Nasal harmony and nasalization in Mostec Slovenian
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Introduction. Nasal harmony is one of the most well-studied topics in phonology (Schourup 1973; Piggott 1992; Cohn 1993; Walker 1998/2000). The key studies are typically based on languages that exhibit particularly clear cases of nasal harmony, affecting many segments (Cohn 1990; Walker 1999), or where nasal harmony is further supported by phonological patterns, such as segment distributions (Robins 1957; Thomas 2013). In this paper, we present the first case of nasal harmony in its language group, which furthermore exhibits atypical properties.

Background. Nasal harmony in the Slovenian dialect of Mostec was first reported by Toporišič (1981, 2009), who describes it as being triggered by the nasal glide [ŋ] and targeting adjacent vowels (e.g. [sɔːnɛ] ‘dreams’, [ʒiˈvlɛːjä] ‘life.GEN’). Nasal sonorant stops are not triggers ([upuˈndːʃɔw] ‘impersonated.M.SG’, ['zɾːmlu] ‘earth, dirt’). The problem with these data is that they only show nasalization of one adjacent vowel in each direction. This situation could merely be coarticulatory nasalization, which is expected on adjacent segments. If this is the case, however, there is no reason why nasal sonorant stops should behave any differently than nasal glides.

Methods. To examine Toporišič’s claims, we used a nasalance mask NAS-1 by Glottal Enterprises. The mask has one chamber for the mouth and another for the nose, each with its own microphone. 10 participants (5 female and 5 male; aged 66–92) pronounced isolated words or short phrases.

Real words. We first asked the participants to pronounce real words. We selected 98 words that contain the nasal sonorant stops and [ŋ], paying particular attention to the environments in which these segments appear. In addition, we also collected 32 of nasal-oral (near) minimal pairs.

Figure 1: A nasal-oral minimal pair. The upper waveform is nasal, whereas the lower one is oral.

A visual inspection of waveforms reveals the existence of [ŋ] and nasalization. Figure 1 presents a sample minimal pair /jiːv/ ‘field’ ~ /siːv/ ‘gray.F’. Looking at the nasal waveform of the nasal stimulus alone, it would appear that the whole word is somewhat nasal. However, when we compare that to the oral stimulus, we see that this is decidedly not the case: there are clear amplitude differences only on the first two segments, thus suggesting an analysis /jiːv/ with a [v] as a blocker.

Nonce words. What real-word data demonstrate is that the best way to interpret results is via nasal/oral minimal pairs. The challenge with this approach is that the existing words do not allow us to check for all relevant variables (directionality, triggers, targets/blockers). For this reason, we conducted a nonce-word experiment (Berko 1958). Our stimuli were either disyllabic with the initial trigger (e.g. /ʃjala/) or trisyllabic with the trigger in the onset of the final syllable (e.g. /zalju/). In the position of the trigger, the words contained {j, j, m, b}, and the other consonants (potential targets or blockers) were {l, r, v, z, j, d, t}. To facilitate the elicitation, a similar real word was provided (e.g. /ʃiːv/) and then the speakers were told to pronounce the word with a different consonant. Nasal stimuli were elicited first. For trisyllables, the participants were told to derive...
non-nasal stems with the suffixes such as /-ija/ ‘FEM’ and /-yja/ ‘3.SG’. The recordings were segmented in Praat and a script calculated nasalance at five equidistant times for each segment. Nasalance is here defined as a subtraction of the intensity of the nasal waveform minus oral waveform; the higher the nasalance, the more nasal a segment is (Fletcher et al. 1984).

**Results.** Figure 2 presents nasalance of minimal triplets with \{j, ţ, m\} for various types of tri-syllables (differences in the initial consonant are ignored). In these graphs, the j-line serves as a baseline, i.e. words that contain no nasal segments. The x-axis is normalized by segment. While we can see that [m] (appearing as segment 5) has the highest nasalance, nasalance with m-words converges with (non-nasal) j-words by the closest consonant (segment 3), regardless of what that consonant is. In contrast, the trigger [ţ] “J” displays higher than baseline nasalance significantly longer for [l] (and less for [v] “v”), converging only at the initial consonant (segment 1). The three lines converge by segment 3 with other consonants, suggesting that obstruents and [r] are blockers. In short, [ţ] is a trigger of nasal harmony, whereas [l] is a consistent target. Crucially, however, [m] patterns differently, displaying only nasalization of adjacent segments (4 and 6), but no further.

**Discussion.** The results suggests that [m] is not a trigger of nasal harmony, only /ţ/ is. To make sense of this situation, we need to consider that /ţ/ developed from Common Slovenian /ñ/. This is unsurprising, since nasal sonorant stops often become nasal glides diachronically (Trigo 1988). Nasal harmony in Mostec likely arose due to the pressure to retain nasality in a perceptually weak position (on a glide rather than nasal sonorant stop). Mostec furthermore makes sense from a cross-linguistic perspective. While most studied cases of nasal harmony are triggered by nasal vowels and/or nasal sonorant stops, at least one other language, Ennemor, shows nasal continuant consonants as triggers (Hetzron and Marcos 1966). Mostec extends this typology since nasal glides act as triggers. Segments that are more compatible with nasality are better triggers of nasal harmony, giving the typology: nasal sonorant stops, nasal vowels > nasal glides > nasal continuants.

**Conclusions.** Nasal harmony in Mostec is the first instrumentally confirmed case of nasal harmony in a Slavic language. While the triggers are atypical, they make sense historically and typologically. This paper also demonstrates how to effectively combine phonetic (nasalance mask) and phonological methods (real and nonce word elicitation) in fieldwork to document a critically endangered language.