
ut ^h -i	<i>'I/we rise'</i>	ot ^h -o	<i>'you rise'</i>

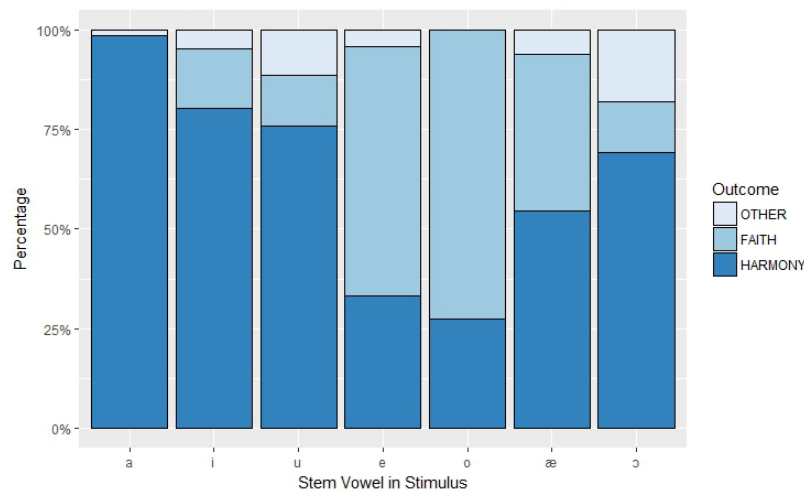
Three experimental investigations (wug tests; Berko, 1958) were conducted in which participants were presented with nonce and real verbs conjugated in the 1st or 2nd person in sentence frames, and asked to produce the same verb in a different sentence frame calling for a change in the person affix—thus, a change from high affix to mid affix, or vice-versa. The results reveal that, although Bengali speakers reliably implement the alternation pattern with real verb stimuli (whether frequent or not frequent), they extend the pattern in nonce verb stimuli at significantly lower rates (see (2)). These findings echo the results of experimental tests in other languages in which chain shifts resist generalization to nonce words. Moreover, these rates of implementation are dramatically lower when the stimulus verb features a high-mid vowel (e or o) in the stem; results from one production task are shown in (3).

The results of these analyses suggest an underlearning of the more transparent, phonetically motivated part of a chain shift—that involving the raising of the mid vowels (e and o) to harmonize with the high suffix vowel (i)—contradicting prior findings that phonetic naturalness facilitates implementation of opaque patterns. It is proposed that this underlearning results from the very nature of the roles these vowels play in a chain shift pattern—sometimes serving as the (underlying) target of an alternation, and other times as the (surface) output of the alternation.

(1) Implementation of Vowel Harmony by Token Frequency



(2) Implementation of Vowel Harmony by Stimulus Stem Vowel, Nonce Verbs



References

- Becker, M., Ketrez, N., & Nevins, A. (2011). The Surfeit of the Stimulus: Analytic Biases Filter Lexical Statistics in Turkish Laryngeal Alternations. *Language*, 87(1), 84-125.
- Berko, J. (1958). The Child's Acquisition of English Morphology. *Word*, 14, 150-177.
- Dey, P. (1979). On Rule Ordering in Bengali Phonology. *Indian Linguistics*, 40(1), 24-34.
- Ettlinger, M. (2009). *Variation as a Window into Opacity*. Paper presented at the 43rd Meeting of the Chicago Linguistics Society, Chicago.
- Kirchner, R. (1996). Synchronic Chain Shifts in Optimality Theory. *Linguistic Inquiry*, 27, 341-351.
- Lahiri, A. (2000). Hierarchical Restructuring in the Creation of Verbal Morphology in Bengali and Germanic: Evidence from Phonology. In A. Lahiri (Ed.), *Analogy, levelling, markedness: Principles of change in phonology and morphology* (pp. 71-123). Berlin: Mouton de Gruyter.
- Moreton, E. (2004). Non-Computable Functions in Optimality Theory. In J. McCarthy (Ed.), *Optimality Theory in Phonology* (pp. 141-164). Malden: Blackwell.
- Murshid, G. (1992). *Bengali-English-Bengali Dictionary*. London: Ruposhi Bangla Ltd.
- Sanders, R. N. (2003). *Opacity and Sound Change in the Polish Lexicon*. (Doctoral dissertation), University of California, Santa Cruz.
- Sarkar, P. (2004). *Segmental Phonology of Standard Colloquial Bengali*. (Doctoral dissertation), University of Chicago.
- Thompson, H.-R. (2010). *Bengali: A Comprehensive Grammar*. London: Routledge.
- Zhang, J., Lai, Y., & Sailor, C. (2009). Opacity, Phonetics and Frequency in Taiwanese Tone Sandhi. In M. Pak (Ed.), *Current Issues in Unity and Diversity of Languages: Collection of Papers Selected from the 18th International Congress of Linguists* (pp. 3019-3038): Linguistic Society of Korea.
- Zhang, J., & Liu, J. (2016). The productivity of variable disyllabic tone sandhi in Tianjin Chinese. *Journal of East Asian Linguistics*, 25, 1-35.