Crosslinguistically, rhotic sounds are subject to a great deal of variation. For example, English postvocalic /r/ exhibits variable degrees of realization (full, semi- and non-rhoticity) both synchronically and diachronically, and has been described as inherently fragile (Lutz 1994). Furthermore, bilinguals with long-term exposure to a rhotic (/r/-ful) second language (L2) have been shown to realize postvocalic /r/ in their otherwise non-rhotic (/r/-dropping) native language (L1; Ulbrich & Ordin 2014). Indeed, the presence of semi-rhotic English varieties with variable realizations of /r/ suggests that the loss/emergence of the postvocalic /r/ both within and across life spans may be subject to a (similar) set of constraints.

Here, we shed light on the nature and dynamics of rhotics from the perspective of adjustments in an individual’s L1 due to long-term exposure to an L2 (e.g. Mennen 2004). The degree of adaptation of L2 speech patterns according to the L1 has been shown to be constrained by various contextual and sociolinguistic factors such as language prestige and dominance (e.g. Lev-Ari et al. 2014). However, whether adjustments in the realization of /r/ within an individual’s life span follow universal principles (e.g., psychoacoustic properties of rhotics) as well as developmental and diachronic trajectories remains to be explored. Furthermore, we do not know whether non-rhotic L2s may exert an influence on L1 rhoticity (i.e., the opposite direction described in Ulbrich & Ordin 2014). Given the fact that rhotic sounds typologically show considerable qualitative differences, another possible scenario is the emergence of variable realizations of postvocalic /r/ (in lieu of its complete loss) in the L1 after long-term exposure to a non-rhotic L2.

In our experimental study, we investigated the phonetic quality of /r/ in the native language of American English speakers (from a rhotic variety), who had post-pubescent long-term exposure to L2 German (a non-rhotic language), and tested which phonological contexts and sociolinguistic variables favor the deletion of postvocalic /r/. Based on previous observations on postvocalic /r/ in synchronic and diachronic varieties of English (e.g. Feagin 1990), we hypothesized:

1. postvocalic /r/ to be more likely to undergo reduction in unstressed syllables than in stressed ones;
2. the stressed rhoticized [ɔr] in American English to be more resistant to variability than other /r/-colored vowels in the same context;
3. the complexity of the syllable coda (simple vs complex) to influence rhoticity; and
4. bilinguals to produce rhotic sequences with a higher $F3$ than monolinguals as an indication of gradual loss of postvocalic /r/ since rhoticity is acoustically characterized by a lowered $F3$ throughout a [Vr]-sequence.

In our experiments, 12 American English – German late bilinguals residing in Germany (mean LOR=25 years) performed a variety of speech elicitation tasks in both their L1 and L2. The test items used in our controlled tasks were mono-morphemic words with the postvocalic /r/ occurring either after a stressed or unstressed vowel. We further controlled for other phonological variables such as syllable complexity and consonantal contact (homomorphic vs heteromorphic contexts). Auditory coding into binary categories (rhotic/non-rhotic) was used to analyze presence and absence of rhoticity. Additionally, we measured $F3$ values of the [Vr] sequences.

An analysis of the categorical data revealed that, as compared to monolinguals, the realization of /r/ by bilinguals exhibited a high degree of variability, albeit constrained by various factors. In particular,
the preceding vowel environment impacted the rhoticity of the syllable, with stressed [ɹ] strongly favoring the retention of rhoticity and unstressed [s] strongly disfavoring it. This yields the following hierarchy concerning resistance of vowels to the loss of rhoticity: [ɹ] > stressed vowels except [s] > [s]. While phonological and morphological complexity of the syllable did not impact production, the following environment (consonant vs. pause) constituted a significant factor, with pauses favoring rhoticity and consonants non-rhoticity. Additionally, we observed task effects: As opposed to speech elicited by more controlled tasks (where our American participants were exclusively r-ful), tasks that yielded more casual speech showed an increase in variability and hence less monolingual-like behavior.

As for phonetic properties, we measured minimum and maximum F3s of the [Vr] sequences that were identified as r-ful in the categorical analysis (Figure 1). Following Hay & Maclagan (2010) and Drager & Hay (2012), we additionally measured minimum F3 of prevocalic /r/ for each participant and fitted it as a fixed effect in a mixed effects model in order to normalize for differences in vocal tract length. Preliminary analyses suggest that bilinguals produced the vowel section of [Vr] sequences with significantly higher maximum F3 values, suggesting the presence of a lesser degree of constriction, and consequently a lower level of r-coloring, during the rhotic portion of the vowel.

We take our results to show that non-rhoticity in the L2 influences rhoticity in the L1 in terms of (i) the gradual loss of post-vocalic /r/, as well as (ii) the acoustic quality of [Vr] sequences. We will suggest that the adaptation of rhoticity within an individual’s lifespan mirrors both diachronic and synchronic patterns commonly observed in English varieties, as well as the general laws of phonetics.

**Figure 1**: Min F3 in Hz in monolinguals vs. bilinguals.

**References**