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## Methods of investigating vowel interferences of French learners of German

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The French and German vowel inventories (Fougeron & Smith, 1999; Kohler, 1999) show many similarities, for instance, both have the front rounded vowels [y, ø, œ]. Contrary to German, French has no vowel length contrast. Although specialized teaching materials for German consider the problem of vowel length/tenseness (e.g. Hirschfeld, 2014; Hirschfeld et al., 2007), it is still unclear how frequently vowel errors occur in L2 speech and which pairs of long/tense and short/lax vowels create the most serious difficulties for French learners of German. We present three methods to analyze the interference processes occurring in read speech of French learners of German (Trouvain et al., 2014). The investigated material covers all monophthongal full vowels from 60 sentences read by 30 beginners and 20 advanced learners as well as 40 native speakers.

First, we analyzed phone confusion matrices of the non-native speech that was hand labeled by German annotators. The lowest scores of correctness were shown for /œ/ (57%), /ʏ/ (63%), and /ɛ:/ (68%), with /ø:/, /y:/, and /e:/ as the main substitutions. Second, in a perception study based on the investigated material, German native speakers listened to words belonging to minimal pairs like *Miete* /'mi:tə/ - *Mitte* /'mɪtə/ ('rent-middle') differing in length/tenseness. Correct identification of native speech was 98%. The results for the learners indicate that, overall, short vowels were identified correctly less often (64%) than long vowels (77%), but with great inter-individual differences. The vowels with the lowest perception score were /ɔ, œ, ʏ/ with wrong identifications of 65% (beginners) and 47% (advanced). Although most problems occur in the beginner group, every second advanced learner shows for short vowels an identification rate lower than chance, which means they were perceived as long by German native listeners. Finally, acoustic measurements of the minimal pair words revealed different strategies: some learners tend to lengthen while others tend to shorten vowels.

The results of these three investigations help to create a more detailed account of the transfer of vowel contrasts, extending prior research on vowel perception (Kingston, 2003; Flege & MacKay, 2004), with orthography as a possible source of interference. Furthermore, the results of the studies can be used to create individualized training and feedback for foreign language learners.

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