

# 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<sub>1</sub>/: triggers coronal palatalization, resists dorsal assimilation
  - /i<sub>2</sub>/: does not trigger coronal palatalization, undergoes dorsal assimilation

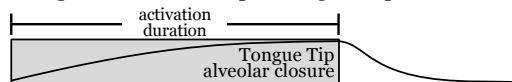
Stem	Coronal Palatalization	Dorsal Assimilation
iki <sub>1</sub>	iki <sub>1</sub> -u 'and wound'	iki <sub>1</sub> -k 'wound.DUAL'
savi <sub>1</sub> -k	savi <sub>1</sub> -u 'and knife'	savi <sub>1</sub> -k 'knife.DUAL'
ini <sub>2</sub>	ini <sub>2</sub> -lu 'and place'	innu <sub>2</sub> -k 'place.DUAL'
kami <sub>2</sub> -k	kami <sub>2</sub> -lu 'and boot'	kamm <sub>2</sub> -k 'boot.DUAL'

### Proposals

- Patterning of two /i/ vowels in Barrow Inupiaq is due to contrast between dynamically-defined **strong** and **weak** gestures
- Contrastiveness of gestural blending strength parameter ( $\alpha$ ) provides unified account of patterns of apparent exceptionality

## Gestures & Gestural Parameters

- Gestures (Browman & Goldstein 1986, 1989): dynamically-defined, goal-based units of phonological representation



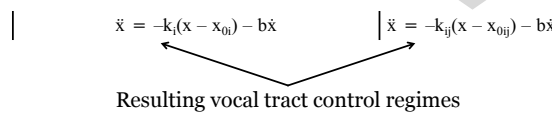
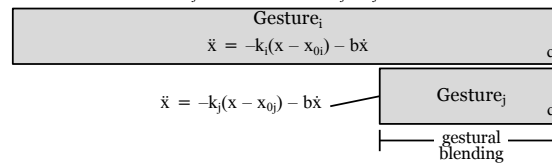
- Gestural specifications:
  - Target articulatory state ( $x_0$ ): constriction degree and location
  - Stiffness ( $k$ ): how quickly a gesture's target articulatory state is reached
  - Articulators: tongue tip, tongue body, velum, etc.
  - Blending strength ( $\alpha$ ): degree of ability to control vocal tract in case of intergestural competition
- Achievement of gesture's target articulatory state determined by dynamically-defined equation of motion:

$$\ddot{x} = -k(x - x_0) - b\dot{x}$$

$\uparrow$                        $\uparrow$   
 Stiffness              Target

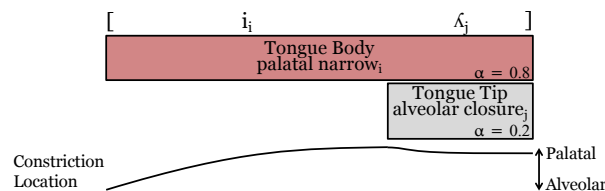
## Gestural Strength & Blending

- 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  $\alpha$  value
- Target blending:  $x_{0ij} = (x_{0i} \cdot \alpha_i) + (x_{0j} \cdot \alpha_j)$
- Stiffness blending:  $k_{ij} = (k_i \cdot \alpha_i) + (k_j \cdot \alpha_j)$

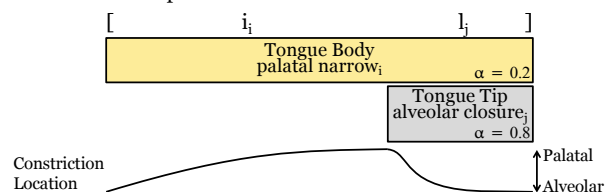


## Coronal Palatalization

- 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



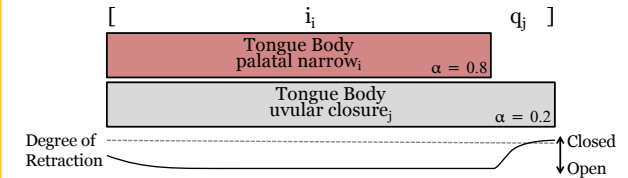
- Result: palatalization of /l/ to [ɕ] following strong /i/
- Weak /i/: achievement of alveolar constriction favored over achievement of palatal constriction



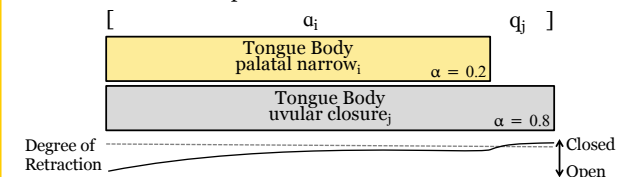
- Result: no palatalization following weak /i/

## 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



- Result: no retraction during production of /i/
- Weak /i/: achievement of uvular constriction favored over achievement of weak palatal constriction



- Result: retraction during production of /i/

## 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