ONE CORPUS, ONE RESEARCH QUESTION, THREE METHODS - GERMAN VOWELS PRODUCED BY FRENCH SPEAKERS

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1. INTRODUCTION

Learning a foreign language (L2) after puberty is not an easy task. Especially interference from the phonological and phonetic system of the native language (L1) is one of the main reasons for this difficulty.

One aspect that has received considerable amount of attention is the acquisition of vowels in L2 (e.g., among many others, [5, 9, 13, 14]). Computer assisted language learning is one way to train and improve perception and production of various L2. For successful implementation of software solutions, phonetic learner corpora are essential.

Such a phonetic learner corpus has been created in the course of the project IFCASL ("Individualized Feedback for Computer-Assisted Language Learning", http://www.ifcasl.org) [4, 12] which investigates the problems that arise in the French-German language pair. This corpus, for instance, allows for the investigation of the interference French speakers have with German vowels. The data of the corpus can be analyzed with different methods, which focus on different aspects of this problem, and which ultimately contribute different results which create a more detailed analysis of the processes in question.

The German and French vowel systems are an interesting possibility to study L1-L2 interferences for several reasons. The German vowel system consists of 16 monophthongs with long and tense as well as short and lax vowels /iː, eː, ɛː, aː, oː, uː, yː, øː, ɪ, ɛ, a, ɔ, ʊ, ʏ, œ, ə/. On the other hand, the French vowel system exhibits similar properties, but also important differences in comparison to the German vowel system. These differences occur on the phonological and phonetic level [3]. The French vowel system uses 11 oral monophthongs: /i, e, ɛ, a, y, ø, œ, u, o, ɔ, ə/, see e.g. [10]. This means that the two systems are quite similar with respect to contrasts in vowel height and roundness, although there seem to occur small acoustic differences between the two languages (e.g. [11]). However, crucially, French does not contrast long and short vowels, but German does [10, 3].

In specialized teaching materials the problem of vowel length/tenseness has been recognized (see e.g. [6, 7]). However, it is still unclear how frequent vowel errors occur among the learners and which pairs of long and short vowels create the most serious difficulties for learners and also native listeners. We shortly present three methods to analyze the interference processes occurring in the L2-productions of French learners of German. We also show the different results which are all based on the IFCASL learner corpus to illustrate that the interference has several aspects which can be investigated with different methodological approaches.

2. METHODS AND RESULTS

All analyses have been carried out using parts of the IFCASL learner corpus. The corpus consists of recordings of read speech from French learners of German and German learners of French in both their respective L1 as well as their respective L2.

2.1. Automatically Extracted Confusion Matrices

A first investigation of the vowel productions of French speakers is an automatically generated list of production alternatives, based on the annotations that are part of the corpus [4, 8, 12]. Results indicate the two vowels that were the most difficult were /œ/ which was correctly produced in 57% of the cases, and as [ø or øː] in 24% of the cases, and /ʏ/ which was realized correctly 63% of the time ([y,yː] in 24% of the cases). The short /a/ was the vowel that was labelled as being produced correctly most often, that is, in 91% of the cases, its long counterpart /aː/ was labeled as being correctly produced in 83% [a] in 16% (see [8]). This study gives an overall impression which segments were produced correctly, and we can see on an overall level, which vowels seem

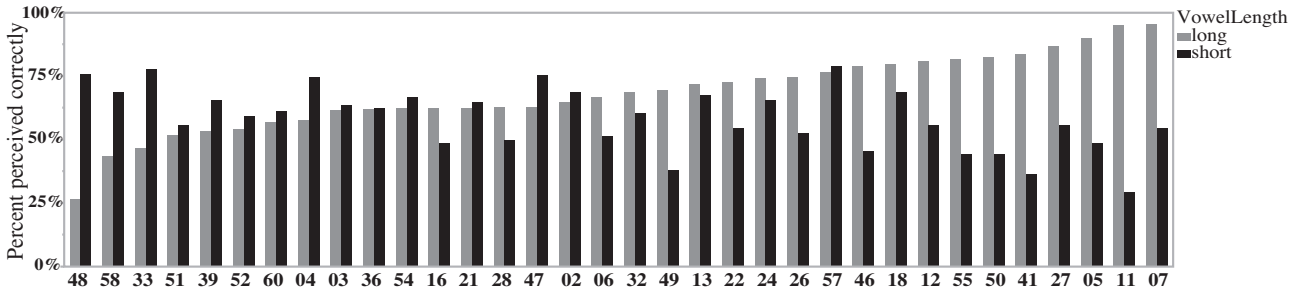

Figure 1: *Percent of correctly perceived vowels depending on the speaker and vowel length for the BEG group.*

to be harder to produce correctly for French learners of German, and which vowels seem to be easier.

2.2. Perception Experiment

The second analysis we present focuses on the perceptual side of the French learners' productions [14]. While for the first investigation, trained phonetics students provided the basis for the analysis, in this case, listeners decided what word they heard. In the German part of the corpus, 11 (near) minimal word pairs with the vowel as the crucial difference were recorded (e.g. /iː/ vs. /ɪ/: *Miete* 'rent', *Mitte* 'mid'). All of these words were excised from their sentence context. These words were played in isolation and 11 native German listeners indicated in a forced choice perception experiment, which member of the minimal pair they heard. For the experiment, 1157 items were played to the listeners. Results indicate that long vowels were identified correctly 76.6% of the time, whereas short vowels were perceived correctly in 63.9% of the cases, a difference that proved to be significant. We also found that advanced learners (ADV) were perceived more often correct compared to beginners (BEG). BEG were correctly perceived as long in 69.5% of the cases, and as short in 58.4% (see Figure 1 for the BEG), whereas ADV learners were perceived correctly 86.9% for long vowels, and 72.2% for the short ones. Generally, speakers seemed to have more problems with round vowels than with unround vowels. Furthermore, individual differences were found, some speakers were better in producing long vowels compared to short vowels, but others showed the opposite tendency. Some were equally correct in both cases, others were equally incorrect for long and short vowels.

2.3. Acoustic Measurements

The third method that is presented here used the results of the perception experiment as point of departure. Based on the individual patterns (see Figure 1 for the BEG), we chose six speakers varying with respect to the ratings in the perception task (having short and long vowels perceived well, with a bias for either short or long vowels, or being perceived bad for both categories, e.g., speaker 51 in Figure 1. All segments of the words were hand-labelled and analysed with PRAAT [1]. Duration, as well as formant values at vowel mid-points were analyzed. Whereas the number of speakers is too small for statistical evaluations, the patterns that emerged were quite striking. Most of the speakers did not differentiate the vowel categories correctly, with a great overlap regarding their duration. Furthermore, they also showed some problems to produce acceptable formant values. Thus, the individual differences can be used for the creation of an individualized vowel training software that focuses on duration as well as formant values of vowel productions [2].

3. SUMMARY

In this article, we presented three methods that investigated the vowel production of French learners of German. All these methods used the same data base. Depending on the method the results shed light on slightly different aspects of the same process, the interference of the French phonetic and phonological system on the production of the German L2 vowels. Whereas the first method revealed that especially rounded vowels are problematic in the long/short distinction, we could show with the second method, that particularly [oː - ɔ] seem to be hard to produce for French learners. The third method corroborated this finding and added acoustic details on duration and formants. The results of the studies can be used to create individualized training and feedback for foreign language learners, aimed at reducing their accent in L2.

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