Frequency effects in production and perception of long vowels in Turkish

The nature of representations whether they are categorical or gradient is an intriguing question in phonology. In the discussion of phonological representations, the classical approach is challenged by usage based models which suggest gradient and dynamic representations that directly emerge from the linguistic experience (input) instead of discrete, static, abstract and economical (non-redundant) representations and rules. Mostly a probabilistic view is adopted in these models to capture the gradient and dynamic nature of the mental representations that they advocate. This study aims to understand whether the linguistic experience of Turkish speakers have an effect on their knowledge of the phonology of their language and linguistic processes like production and perception using two experiments. The representation of lexically specified vowel length is chosen due to its special status in Turkish. This type of length in Turkish is not optional or predictable and gives rise to variation and confusion among speakers.

To make headway into the study, 1722 words with lexically specified vowel length have been sorted out from the official Turkish Language Dictionary (TDK, 1974) and analyzed in terms of i) the syllable structure of words, ii) the vowel of the syllable following the long vowel iii) the consonant preceding or following the long vowel. The patterns that have emerged from this analysis can be seen in Tables (1) & (2). Additionally it has been observed that, long vowels are mostly surrounded by the sonorants [m, n, l, r] (35%) and the vowels that follow the long vowel usually do not agree with it in backness feature (73%) despite the within-word frontness/ backness vowel harmony rule in Turkish.

These regularities suggest that we can construct a prototypical word with a lexically specified long vowel. If the representations are influenced by these patterns we would expect nonce words to be formed that are closer to the prototype to be produced and perceived with long vowels with higher rates than the words that are far from the prototype. A further prediction is that nonce words, which are lexical neighbors of the existing words with long vowels would also influence the representations.

Our predictions are borne out by experiments. In the first experiment, the relation of different frequency effects (frequency of patterns vs. exemplars) and language production is investigated with the help of nonce items that are created using the results of the distributional analysis of long vowels and lexical neighborhoodness. There are four sets of words i) prototypically long (PRO), ii) similar to the existing words with long vowels (EXE), iii) both prototypical and similar to existing words (BOTH) and iv) prototypically not-long and not similar to existing words with long vowels (NONE). The results obtained from 40 participants (mean age: 20.9) have shown that linguistic experience has an effect on the production of long vowels in Turkish (Table 3). Although statistical analysis is not complete yet, the findings suggest that lexical neighborhood effects is more influential than the frequency of patterns effect in production of long vowels in Turkish.

The nonce items are tested for perception as well (20 participants, mean age: 20.7). The long and the short versions of the items are recorded and the participants have listened to both versions and are asked to judge the well-formedness of the items on a scale of 1 to 5. The results are observed to be consistent with the results of the first experiment (Table 3). The BOTH set is rated with highest well-formedness rates for the version with long vowels while NON set is rated with lowest well-formedness rates for the long versions.. Similar to the results of the first experiment, also in the second experiment lexical neighborhood effect seems to weigh more than the frequency of patterns effect.

These results suggest that there is a correlation between production and perception of long vowels in Turkish and the linguistic experience of the speakers. When both types of frequency effects i.e. frequency of patterns and lexical neighborhoodness are used creating nonce words, the versions with long vowels are favored. When they are used independently lexical neighborhood effect appears to be more powerful than the effect of frequency of patterns.

Özge Sarıgül   LSA 2011
Bogazici University

Results of the analysis of distributional patterns of long vowels

Table 1. Distribution of Long Vowels

vowels	% in total
a:	68%
i:	22%
u:	8%
other (e:,ı:,ö:,o:,ü:)	2%

Table 2. Position of the Long Vowels

		% in total
syll. number	2	53%
	3	33%
	other (1,4,5,6)	14%
position	penult	73%
	other	27%

Table 3. Results of Production (EXPI) and Perception (EXPII) Experiments

	type of nonce	BOTH	PRO	EXE	NON
EXPERIMENT I	% of words produced with long vowels	53%	21%	31%	0.80%
EXPERIMENT II	rates for the long version (1-5)	4.7	4	4.3	2.7
	rates for the short version(1-5)	2.7	3.7	3.3	4.5

Selected references:
        Bod, R, Jennifer Hay, and Stephanie Jannedy et. al 2003. (eds.), *Probabilistic Linguistics*. Cambridge, MA: MIT Press.
        Bybee, J. 2001. *Phonology and language use*, Cambridge U.K: Cambridge University Press.
        Chomsky, N., and M. Halle. 1968. *The sound pattern of English*. New York: Harper and Row.
        Pierrehumbert, J. 2001. Stochastic phonology. GLOT 5:6, 1-13.
        TDK (1974), *Türkçe Sözlük*, 6. baskı, TDK yayını, Ankara.