Deriving Exceptional Phonological Patterns from Contrastive Gestural Strength

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Introduction

- Exceptionality: two versions of the same sound participate in phonological processes in different ways
- Barrow Inupiaq: two versions of /i/ (Kaplan 1981, Archangeli & Pulleyblank 1994)
  - /i/: triggers coronal palatalization, resists dorsal assimilation
  - /i/: does not trigger coronal palatalization, undergoes dorsal assimilation

Gestural Strength & Blending

- Concurrently active gestures with conflicting target articulatory states undergo blending (Saltzman & Munhall 1989)
- Blending: weighted averaging of gestures’ specifications, with weighting determined by gesture’s α value
- Target blending: \( x_{ij} = (x_{0i} \cdot \alpha_i) + (x_{0j} \cdot \alpha_j) \)
- Stiffness blending: \( k_i = (k_i \cdot \alpha_i) + (k_j \cdot \alpha_j) \)

Dorsal Assimilation

- Dorsal assimilation: result of overlap of preceding vowel by dorsal consonantal gesture
- Strong /i/: achievement of strong palatal constriction favored over achievement of uvular constriction
  \( \alpha = 0.8 \)
- Weak /i/: achievement of uvular constriction favored over achievement of weak palatal constriction
  \( \alpha = 0.2 \)

Coronal Palatalization

- Coronal palatalization: result of overlap of coronal consonantal gesture by preceding vowel gesture
- Strong /i/: achievement of strong palatal constriction favored over achievement of alveolar constriction

Gestures & Gestural Parameters

- Gestures (Browman & Goldstein 1986, 1989): dynamically-defined, goal-based units of phonological representation
- Gestural specifications:
  - Target articulatory state \( (x_{0i}) \): constriction degree and location
  - Stiffness \( (k_i) \): how quickly a gesture’s target articulatory state is reached
  - Articulators: tongue tip, tongue body, velum, etc.
- Blending strength (\( \alpha_i \)): degree of ability to control vocal tract in case of intergestural competition
- Achievement of gesture’s target articulatory state determined by dynamically-defined equation of motion:
  \[ \dot{x} = -k_i(x - x_0_i) - bx \]
  - Stiffness
  - Target

Advantages of Gestural Strength Analysis

- Contrastive element (strength parameter \( \alpha \)) persists from underlying to surface form
- cf. Reliance on derivational opacity with absolute neutralization, which is incompatible with non-derivational frameworks (Kaplan 1981, Archangeli & Pulleyblank 1994)
- Unifies patterning of strong and weak /i/ across multiple phonological processes
- Constrains predicted inventory size
- cf. Exceptionality via indexation (e.g., constraint indexation (Pater 2000, 2009)) with accidental indexation of one /i/ to multiple constraints
- Indexation predicts system in which constraints are not all indexed to the same sets of /i/ vowels
- Number of possible indexed vowels in language’s phonological inventory = \( 2^n \), where \( n \) = number of indexed constraints/rules