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A Gestural Account of Neutral Segment Asymmetries in Harmony

Neutral segments in harmony may either block the spread of a harmonizing feature or remain transparent to it. Often, these two distinct types of neutral segments are accounted for via the same mechanism, usually some kind of feature co-occurrence restriction. Such analyses come with the tacit prediction that within a given harmony phenomenon the sets of attested transparent and blocking segments should be the same. However, both nasal harmony and rounding harmony display asymmetries within the sets of attested blocking and transparent segments, with the sets of transparent segments being considerably more restricted than the sets of blocking segments. This work accounts for this asymmetry by adopting gestural representations, as in Articulatory Phonology (Browman & Goldstein 1986, 1989), and by providing a representation of harmony in which only a small set of segments may induce transparency based on the involved articulators.

In nasal harmony, all consonants are attested blockers but only obstruents are attested as transparent (Walker 1998/2000). A well-known case of obstruent transparency in nasal harmony comes from Guaraní, in which underlyingly nasal vowels act as triggers:

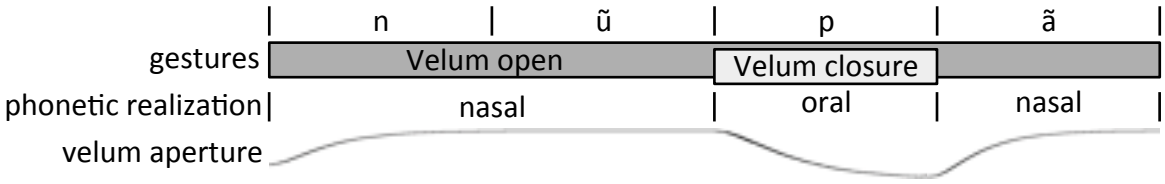
a. nũpã 'to hit' b. mõtĩ 'to cause shame' c. mõkõ 'to swallow'

There is no similar case of nasal harmony in which liquids or glides are the transparent segments. Similarly, in rounding harmony a multitude of blocking behaviors by vowels is attested but only /i/ behaves transparently (Kaun 1995). Transparency of /i/ is found in Halh Mongolian, in which a round vowel in an initial syllable triggers rounding harmony on all vowels except /i/:

a. poor-ig-o 'kidney' ACC REFL *poor-yg-o b. pɔitɔ 'clumsy' *pɔytɔ

These typological patterns can be captured by adopting a gesture-based account of harmony. In Articulatory Phonology, gestures are goal-based units of representation, each specified for an articulatory task to be carried out over some span of time. Harmony is analyzed here as the result of the extended duration of a gesture whose period of activation may possibly span an entire word. When the phonological grammar requires a gesture specified for velum opening to extend in duration, this gesture will overlap additional consonants and vowels in a word, resulting in their nasalization; this is nasal harmony. Likewise, an extended-duration lip protrusion gesture is responsible for rounding harmony. Nasal harmony and rounding harmony are triggered whenever a consonant or vowel is accompanied by an extended-duration velum opening gesture or lip protrusion gesture, respectively.

Blocking of harmony can be modeled as cutting short an extended-duration gesture in order to satisfy constraints on the temporal overlap of incompatible gestures, similar to featural co-occurrence constraints. A gestural account of transparency, on the other hand, does not rely on this ban on overlap. This account must then explain why the overlap of a velum opening gesture and the gestures of an obstruent results in an oral consonant and not a nasal one, and why the overlap of a lip protrusion gesture with the gestures of /i/ results in an unrounded vowel and not a rounded one. It is proposed that these sounds behave transparently because they include gestures that are antagonistic to the harmonizing gesture. An obstruent is transparent to nasal harmony because it includes a velum closure gesture that is active for a period within the span of time in which a harmonizing velum opening gesture is active. When this concurrent activation of the two opposing velum gestures occurs, the obstruent's velum closure gesture overpowers the velum opening gesture, following the workings of the Task Dynamic Model of speech production (Saltzman & Munhall 1989). The result is a period of orality within the span of nasality. When the velum closure gesture ends, the velum opening gesture once again exerts full control over the velum, causing it to open. The following figure demonstrates:



The restricted sets of transparent segments in nasal harmony and rounding harmony fall directly out of the gestural coactivation account of transparency. The inclusion of a velum closure gesture in the representation of obstruents in Articulatory Phonology is necessary to create the aerodynamic conditions responsible for obstruency. No other consonants or vowels include this velum closure gesture, and thus these consonants are unable to behave transparently to nasal harmony. Similarly, it is proposed that the transparency of /i/ in rounding harmony is caused by the inclusion of a lip spreading gesture in the representation of /i/. When this lip spreading gesture is active, it overpowers the effect of the harmonizing lip protrusion gesture that overlaps it, and the result is unrounded /i/. Because only /i/ is proposed to include this lip spreading gesture, in order to maximize its acoustic/perceptual distance from the back vowels, it is the only vowel that may behave transparently in rounding harmony. The gestural representation of transparency in harmony thus correctly predicts that the set of transparent segments for a given harmony phenomenon is restricted and specific to the involved articulators.

Feature-based accounts of harmony such as those in Archangeli & Pulleyblank (1994), Cole & Kisseberth (1994), and O'Keefe (2005) often account for all neutral segments by positing phonetically based co-occurrence restrictions or similar devices between a harmonizing feature and some other feature of a neutral segment. However, such an approach is unable to account for the asymmetries between transparency and blocking behavior observed in nasal harmony and rounding harmony. In a feature-based analysis, the co-occurrence constraints that are responsible for a harmony phenomenon's blocking behavior can easily be reranked such that they produce systems in which any segment that is attested as a blocker may behave transparently as well, significantly over-generating possible patterns of transparency in harmony. In contrast, the gestural account of harmony makes no such prediction as transparency and blocking are the results of two distinct mechanisms. While blocking is the result of gestural co-occurrence restrictions, transparency is the result of concurrent activation of antagonistic gestures.

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