Schemas, templates and rules in morphophonology learning

Construction grammarians have suggested, on occasion, that knowledge of grammar reduces to knowledge of constructions/schemas, defined as form-meaning pairings (e.g. Bybee, 2001: 81; Croft, 2001: 46; Hilpert, 2008: 9; Schönefeld, 2012: 11; Taylor, 1998: 163). Other work has questioned the sufficiency of form-meaning mappings in accounting for productive grammatical knowledge (e.g. Becker & Gouskova, 2012; Cappelle, 2006; Goldberg, 2002: 349; Dabrowska, 2010; Iwasaki, 2015; Pierrehumbert, 2006). Much of this work has focused on demonstrating that arbitrary paradigmatic mappings traditionally captured by rules are learned by speakers and do play a role in productive use of language. However, it has, until recently, seemed possible to claim that such mappings involve mappings between previously learned constructions (Kapatsinski, 2013; Nesset, 2008; but cf. Becker & Gouskova, 2012, Pierrehumbert, 2006). I will present recent work from miniature artificial language learning showing this claim to be incorrect: learners attempt to acquire constructions/schemas and paradigmatic mappings in parallel.

264 adult native English speakers were asked to learn languages featuring subtraction: the final vowel would delete to form the plural from the singular. All training examples involved a CVCVCV form, which resulted in a CVCVC product. Thus, participants could learn both a rule, $V \rightarrow 0/\_\_\_\#$, and a product-oriented schema, along the lines of 'plurals are CVCVC'. At test, participants were presented with old CVCVCV inputs, new CVCVCV inputs and, crucially, new CVCV inputs. For these last, the subtraction rule $(V \rightarrow 0/\_\_\#)$ predicts subtraction (CVCV$\rightarrow$CVC). On the other hand, the schema predicts addition.

When the CVCVC plurals could end in a variety of equiprobable consonants, participants were found to prefer subtraction over addition with CVCV sources. In contrast, when most products ended in [k], taking the form CVCVk, participants were equally likely to subtract the final V of a CVCV and to add the overrepresented consonant. Interestingly, to help addition, overrepresentation of [k#] could happen in either the source or product meaning. Thus, extra examples of CVCVk *singulars* favored addition of a consonant to CVCV for forming plurals as much as extra examples of CVCVk plurals did. This result suggests that what these examples are doing is provide support for a meaning-independent prosodic template: boosting CVCVC in the singular causes the template to be used more in the plural, instead of restricting it to the singular meaning. However, when the extra examples of CVCVk occurred in the singular, participants were as likely to add consonants other than [k] as they were to add [k] when forming a plural. On the other hand, when the extra examples of CVCVk occurred in the plural, the added consonant was overwhelmingly [k]. Thus, unlike the prosodic template, the segmental content overrepresented in a particular paradigm cell *was* restricted to the meaning of that cell: boosting the frequency of [k#]$_{\text{SINGULAR}}$ did not help [k#]$_{\text{PLURAL}}$.

Importantly, adding CVCVkV$_{\text{SINGULAR}} \rightarrow$CVCVk$_{\text{PLURAL}}$ examples favored addition over deletion but not as much as adding source-less examples of CVCVk$_{\text{PLURAL}}$, suggesting that the former provided support for *both* the product-oriented schema 'plurals end in [k]' and the rule $V \rightarrow 0/\_\_\#$. Finally, if CVCVk examples were added to both singular and plural paradigm cells, participants preferred to not change CVCV forms at all, suggesting that such examples boosted a 'do nothing' operation (Taatgen & Anderson, 2002) or made the $V \rightarrow 0$ change harder to notice. Overall, the results suggest that learners track the frequencies of paradigmatic mappings like V#$\rightarrow$# as well as prosodic templates like CVCVC, in parallel to tracking the frequencies of constructions/schemas. While harder to track (due to need for form comparisons), paradigmatic mappings can pay off when they provide a more predictive grammar.