

VOWEL PERCEPTION AND PRODUCTION OF LATE TURKISH LEARNERS OF L2 GERMAN

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ABSTRACT

The objective of this study was to test whether quantity and/or quality distinctions are problematic for Turkish learners acquiring L2 German. The perception and production of the German long/short vowel pairs /i:/-/ɪ/, /a:/-/a/, and /u:/-/ʊ/ by a group of Turkish high school learners of L2 German were compared to an age-matched control group of German native speakers. The results of both the perception and the production experiment show that quality rather than quantity is the difficult feature for Turkish learners to acquire. Further, orthography seems to play an important role. For reasons of comparison, data on the production of the corresponding Turkish short vowels were collected as well. The results show clearly that the Turkish learners transfer the quality of their Turkish vowels to their production of German vowels.

Keywords: cross-linguistic perception/production, vowel quality, vowel quantity, Turkish, German

1. INTRODUCTION

About one fifth of the world's languages exhibit vocalic quantity distinctions, i.e. durational differences in the production of vowels [5]. German is one of them, though for most of the contrastive vowel pairs there is a complex interplay between durational and spectral features [4]. With the exception of the vowel pair /a/-/a:/, German long vowels are generally tense, while German short vowels are lax.

The phonological status of vocalic quantity distinctions in Turkish is not clear. Though there are scholars who specify long vowels as part of the phonemic system of Turkish [3], some German as a Foreign Language (GFL) scholars limit the existence of long vowels in Turkish to foreign words and conclude that quantity (and quality) distinctions are therefore a major problem for Turkish learners acquiring German as an L2 [8]. Empirical studies on other languages as L1 and L2 have further come to the conclusion that success in

learning a quantity contrast in the L2 seems to be related to the role of the duration feature in the L1 [6].

In order to empirically test the hypothesis that quantity and/or quality distinctions in German are problematic for Turkish learners acquiring L2 German, a perception and a production experiment were conducted with Turkish GFL students and a German monolingual control group. The results of the experiments show that the problems of Turkish GFL learners with the long-short vowel distinctions in their L2 are not all-inclusive, but depend more on quality than quantity distinctions (perception and production experiment) and the often neglected influence of orthography (production experiment).

2. EXPERIMENT 1: PERCEPTION

2.1. Subjects

22 Turkish participants (experimental group) and 21 German participants (control group) took part in the experiment. The Turkish learners were high school students at a German school in Istanbul where they had received 3 years of intensive GFL instruction (first year: about 20h/per week, the following years about 10h/per week). The German native speakers were high school students in the west of Germany (Dortmund), a region where Standard German is spoken.

Of all participants, 20 per group were analyzed for the perception experiment. Ø age Turkish group: 17.5 (SD=.5); 6 female, 14 male participants. Ø age German group: 17.9 (SD=.7); 12 female, 8 male participants.

2.2. Experimental design

In order to test whether quality and/or quantity is problematic for Turkish GFL learners, the German long vowels /i:/, /u:/, /a:/ and the German short vowels /ɪ/, /ʊ/, /a/ were manipulated in reminiscence of a design used by Sendlmeier [9].

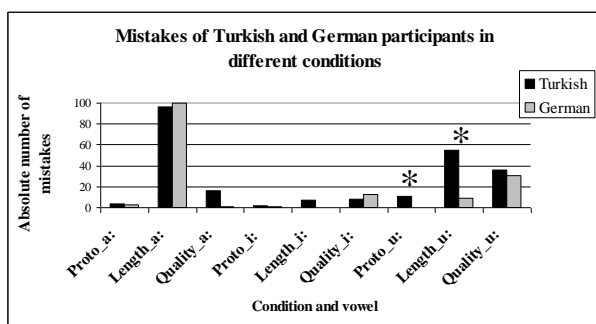
With the help of PRAAT, a prototypical long vowel (spoken by a female German native speaker)

was shortened (by cutting out whole periods from the middle of the vowel) to the average length of its corresponding short counterpart, whereas a prototypical short vowel was lengthened (by replicating whole periods) to the average length of its corresponding long counterpart. For the discrimination task, nonsense word pairs were then matched for three conditions: (1) condition “proto”: non-manipulated long vowel vs. non-manipulated short vowel, e.g. /bu:p/ vs. /bʊp/, (2) condition “length”: lengthened short vowel vs. non-manipulated long vowel, e.g. /bʊ:p/ vs. /bu:p/, (3) condition “quality”: shortened long vowel vs. non-manipulated short vowel, e.g. /bʊp/ vs. /bʊp/. Each vowel pair was judged 5 times in each condition for being “same” or “different”, plus the control condition “clearly different” (/bap/ versus /bɪp/) and 20 filler pairs (“same”) such as /bu:p/ vs. /bu:p/. In all, each subject rated 80 nonsense word pairs, presented in blocks of 8. The experiment lasted about 5 minutes.

2.3. Results

As expected, almost all instances of the manipulated “a-pair” (= /a/-/a:/ vowel pair) in the condition “length” were rated wrongly as “same” (s. Figure 1), as this pair – in contrast to the others – is distinguished solely on the basis of duration. Hence, when /a/ is lengthened, it should sound like a true /a:/.

Figure 1: Results perception experiment.



The programming language “R” [7] was used to calculate in which condition and for which vowel pair the Turkish participants differed from the German control group. Due to the problem of multiple testing, α was adjusted according to the Bonferroni correction, hence, α was set at .006.

As can be inferred from Figure 1, significant differences could be detected for the “u-pair” (see asterisks): For the condition “length”, the group difference was highly significant with $p < .001$

($U=48$), for the condition “proto”, the group effect was significant at $p=.003$ ($U=120$).¹

2.4. Discussion

Turkish participants only had obvious difficulties keeping spectral differences apart, as nonsense words in condition “Length_u” had the same length but different quality, i.e. spectral properties. However, this was only true for the “u-pair”. Interestingly, none of the “quality” conditions showed significant differences between groups, which suggests that the duration feature does not pose a prominent problem for Turkish learners of L2 German. Because of the relationship between perception and production in second language speech learning [2], it was expected to obtain similar results in the production experiment, namely no difficulties in the quantity distinction.

3. EXPERIMENT 2: PRODUCTION

The same subjects as above participated in the production experiment. For the acoustic analysis, 8 randomly chosen participants (4 female/4 male) per group were analyzed.

3.1. Experimental design

In the production experiment, a simple picture naming task was used to elicit speech data from the participants. The pictures depicted monosyllabic words that were taken from the Turkish participants’ GFL exercise book *Delfin*, in order to ensure that the learners would know the words.

The same point vowels as in the perception experiment were of interest (/i:/ /ɪ/ /a:/ /a/ /u:/ /ʊ/). For every vowel three words were elicited; as an example, for the vowel /i:/ the words *Dieb* (“thief”), *Lied* (“song”) and *Spiel* (“game”) were chosen.

For reasons of comparison, the Turkish participants did the same production experiment in their native language as well, again with three words for each of the relevant Turkish vowel categories (/i/ /a/ /u/). For the vowel /i/, for example, the words *bin* (“thousand”), *diş* (“tooth”) and *sis* (“fog”) were elicited.

Pictures were presented digitally on a computer screen; recordings were made with a DA-P1 DAT recorder and a Sennheiser ME 62 microphone in a quiet class room. All 18 items (for the German production task, 9 more for the Turkish) had to be named three times (three runs in random order).

3.2. Measurements

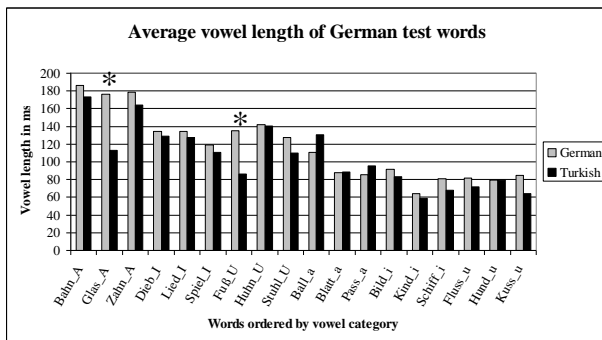
Quantity (duration of vowels in ms) and quality (F1 and F2 values) measurements were done in PRAAT. After labeling on- and offsets of the vowels, length and formant values (F1 and F2) were taken from the spectrogram through a script. Results were double checked and corrected by hand or labeled as missing data, if the automatic measurement yielded erroneous results.

3.3. Results and discussion

3.3.1. Quantity

Tests for group differences were conducted for every single word because averaging the respective words for each vowel category would have yielded misleading results, as it would have been due to certain words only that group differences would exist.

Figure 2: Results production experiment. Quantity



The two words for which Turkish speakers produced significantly shorter vowels (with a corrected α at .003) were *Glas* (“glas”, $p<.001$, $U=.5$) and *Fuß* (“foot”, $p<.001$, $U=0$), the only items that differ in their orthographic marking of vowel length. While in all other test words, long vowels are marked in the orthography by either the so called “lengthening h” (*Dehnungs-h*) or <ie> for /i:/, the writings of *Glas* and *Fuß* are not as straightforward.

The “lengthening h” in German helps readers (and learners) to know that the vowel preceding <h> is long; however, this marking is not mandatory. Words exist, for which it is not immediately clear whether the vowel is short or long. For example in the word *das* (“the/this”), the vowel is short (/das/), while in a word like *Glas*, the vowel is long (/gla:s/). Apparently, this orthographic inconsistency is a problem for GFL learners, which is reflected in their shorter production of long vowels.

3.3.2. Quality

Figures 3-6 show the acoustic vowel spaces (F2 plotted against F1) of different groups and vowel categories. Because both the German and the Turkish group had female and male speakers (4/4 each), formant values were normalized by the Lobanov method.

Figure 3: German LONG vowels spoken by German native speakers (black) and Turkish learners (red).

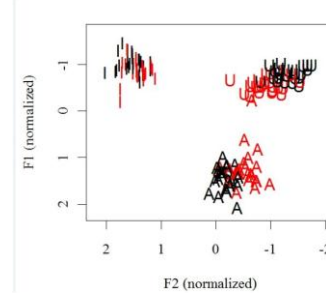


Figure 4: German LONG vowels (black) and Turkish vowels (green) spoken by native speakers.

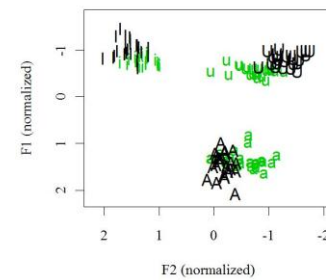


Figure 5: German SHORT vowels spoken by German native speakers (black) and Turkish learners (red).

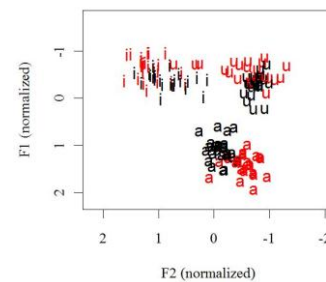
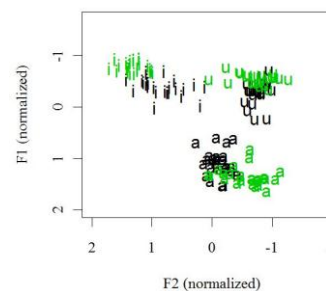


Figure 6: German SHORT vowels (black) and Turkish vowels (green) spoken by native speakers.



The plots (of each person's averaged word item) show that productions of German short and long vowels by Turkish foreign language learners (s. Figures 3 and 5) have an overall tendency to resemble the vowel qualities of their mother tongue (s. Figures 4 and 6) and thus diverge clearly from German native productions (seen in all figures as black).

Test for group differences (native German speakers versus Turkish learners, s. Figures 3 and 5) on both F1 and F2 values showed that almost all vowels (except /i:/) differ significantly in either the horizontal or the vertical dimension (s. Table 1). As can be seen in Figure 4, /i/ is the only Turkish short vowel that is similar in quality to the German long counterpart, hence, Turkish learners do not produce the quality of German /i:/ significantly different from German native speakers.

Yet, all other vowels differ significantly according to the different qualities of the Turkish vowels: For example, German /a:/ and /a/ are produced significantly further back by Turkish learners, as their native /a/ is also located further back in the acoustic vowel space.

What is further evident is that all German short, lax vowels are produced with less centralized F1 and F2 values by Turkish learners. Since the native Turkish vowels are more decentralized than the German short vowels, this quality is transferred to the production of the L2 vowels. Table 1 shows the test results for group differences. As in the previous tests, α was adjusted according to the Bonferroni correction ($\alpha = .008$).

Table 1: P-Values (and U-Values) for group differences (native German speakers versus Turkish learners).

| | /a:/ | /a/ | /i:/ | /i/ | /u:/ | /u/ |
|-----------|--------------------|--------------------|------------------|--------------------|-------------------|--------------------|
| F1 | p=.14 (U=360) | p<.001* (U=87) | p=.02 (U=171) | p<.001* (U=449) | p<.001* (U=71) | p<.001* (U=451) |
| F2 | p<.001* (U=519) | p<.001* (U=511) | p=.04 (U=388) | p<.001* (U=116) | p<.001* (U=90) | p=.24 (U=212) |

4. GENERAL DISCUSSION

Both the perception and the production experiment show that the quantity distinction in German is not per se problematic for Turkish learners of L2 German. This finding supports assumptions made by Bohn [1] who claims that duration cues (in vowel perception) are easy to access whether listeners have had specific linguistic experience with them or not. The same seems to be true for production; however, the influence of orthography should not be underestimated. It was found that Turkish learners do produce some German long

vowels significantly shorter than German native speakers; yet, this seems to be due to orthographic, not phonological interference.

As for the quality dimension, things seem to be different. From the plots it becomes evident that the Turkish speakers transfer the quality of their native vowels to the quality of their L2 vowels. In this respect, transfer does seem to play an important role, though this concept is certainly not the only factor in second language speech learning.

5. REFERENCES

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¹ It needs to be noted that the group effect in condition "Proto_u" would not be significant if only one German participant had made one mistake in this condition or if only one Turkish participant had made one mistake less. For this reason the effect should be interpreted with caution and I will refrain from its discussion in the current paper.