

# THE MUTUAL INFLUENCE OF VOWEL LENGTH PERCEPTION IN THE SECOND AND THIRD LANGUAGE

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## ABSTRACT

The aim of the paper is to examine the acquisition of vowel length as a distinctive feature from the multilingual perspective. A group of 26 L1 Polish first-year university students were presented with a discrimination task (ABX) juxtaposing minimal pairs containing vowel length contrasts in their L2 and L3. The participants shared English as their L2 but were subdivided into two groups according to their L3 (L3 German or L3 French). Since German and English share the feature of phonemic vowel length while French and Polish do not, it presents an opportunity to examine the role of typology as a motivating factor of Cross Linguistic Influence. The paper compares the results of the perception task between two foreign languages of a speaker, points to cross-group differences, and discusses the sources of CLI in L2 and L3 phonology.

**Keywords:** L3 acquisition, perception, ABX, CLI

## 1. INTRODUCTION

The field of multilingual phonological acquisition is still not the mainstream area of multilingual investigation. This branch of Third Language Acquisition (TLA) is very much a twenty-first-century domain, as first studies emerged in the 1990, and since then the area has been gradually expanded by such scholars as Cabrelli Amaro [3, 4], De Angelis [6], Gut [9], or Wrembel [15, 16].

TLA research has focused mainly on the Cross-Linguistic Influence (CLI) and factors shaping the acquisition of an additional language (L3/Ln). Determining those factors has been the general focus of the TLA field models which have identified such predictors as language status [1, 7], the learning experience of the speaker [8], or typology [9, 10]. This paper examines the last of these three factors.

### 1.1. Typology in L3 acquisition models

Typology is a frequently quoted source of CLI on the ground of multilingual acquisition: it has been proven to motivate the transfer on the ground of sentence

morphosyntax [11] or lexicon [5], and phonetics [4], [5]. This paper examines language typology as a possible factor conditioning the process of an additional language acquisition. Rothman's [12] Typological Primacy Model (TPM) states that at the initial stage of acquisition a speaker subconsciously selects the language which is typologically the closest, cross-linguistically overlapping mental representations, and employs a holistic transfer of the features exhibited by the typologically closest language. A different approach is presented by Westergaard et al. [14], whose Linguistic Proximity Model (LPM) predicts transfer of the typologically similar features selected on the property-by-property basis rather than the overall typological similarity. Leung [11], in turn, proposes full transfer at the initial stage of acquisition, which is later shaped and modified by TLA experience. It must be noted, however, that none of these models was created with phonology in mind, but rather syntactic and morphological development. The existent phonological acquisition models do not allow for typology as a determining factor for the ease of acquisition and rely mainly on the qualitative proximity of sounds.

### 1.2. Previous studies

In the understudied field of phonological TLA the regressing L3-to-L2 CLI has barely been studied. Most studies have recognised the lateral direction of CLI (Kopečková [10], Gut [9], Wrembel [15, 16]) in observing potential changes; none of those studies, however, was designed with exploring the L3-to-L2 transfer in mind and they focused more on the other direction of lateral CLI (L2-to-L3). The truly pioneering study in the scope of reverse lateral CLI was one conducted by Cabrelli Amaro [3], testing the Phonological Permeability Hypothesis [4]. She found that the newly introduced language had a bigger impact on the L2 than on the L1 of the tested speakers. This evidence of the L2's sensitivity to the features introduced by the new language prompts questions to what extent it is visible in the phonology of typologically close or distant languages.

## 2. THE STUDY

This paper attempts to bring some insight to the effect of L3 experience on the L2 performance in the scope of phonological perception. It also aims to explore how two foreign languages sharing a phonological feature could support each other in the process of vowel discrimination.

The languages included in the study are Polish (L1), English (L2), French and German (L3). The selection of languages allows for exploring typologically-motivated transfer. The understanding of the term ‘typology’ is rather narrow, i.e. the fact that languages exhibit a certain feature. It is hypothesised that L3 German group will outperform the other one, as for this group both foreign languages share the investigated feature, while for the L3 French group, vowel length is present in their L2 only. Assuming multidirectionality of CLI, the extensive training in L3 German should reinforce the presence of the feature in the L2 as well. Given the limited experience with L3, one might look more into the L2 effect on the L3, in which case L3Ger group should also perform better due to the reinforcement of vowel length property coming from the L2 experience.

### 2.1. Methodology

The paper aims to determine (RQ 1) whether the shared property of phonemic vowel length will enhance the performance in L2 vowel discrimination for the typologically matched L3 group when compared to unmatched L3 group and (RQ 2) whether L2 experience with vowel length will enhance the performance in L3 that exhibits the same feature when compared to an L3 which does not. The perceptual tests were designed employing minimal pairs with L2 and L3 vowels, selected on the basis of the PAM-L2 model [2]. According to this model the vowels of a foreign language could be classified as /a/-like, /o/-like and /i/-like categories for a Polish speaker. The Polish system contains only six vowels, while the speakers’ foreign languages exhibit much richer systems, which opens the potential for perceptual assimilation of multiple Ln sounds into single categories of L1. The tested vowels are presented in Table 1:

**Table 1** Cross-language vowel correspondence

	high, front	open, back	open, unrounded
Polish	/i/	/ /	/a/
English	/ /, /i:/	/ /, / :/	/æ/, / /, /a:/
German	/ /, /i:/	/ /, /o:/	/a/, /a:/
French	/i/, /y/	/o/, / /	/ɑ/, /a/

### 2.2. Participants

The participants of the study were 25 Polish first-year university students of a foreign language philology. They passed final exams in L2 English at the B2 level and are receiving extensive training in L3 (300hrs of language classes during an academic year) starting from the elementary level. They were divided into two groups determined by their L3 – German or French (L3Ger vs. L3Fr). There were 7 males and 18 females, with the average age of 23 (SD=2.4). They reported no injuries or ailments affecting their memory or hearing. The learning experience of L2 was on average 11.6 years. The participants started the course in their L3 from the basics 6 weeks prior to the testing session, however, it must be noted that a few of them had had some previous exposure to the language and could therefore be classified as false beginners.

### 2.3. Stimuli

The tested vowels were imbedded in mono- and bisyllabic words of the respective languages, i.e. minimal pairs featuring the sound in various phonological contexts. In order to provide conditions for CLI to occur there was no attempt to maintain a monolingual language mode; the instructions for the task were given in L1 Polish, and the tasks employing the foreign languages of participants were used intermittently within a bigger project, to activate all languages known by the speaker. The perceptual sensitivity was tested on an ABX discrimination task, which presented 4 pairs for each vowel contrast, each twice (a total of 28-32 tokens depending on the language) with a counterbalanced order of the AB stimuli. In each language two standard-accented native speakers were used to create stimuli – one to provide stimuli A and B, and another for the X stimulus in order to allow for inter-speaker variation and hence ensure that the tested skill relied on categorical perception rather than perception of acoustic similarity.

### 2.4. Tasks

Testing took place in a quiet room. The participants were asked to perform an ABX perceptual discrimination task – a standard task presenting two different words and a third one, which is a repetition of either of the former two words. The task of the listener was to determine whether the third word (X) was the same as the first (A) or the second one (B).

For each language task participants heard minimal pairs containing the vowels predicted to the same L1 category by the Polish speaker according to the rules of the PAM-L2 model. The task was carried out

separately for the participants' L2 and L3. The task was conducted in E-Prime 2.0., collecting accuracy and Reaction Time (RT) scores for each stimulus, using semi-open headphones to ensure the proper quality of the stimulus. The words in each series of stimuli were presented to the participants with 500ms intervals, with 1500ms to answer and no orthographic reinforcement of the stimuli was provided.

### 3. RESULTS

The results were analysed for accuracy rate and Reaction Time both across groups for L2 English and respective L3s as well as within groups for performance in second and third language. One L3Ger student had to be excluded as their score constituted an outlier both in L2 and L3 results.

The scores were analysed using Jamovi statistical programme. For each participant the average accuracy was calculated for L2 and L3, and ANOVA test was run to examine the significance of the group (L3Ger or L3Fr) and language (L2 or L3) on the accuracy and RT scores for vowel discrimination.

#### 3.1. Performance in L2 English

The study generated 768 scores for accuracy and RT each. The outlying scores having been eliminated based on z-scores, the results showed normal distribution. Overall, the accuracy of the participants of both groups was above the chance level at  $M=64%$ , ( $SD=12.7$ ) for L3Ger and  $M=71%$ , ( $SD=9.7$ ) for L3Fr. However, the accuracy scores did not differ significantly across groups ( $p=.11$ ), and neither did the scores in RT with  $M=676ms$  for L3Ger; and  $M=658ms$  for L3Fr ( $p=.60$ ).

**Table 2.** The overall L2 performance for groups L3Ger and L3Fr by vowel

	vowel	group	Accuracy (%)
<i>Mean</i>	START	L3Ger	60.3
		L3Fr	72.3
	STRUT	L3Ger	50.8
		L3Fr	53.8
	TRAP	L3Ger	75.0
		L3Fr	86.5
	FLEECE	L3Ger	76.5
		L3Fr	76.5
	KIT	L3Ger	69.8
		L3Fr	84.9
	LOT	L3Ger	55.8
		L3Fr	48.1
	THOUGHT	L3Ger	63.5
		L3Fr	75.0

The performance of the participants is shown in Table 2, where the items are split by the vowel

featured as the target of the set. It uses keywords adapted from [13] to present the scores for the success rate in identifying the correct sound. The most prominent difference between the groups was apparent in the ability to identify the KIT vowel, in which t-test score approached significance at  $p=.06$ . The L3Fr group was consistently better in identifying the vowels with an exception of LOT. The difference in average accuracy scores for identifying vowel length as the determiner for the successful discrimination was not significant ( $p=.13$ ).

**Table 3.** Length as L2 accuracy predictor for both L3 groups.

	length	group	Acc (%)	RT (ms)
<i>Mean</i>	long	L3Ger	66.3	682
		L3Fr	74.4	655
	short	L3Ger	62.2	669
		L3Fr	67.6	662

The comparison of the scores according to vowel length, as presented in Table 3, showed that the two groups performed similarly in classifying both types of vowels, and L3Fr made the decision quicker. In the sets where the target word exhibited the longer vowel from the presented pair, there is a tendency for the participants to respond later, however the difference is more visible in the individual comparison than in the juxtaposition of overall scores ( $p=.66$ ).

#### 3.2. Performance in L3

The second aim of the study was to explore the between-group competence in vowel discrimination in the newly acquired L3 of the participants. The assumption was that if the typological similarity aids the performance, L3Ger group will perform better due to the phonemic vowel length, a feature supported by L2 English experience, and absent in the language of the L3Fr group. The difference in the overall performance of the two groups was not statistically significant ( $p=0.14$ ), but the differences in accuracy scoring showed a tendency opposite to the expectations; the group that achieved better results was the L3Fr ( $M=71%$ ,  $SD=5.7$ ) rather than L3Ger ( $M=66%$ ,  $SD=10.7$ ), despite the absence of the vowel length feature in the French language. This difference was statistically significant ( $p=.03$ ).

### 4. DISCUSSION AND CONCLUSIONS

The results demonstrated no group differences based on the facilitative role of typology as far as the investigated feature of vowel length distinction was concerned. The accuracy scores for vowel discriminations did not differ significantly across L3Fr and L3Ger groups. Therefore, the hypothesis of

a mutual support of typologically similar languages cannot be confirmed. Contrary to the preliminary hypothesis, it was the French group that performed better in the discrimination of both L2 and L3 vowels. It was expected that L3Ger group would perform better due to typologically motivated positive transfer (i.e. phonemic vowel length in both languages), but the results of L2 vowel identification do not support such a conclusion. The fact that the L3Ger group did not outperform the L3Fr group in L3 vowel identification puts a question mark on the theories of the full transfer at the initial stage. As far as RT scores are concerned, there were no differences between stimuli with long and short vowels in the target position in L2 ( $p=.94$ ). This contradicts the expectations, according to which the vowel length distinction should be easier for the L3Ger group due to a greater experience with this feature of a vowel.

However, as the results are not conclusive, it is not possible to conclude that typology plays no role in the phonological scope of the initial stages of TLA. More studies need to be conducted to further explore the subject and shed more light on this aspect of multilingual acquisition. Perhaps there is more to be found on the ground of production rather than perception of the sounds by a multilingual learner.

The results have shown that the answer to both research questions is not positive: (1) extensive exposure to L3 with vowel length does not enhance the performance in L2 vowel length discrimination and (2) L2 experience does not support the performance in L3 despite the shared typological properties. The results showed no definite support for typological similarity being a predictor of the performance and did not corroborate predictions made by typologically-focused TLA models – the attested transfer did not prove to occur holistically (as in TPM [12]) nor by property (as in LPM [14]). More research is needed to form specific conclusions as for the role of typology in lateral CLI on the ground of vowel length perception and the mutual support that could be provided by the languages which are typologically similar.

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