No Crossing Constraint: Evidence from vowel harmony
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While many phonologists have taken the No Crossing Constraint (NCC) (Goldsmith 1976, Hammond 1988) as a principle of autosegmental phonology, and one that is generally assumed to be inviolable (e.g. Beckman 2004, Gussenhoven & Jakobs 2011, Hyman 2014), others have presented significant arguments against its universal validity (e.g. Coleman & Local 1991, Archangeli & Pulleyblank 1994). In this paper, we present a novel type of evidence for the NCC, based on experimental data involving Turkish vowel harmony.

If the NCC is a principle of Universal Grammar (UG), we expect that speakers should extend it naturally to phenomena for which they have little or no direct evidence. We present experimental evidence showing that Turkish speakers apply the NCC when called upon to calculate vowel harmony in an environment that is infrequent in the Turkish lexicon and in the hypothetical mirror image of that environment, which is absolutely non-occurring in the Turkish lexicon. The speakers’ observed behavior could not be derived from simply matching frequency patterns in the input, and it (in part) contradicts facets of the classroom instruction they would have received in the Turkish school system.

In Turkish canonical vowel harmony (CVH), specifications for the features [±back] (and [±round]) spread (or are copied) from the immediately preceding vowel onto an underspecified suffix vowel (see (1), where the underspecified suffix vowel is [+high] and (2) where it is [-high]; see also a simplified autosegmental illustration in (3)). CVH is pervasive in Turkish input; CVH is the object of early and intensive classroom instruction (starting in elementary school); and the trigger vowels for CVH are transparently represented in standard Turkish orthography. As a separate phonological process in Turkish, generally, velarized (Dorsal) [ɫ] occurs in the environment of [+back] vowels, and non-velarized (Coronal) [ɫ] in the environment of [-back] vowels (see (4) – note that this also suggests that laterals participate in harmony processes, and may have a V-Place node (see Levi 2001; see also Nevins 2010 for a similar argument). (Actual) noncanonical VH (ANVH) arises when a lateral pre-specified for [Coronal] exceptionally follows a [+back] vowel (see (5b) – compare with (5a)), thereby blocking the spreading of the vowel’s [+back] feature (see the simplified illustration in (6a)), and instead spreading its [Coronal] (i.e. [-back]) feature to a following underspecified vowel (see (6b)). ANVH is infrequent; ANVH is not the object of systematic instruction (rather, individual cases, if mentioned, are dismissed as exceptions); and the trigger consonant for ANVH is orthographically opaque (both [ɫ] and [l] are represented as <l>). We take noncanonical Turkish vowel harmony to be an example of a UG-related locality effect in phonology.

Our analysis predicts that Turkish speakers should extend the blocking effect of a pre-specified lateral to the mirror image, although no actual cases occur in the Turkish lexicon: hypothetical noncanonical VH (HNVH) would then arise if a lateral pre-specified for [Dorsal] exceptionally followed a [-back] vowel, hypothetically blocking the spreading of the vowel’s [-back] feature and spreading its own [Dorsal] feature to a following underspecified vowel (as in (7)); however, [Dorsal] laterals never follow [-back] vowels in (actual) Turkish.

In order to test this, we presented Turkish native speakers (n=14) with 256 Turkish words and pseudowords and asked them to choose the correct suffix variant. Half of the stimuli were presented both auditorily and visually; the other half, auditorily only. As shown in (8a-b), all performed very well on CVH. With the potentially misleading effect of Turkish orthography removed (auditory presentation only), on both words and pseudowords, the speakers display knowledge of ANVH (see (8c)). Crucially, Turkish speakers behave as expected on HNVH with auditory-only presentation (see (8d)). Given the near-ceiling performance on CVH (which, as with classroom instruction, ceteris paribus leads one to expect near-floor performance on ANVH/HNCV) and the paucity (ANVH) or total absence (HNVH) of
relevant exemplars in the input, these findings provide evidence that phonological representations are highly abstract and display the kind of locality effects predicted by the NCC.

Examples:

(1) a. ün-ü [ny] ‘(his) fame’ { [+high] [-back] [+round] } { [+high] [-back] [+round] }
c. kuş-u [kuʃu] ‘(his) bird’ { [+high] [+back] [+round] } { [+high] [+back] [+round] }
d. kız-ı [kuʃu] ‘(his) girl’ { [+high] [+back] [-round] } { [+high] [+back] [-round] }
e. göz-ü [gɔzı] ‘(his) eye’ { [-high] [-back] [+round] } { [+high] [-back] [+round] }
g. dost-u [dostu] ‘(his) friend’ { [-high] [+back] [+round] } { [+high] [+back] [+round] }
h. at-a [atu] ‘(his) horse’ { [-high] [+back] [-round] } { [+high] [+back] [-round] }

(2) a. ün-e [yne] ‘(to the) fame’ { [+high] [-back] [+round] } { [-high] [-back] [-round] }
c. kuş-a [kuʃa] ‘(to the) bird’ { [+high] [+back] [+round] } { [-high] [+back] [-round] }
d. kız-a [kuza] ‘(to the) girl’ { [+high] [+back] [-round] } { [-high] [+back] [-round] }
e. göz-e [geze] ‘(to the) eye’ { [-high] [-back] [+round] } { [-high] [-back] [-round] }
g. dost-a [dosta] ‘(to the) friend’ { [-high] [+back] [+round] } { [-high] [+back] [-round] }
h. at-a [ata] ‘(to the) horse’ { [-high] [+back] [-round] } { [-high] [+back] [-round] }

(3) a. [ba] bal ‘honey’
   b. [bel] bel ‘back’
   c. [solgun] solgun ‘pale’
   d. [leke] leke ‘dirt’

(5) a. [jolu] yol-u ‘(his) road’
   b. [roly] rol-u ‘(his) role’
   [jola] yol-a ‘(to the) road’
   [role] rol-e ‘(to the) role’

(6) a. r o l a
d. r o l e

(8) Results (in percentage; standard deviations are given in parentheses):

<table>
<thead>
<tr>
<th>Canonical VH</th>
<th>Non-canonical VH</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Canonical VH (excluding /l/)</td>
<td>(c) (Actual) Noncanonical VH: [+back] V + light /l/</td>
</tr>
<tr>
<td>Auditory only</td>
<td>98.99% (1.69)</td>
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<tr>
<td>Auditory + visual</td>
<td>98.44% (2.12)</td>
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</table>
(b) Canonical VH with canonical /l/
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<tr>
<th></th>
<th></th>
<th>(d) Hypothetical NVH: [-back] V + dark /[H]/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auditory only</td>
<td>99.33% (1.81)</td>
<td>Auditory only</td>
</tr>
<tr>
<td>Auditory + visual</td>
<td>98.86% (1.88)</td>
<td>Auditory + visual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>82.59% (13.69)</td>
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<td></td>
<td></td>
<td>53.57% (36.67)</td>
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