

The interaction of L1 phonotactics and substance during acquisition of morphophonemic alternations with exceptions

Dinah Baer-Henney, Frank Kügler & Ruben van de Vijver

University of Potsdam

dinah.baerhenney@googlemail.com, kuegler@uni-potsdam.de, vijver@uni-potsdam.de

Most morphophonological alternations have exceptions. Alternations present the learner with the difficulty that there is no one to one mapping of form and meaning (van de Vijver and Baer-Henney, 2011; Kerkhoff, 2007); alternations with exceptions are even harder to acquire. For fully regular alternations it has been discussed controversially whether alternations that are grounded in phonetics – substantively motivated – are learned more easily than other ones that are not (Redford, 2008; Wilson, 2006; Seidl and Buckley, 2005) and whether local dependencies are learned with more ease than non-local ones (Newport and Aslin, 2004). Baer-Henney and van de Vijver (to appear) have shown that phonetically motivated patterns are learned more quickly than arbitrary ones and that the frequency of occurrence also plays a role. In this paper we have studied the acquisition of alternations in the Artificial Language Paradigm (ALP) and we found that German adult learners use different cues for two types of morphophonemic alternations that are exceptional to different degrees. In our artificial language a plural suffix alternated between $[-y]$ or $[-u]$ depending on the vowel of a CVC stem; a local, tier-adjacent dependency. One alternation was a vowel harmony (VH), where the backness of the stem vowel determined the backness of the suffix. VH is based in substance (Linebaugh, 2007). The distinction between front and back vowels has no consequences for syllable structure in German. In another alternation (AV) the tenseness of the stem vowel determined the backness of the suffix. AV is phonetically arbitrary. However, the distinction of tense and lax vowels plays an important role in German phonotactics (Wiese, 1996). Lax vowels appear only in closed syllables, and tense vowels also appear in open syllables. Exceptional items in our paradigm followed the opposite pattern. The alternation types are summarized in table 1.

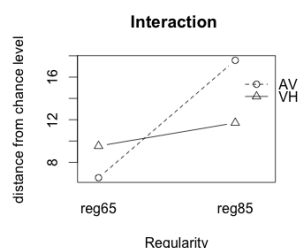
Table 1: alternation types

	add allomorph $[-y]$ if	add allomorph $[-u]$ if
VH: vowel harmony	$V_2 \rightarrow V_{2[-back]} / CV_{1[-back]}C_ \#$	$V_2 \rightarrow V_{2[+back]} / CV_{1[+back]}C_ \#$
VH exceptions	$V_2 \rightarrow V_{2[-back]} / CV_{1[+back]}C_ \#$	$V_2 \rightarrow V_{2[+back]} / CV_{1[-back]}C_ \#$
AV: arbitrary vowel alternation	$V_2 \rightarrow V_{2[-back]} / CV_{1[lax]}C_ \#$	$V_2 \rightarrow V_{2[+back]} / CV_{1[tense]}C_ \#$
AV exceptions	$V_2 \rightarrow V_{2[-back]} / CV_{1[tense]}C_ \#$	$V_2 \rightarrow V_{2[+back]} / CV_{1[lax]}C_ \#$

80 adults were familiarized with artificial input. It always contained a majority and a minority – exceptional – alternation. In different groups, the input contained items that conformed to either 85% or 65% of the target alternation. The remaining plural forms followed the exceptional rule. This resulted in four groups with 20 subjects each: VH-85, VH-65, AV-85 and AV-65. After the training we asked the subjects to form plurals of 96 given new singular forms (Berko, 1958). We measured the extent to which subjects have learned the trained majority alternation. A generalized linear mixed model confirmed that subjects who were trained with the 85% alternations produced more items that were in conformity to the majority input alternation than those that were trained with only 65% alternations. Post-hoc analyses showed that learners generalized the input pattern of the AV-85 condition more often to novel items than learners in the VH-85 condition. When the input contains more exceptions the learners' generalizations are reversed: In the VH-65 condition learners more often generalized the alternations to novel items than in the AV-65 condition (see figure 1).

We explain our data with the interaction of the two factors L1 phonotactics and substance: This means that the learner has conflicting evidence. The unstable situation of an irregular alternation makes it harder to detect dependencies. When learners look for an explanation about which suffix to add, they use all resources available. For VH learners, substance can act as a bias and leads the learners towards the identification of the dependency

Figure 1: Mean distance from chance level of answers in all groups VH-85, AV-85, VH-65, AV-65



between trigger and suffix. For AV learners, the German phonotactics can help. For the 85% learners AV was the easier alternation than VH, hence it turned out that for them the phonotactics of L1 are the more reliable cue because it helps the learner to group the stems on the basis of their vowel. Ott (2011) found that in German this grouping is used to distinguish nouns from verbs and that speakers are aware of the generalization that a consonant cluster preceded by a tense vowel are separated by a morpheme boundary. Also, Germans use the tenseness distinction to identify the obstruents' status of voice (Kleber et al., 2010). However, with an even more unstable input, the 65% learners rely more on substance as a cue. With less regularity the substantively based VH has been discovered more easily and generalized to more items than AV, which was not substantively based. To summarize, we show that depending on type and regularity of an alternation the learners make use of different cues to support the acquisition of morphophonemic alternations.

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