Exploiting a cognitive learning bias for vowel harmony to acquire a non-native vowel contrast

Stephanie Kaucke[1, 2] & Marcel Schlechtweg[1, 2]
[1] Carl von Ossietzky Universität Oldenburg, Germany, [2] Cluster of Excellence "Hearing4All", Germany,
stephanie.kaucke@uni-oldenburg.de

Keywords: non-native speech perception, adverse listening conditions, substantive bias

Previous studies on vowel harmony have shown that it has several benefits in both perception and production. For instance, it reduces difficulties in speech planning (Berg 2003), helps identifying the following vowels after the first (Suomi 1983), and aids in word segmentation (Suomi et al. 1997). Thus, vowel harmony is a phonetically motivated process, while its logical counterpart, vowel disharmony, lacks a phonetic motivation and has not been attested in the world's languages.

In the recent years, a number of studies have examined the learnability of vowel harmony and disharmony in light of a substantive bias. This bias assumes that phonetically motivated patterns which facilitate speech production or perception are acquired more easily than patterns that do not (Wilson 2006). Several studies have revealed that vowel harmony is indeed learned more easily than vowel disharmony (e.g. Martin & White 2021; Martin & Peperkamp 2020).

However, these studies only examined the learnability of the pattern itself, not if a bias for vowel harmony could be exploited to acquire a new vowel contrast. This is the aim of the present study. We examine whether native English speakers can use vowel harmony to their advantage in order to establish new phoneme categories for the German vowels /y/ and /ø/. English speakers have been reported to confuse these vowels with the back rounded vowels /u/ and /o/, respectively (e.g. Strange et al. 2005; Levy & Strange 2008), so we use a palatal (dis)harmony to implicitly teach the difference between these vowels. Since adverse listening conditions can be especially detrimental in non-native speech perception (García Lecumberri et al. 2010), participants might particularly benefit from vowel harmony in noise. Thus, half of the participants were taught and tested in clear speech, and the other half in speech-shaped noise at SNR 8dB and 0dB.

There are two parts to our study: 1.) In an AX Discrimination Task, participants have to discriminate German CVC pseudowords differing in the vowel, and 2.) in an Artificial Language Learning Paradigm, participants are trained with a (dis)harmony pattern by listening to either plural forms containing /y/ or diminutive forms containing /ø/. Depending on the vowel properties of the stem, the suffixes will alternate (e.g. harmonic plurals: *veki-ky* and *mudo-ku*). After the training phase, all participants are tested on new plural *and* diminutive forms to examine if they are able to generalise the learned pattern to another vowel contrast. So in this test phase, participants hear a harmonic and a disharmonic version of a word (e.g. *roto-ky* versus *roto-ku*) and have to choose the correct version based on their training.

Data of the noise condition is still being collected. The results of the clear condition, however, suggest that using a bias for vowel harmony alone is not enough to boost participants' ability to discriminate non-native vowel contrasts. In the AX discrimination task, participants were unable to discriminate /y/ from /u/ and /ø/ from /o/, and in the following learning task, they still performed at chance level regardless of trained pattern or word form.

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