

ACQUISITION OF RHOTICS BY MULTILINGUAL CHILDREN

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ABSTRACT

Longitudinal investigations into L3 phonological acquisition are still scarce. This study examines the acquisition of the rhotic sounds in L2 English and L3 German by 16 native L1 Polish young adolescents over three testing points. It also investigates the sources of cross-linguistic influence (CLI) and the factor of proficiency. The results show a significant influence of proficiency both in terms of target rhotic productions and source of CLI in L2 English than L3 German. However, a lot of variation was found in the realisation of specific rhotics in both foreign languages as well as in individual performance, thus evidencing rather complex cross-linguistic acquisition patterns of rhotics over time.

Keywords: L2/L3 acquisition, rhotics, phonological cross-linguistic influence, multilingualism

1. INTRODUCTION

Various models have been proposed for the description and explanation of the acquisition of non-native speech sounds. They focus on different factors that influence the production of second language (L2) speech sounds such as the transfer of articulatory settings from the L1 to L2 ([10]), the perceived phonetic difference between an L1 and an L2 sound (e.g. [5], [1]) or universal and natural phonological processes (e.g. [4]). To date, no models have been proposed that explain the acquisition of speech sounds by multilingual learners. For these speakers, more than one phonemic inventory is available that can act as a source of cross-linguistic influence (CLI) in the acquisition of a third or further (L3) sound inventory.

Previous studies on phonological L3 acquisition have shown that learners can transfer some phonological structures from their L1 onto both their L2 and L3 (e.g. [18], [6], [20], [13]) as well as from their L2 onto their L3 (e.g. [7], [8], [9] [17], [22]). Moreover, cross-linguistic influence from the L3 and L2 onto a learner's L1 has been observed (e.g. [19], [21]).

Very little, however, is still known about the process of phonological acquisition by multilingual speakers over time, with only a few studies examining multilingual learners at multiple time

points (e.g. [8], [14]). Previous studies suggest that the source and direction of CLI can change depending on the speaker's proficiency in their languages ([9]). Thus, a longitudinal study that encompasses the language learning process of an L3 from its beginning constitutes an excellent test case for the influence of language proficiency on phonological CLI.

The current investigation focuses on the production of rhotics in L1 Polish, L2 English and L3 German. Rhotics are known to involve complex articulations and tend to be late developing sounds in a typical developmental trajectory. Although they are considered to belong to a natural phonological class, phonetically they demonstrate a wide range of variation both within and across languages ([16]). Rhotics span dental, alveolar, and uvular places of articulation, whereas the manner of articulation features trills, taps, fricatives, approximants and retroflex [sic!] articulation ([15]).

We chose rhotics as they have different renditions in the three languages of our multilingual learners. In Polish, the alveolar trill /r/ is used prevalingly, although it may be produced as a tap in fast speech ([11]). In General British, a non-rhotic variety to which the participants were mostly exposed at school, a post-alveolar approximant /r/ is used pre-vocally (e.g. [3]). In Standard German, the uvular fricative /ʀ/ is the most frequent realization of the rhotic sound, although conservative varieties use the uvular trill /R/, especially in the word initial position ([12]).

2. METHOD

2.1. Aims and research questions

The aim of the current study is to investigate the development of cross-linguistic acquisition patterns of rhotics from the perspective of multiple foreign language acquisition. We want to examine the relationship between the multilinguals' ability to produce the L3 and L2 rhotic sounds and its trajectory over time. In addition, we investigate how prior linguistic knowledge influences the course of additional phonological acquisition by young

learners. For this purpose, we posed the following research questions:

- How does the production of rhotics in English and German by L1 Polish speakers change over time?
- Are there differences in the L2 and L3 acquisition process in terms of the sources of phonological CLI and proficiency?

2.2. Participants

A total of 16 L1 speakers of Polish participated in the study (9 female, 7 male; mean age $M=12.25$, $SD=0.41$). They had been learning L2 English in school for about 6 years (pre-intermediate level, 3 hrs of formal instruction per week) and had just started learning German as their L3 (beginner level, 4 hrs per week). L2/L3 pronunciation was not taught explicitly.

In accordance with the tenets of multilingual research methodology, we tested all three of the learners' languages in order to use the learners as their own controls, rather than relying on monolingual norms as controls (see [2]).

2.3. Materials and procedure

All participants were recorded three times, after five weeks into learning their L3 German (T1), after five months of learning German (T2) and after ten months of learning German (T3). The participants were recorded in all of their languages doing a delayed repetition task. In the task they heard a target word in a carrier phrase (e.g. 'I say X again' in English) and were asked to repeat the entire phrase after hearing a prompt ('And what do you say' in English). The stimuli contained standard native rhotics exclusively.

To create appropriate language modes, the data collection for each of the languages was carried out on three separate days by L1 speakers of the respective languages.

The rhotics were elicited in initial and medial positions in the following target words:

- L1 Polish /r/: ryba, raz, rana, rok, teraz, chora, stara, kara (n=8) at T1 only
- L2 English /r/: ring, rabbit, red, rewind, around, orange, merry (n=7)
- L3 German /r/: Ratte, Riese, Rotwein, rot, Rückweg, Fahrrad, kehren (n=8)

2.3. Analyses

All rhotics produced by the participants (n=128 in L1 Polish; n=320 in L2 English; n=368 in L3

German) were analysed auditorily and their realisation was transcribed (using the full set of IPA symbols) by two separate phonetically-trained raters who were either native or near-native speakers of the respective languages. In case of disagreement a third rater was employed for a cross-check.

The rate of the target and other (L1- or L2-like) productions of rhotics in L2 English and L3 German was calculated in raw numbers, means and percentages for each participant and at each testing time. The occurrence of rhotics productions was subsequently submitted to statistical analyses, which were performed using STATISTICA. Since the condition of normal distribution was not met in our data, non-parametric tests were applied. The data were analysed in 3 conditions: as a sum of all target words (Target Total), rhotics in initial word positions and rhotics in medial positions.

3. RESULTS

3.1. Overall accuracy scores

The results show that the participants produce the rhotics in their L1 Polish as a trill in 94% and as a tap in 6% of all cases. Target production of the rhotics in their L2 English and L3 German differs considerably both across languages and over time. As Figure 1 shows, the target production of German /r/ after five weeks of learning lies at 34.8%, while English /r/ is produced accurately in 81.2% of all cases after six years of learning. The participants' correct production of the rhotics decreased at T2, i.e. five months later, in both their L2 and L3. After ten months of learning their L3 German, the production of the German rhotics lies at 21.9%, whereas the English rhotics are produced with a higher accuracy rate at T3 than at T1.

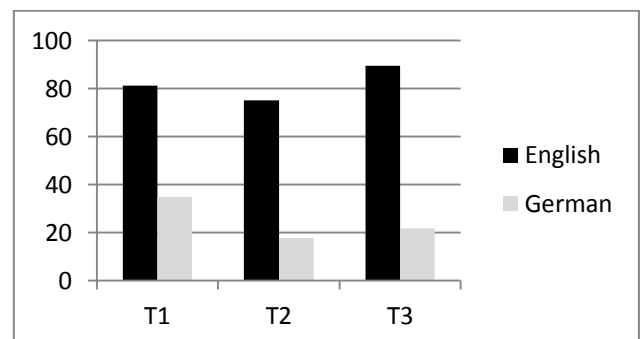


Figure 1: Accuracy scores in rhotics production.

3.2. Developmental patterns over time

To trace the development of production patterns over time, the Friedman repeated measures analysis

of variance by ranks was conducted on the mean target and non-target rhotic articulations at all testing times (T1, T2, T3). For L2 English the results of the test showed statistically significant differences between the means of target renditions of L2 English rhotics for the total sum of token words ($\chi^2=10$, $p=0.006$) as well as the words with rhotics in initial position ($\chi^2=7$, $p=0.027$) and medial position treated separately ($\chi^2=18.7$, $p=0.0001$). However, the post-hoc Dunn's Test of multiple comparisons pointed to statistically significant differences only for the medial rhotics at T1 vs. T2 and T1 vs. T3 ($p<0.05$), with the remaining comparisons failing to show any statistical difference.

For L3 German, the Friedman repeated measures analysis of variance showed statistically significant differences between the means of target renditions of L3 German rhotics only for the words with rhotics in initial position ($\chi^2=9.5$, $p=0.009$) at all the testing times. However, the post-hoc Dunn's test did not point to any statistically significant differences between the testing times.

The Wilcoxon matched-pairs test was performed to compare the performance of target rhotics production of L2 English vs. L3 German at particular testing times. It showed that the mean ranks differed significantly ($p<0.05$) between these languages at all the testing times in all the three conditions, i.e. total token words, words with rhotics in initial position, and words with rhotics in medial positions. A multivariate analysis of variance MANOVA was conducted to compare mean target productions of rhotics at three testing times for both languages (L2 and L3). All the main effects of the variables were found to be significant, including Language ($F=52$, $p<0.0001$), Time ($F=7.4$, $p=0.0026$) as well as the Time*Language interaction ($F=4$, $p=0.0302$). The least square means for the Time*Language interaction demonstrate that for L3 German there are lower Target Total values than for L2 English. Target Total reaches the highest values for L2 English at T3, and for L3 German at T1, whereas the lowest values are reached for both languages at T2.

In the subsequent analysis, the frequency of occurrence of specific rhotic articulations was calculated for L2 English and L3 German at three testing times (T1, T2, T3). The production categories included: L1 (Polish-based), L2 (English influence), T (target), O (other), M (mispronounced or deleted). See Figures 2 and 3 for the distribution of specific categories over time.

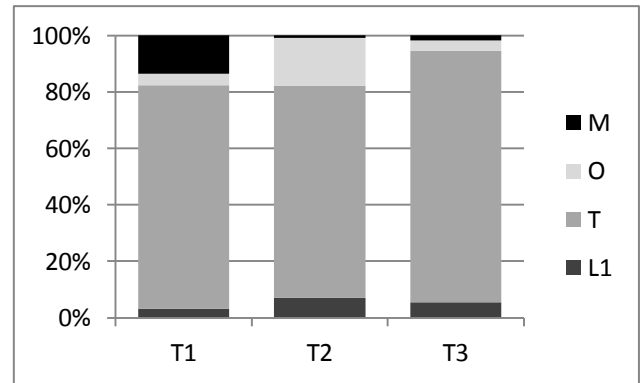


Figure 2: Categories of rhotics in L2 English.

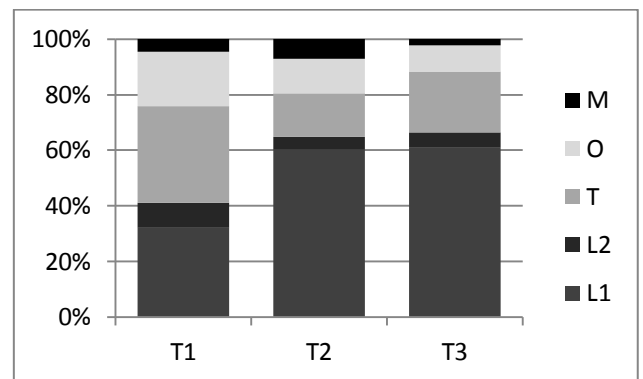


Figure 3: Categories of rhotics in L3 German. L1 (Polish-based), L2 (English influence), T (target), O (other), M (mispronounced or deleted)

The range of replacements by other sounds was comparable across languages, with L3 German exhibiting more instances (19.6% at T1, 12.5% at T2, 9.4% at T3) than L2 English (17% at T2 and ca. 4% at both T1 and T3). Mispronunciations or deletions were most common in L2 English at T1 (13.5%) and less so in L3 German T2 (7%), while quite negligible at other testing times (4.5-0.9%).

As far as CLI is concerned, in L3 German the occurrence of L1-based rhotic production was at 32% (T1) and then increased to 60-61% (T2 and T3), while L2-based English renditions accounted for 9% (T1) to ca. 5% of rhotic productions (T2 and T3). In L2 English the L1-like rhotic productions ranged between 3–7% over three testing times.

3.3 Variability and individual variation

One major difference between the production of the rhotics in the participants' L2 and L3 lies in the occurrence of mixed forms, i.e. sounds that combine articulatory elements of two of the participants' languages. These productions occur exclusively in their L3 German at T1 and T2 and can take on various forms: simultaneous realisations of two L3 sounds ($/x/ + /ʁ/$; $n=4$ at T1), of an L1 and an L3 sound ($/r/ + /ʁ/$; $n=2$ at T1 and $n=3$ at T2), of an L1 and an L2 sound ($/r/ + /ʝ/$, which occurred once at

T2) or of an L2 and an L3 sound (/ɹ/ + /ʁ/, which occurred once at T1).

Substitutions of the rhotic by another speech sound occur in both the L2 and L3, but are overall more frequent in the latter. For both languages, frequency and substitution patterns differ across the three testing times: while at T1, substitutions are only produced in their L3 German by the children (11 times produced as [v] and 4 times as [w]), at T2 the rhotic is substituted in both German (10 [l] and 1 [v]) and English (5 [v], 3 [w] and 2 [l]). At T3, the rhotic is produced as a [l] 12 times in German and twice each as a [v] and [w] in English.

As in all learner groups, inter-individual variation is high: while 3 out of the 16 learners never produce a single rhotic in their L3 German in a target manner at any of the testing points, two produce them faithfully in 80% of all cases across all testing times. Moreover, of the four children who produced the German rhotic with high accuracy at T1, two do not produce it anymore at all at T2 and T3.

4. DISCUSSION

In RQ1 we asked how the production of the rhotics in English and German by Polish L1 speakers changes over time and with increasing proficiency. The group results indicate a U-shaped acquisition of the rhotic in L3 German with an across-group initial accuracy of about 35% that drops to 18% after five months of learning and rises again to 22% after ten months of learning. However, a look at individual learners shows that this U-shape is found for only one learner, while others have different learning curves or show no changes in their accuracy of the production of the German /ʁ/.

The performed statistical tests do not point to any straightforward developmental patterns for the acquisition of L2/L3 rhotics. What seems evident is the difference in target renditions between more proficient L2 English and less advanced L3 German, with the former achieving much higher rhotics accuracy scores across the board. Better target performance in L2 English could be explained in two manners; firstly, as a function of increased language proficiency, and possibly, as a result of the less marked articulation of rhotics in English (alveolar approximant) in comparison with a more articulatory challenging German rhotic sound (uvular fricative). Moreover, the teacher of German used an alveolar trill in class.

In addition, proficiency seems to influence the trajectories of development in the L2 and L3, which followed mirror-like, i.e. reverse patterns with L3 German starting off with relatively the best scores at T1 and more proficient L2 English reaching the

highest scores at T3, while T2 marked a drop in performance in both the L2 and L3. Our findings thus do not quite follow the evident accuracy growth patterns as reported in the only related previous study ([14]). A possible explanation could be that the participants relied more on imitative skills at T1 with their L3 rather than linguistic knowledge.

Some of the learners' acquisition of their L3 German seems to be influenced by their L2 acquisition of English. Although after six years of learning the learners' overall accuracy in producing the English rhotic /ɹ/ is high, at T2 this rate drops and nine out of the 19 children substitute the rhotic by other sounds such as [v], [w] and [l]. At T3, these substitutions are produced by 4 participants at least once. It thus appears that the phonological system of the L2 English of some participants is affected by the learning of a new language in such a way that it becomes more variable. All in all, rhotic sounds which were selected as a focal feature due to their different rendition in the three languages of the multilingual learners, proved particularly interesting in the occurrence of mixed forms and distribution patterns of articulation categories.

In RQ2 we aimed to investigate any differences in the L2 and L3 acquisition process in terms of the sources of phonological CLI. In L3 German the occurrence of L1-like rhotic production was high, thus evidencing considerable influence from the native language. Another, yet less pronounced source of CLI was L2 English. The CLI in L2 English rhotic productions was much less evident: the L1 influence fluctuated between 3–7% and there was no evidence of a reverse transfer in terms of rhotic production, neither from the L3 to L2 (as in [7]), nor from the L3/L2 to L1 (as in [17]).

Our results thus show that at a higher proficiency level (L2 English) the CLI from the L1 was minimal and remained stable across testing times. In turn, at a lower proficiency level, in case of L3 German, the L1 influence was considerable and even increased at later stages, while at the early stages the L2 influence was somewhat more visible than later. These findings partially support some previous research in which L2-accented production in L3 prevails initially, while CLI reverts to the L1 at later stages of L3 acquisition ([7], [17]).

In conclusion, our results demonstrate that an explanatory model of multilingual phonological acquisition needs to include the source of CLI and proficiency as factors influencing the developmental process.

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