Three-dimensional chess in laryngeal acquisition

The Phonology/Phonetics Interface in Ln Acquisition: Insights from Representational Hierarchies

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Outline

- Redeployment
- Dimensional Theory
- Mayan studies
- Laryngeal-dimension redeployment

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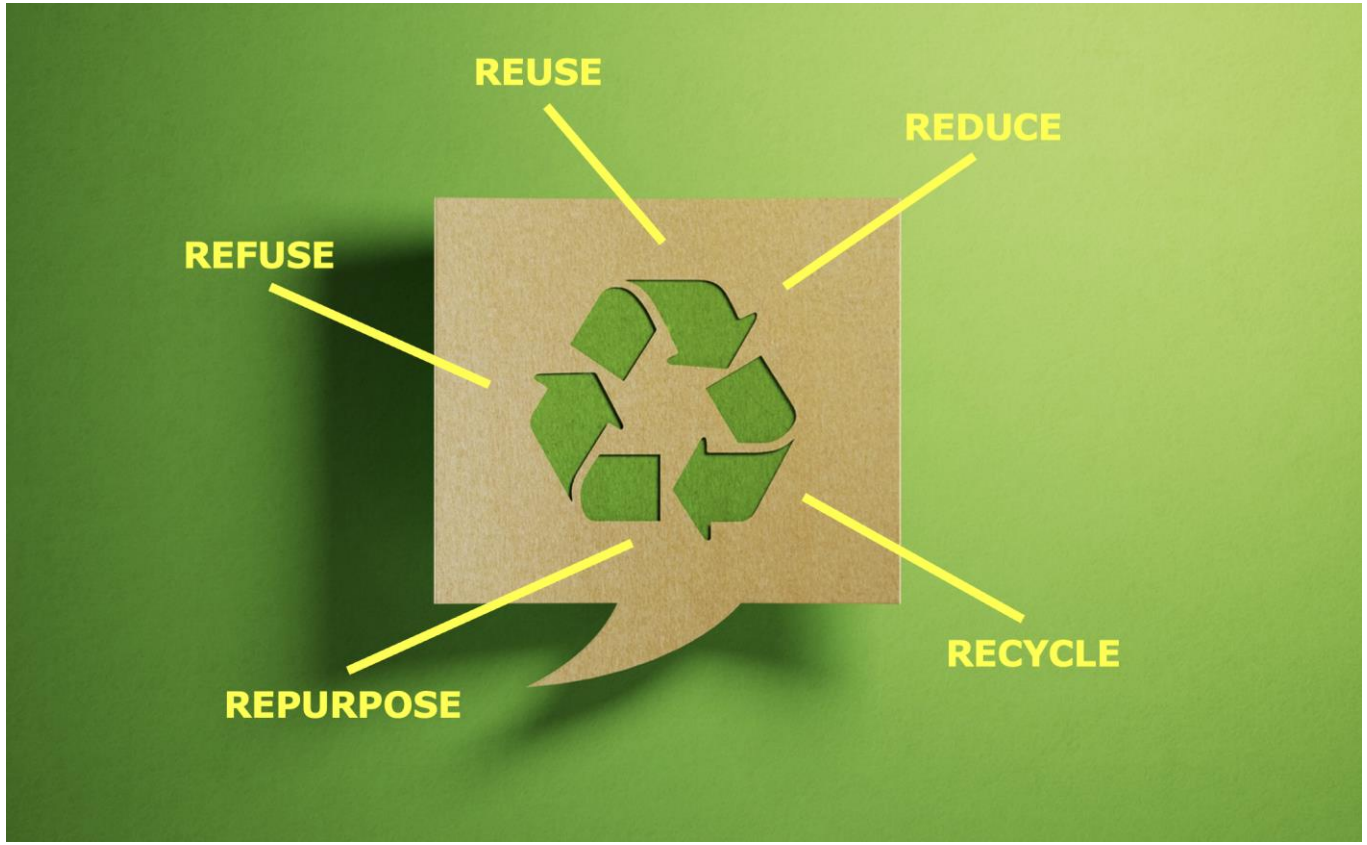
Redeployment

Phonological acquisition

Redeployment is phonological, not phonetic

- Archibald (2005) introduced the notion that an element *x* from the L1 could be used in new ways or to build new structures in the L2, .
- A contrastive feature can be redeployed in phonological representations with very different relationships to acoustic cues.
- Redeployment is different from Brown (2000) in this regard.



Example: English L1, Czech L2 /t–c/

- English does not make a simple [posterior] contrast in stops but does so in fricatives: /s–ʃ/ (Son 2005; Clements 2009: 50; Nelson & Flynn 2022).
- Atkey (2001) demonstrates that English speakers can take the [posterior] feature, which they use for the fricative contrast in their L1, and learn to build new stop contrasts in their L2 Czech.
- Critically, the acoustic cues which distinguish /s/ from [posterior] /ʃ/ in their L1 English are very different from the acoustic cues which distinguish /t/ from [posterior] /c/ in their L2 Czech.
  - The English fricative contrast manifests primarily in noise frequency
    - [posterior] /ʃ/ has a turbulence noise which is relatively low in frequency + lip protrusion
- English speakers must learn the acoustic cues and gesture calculations anew, because unlike the English /s–ʃ/ contrast, the Czech /t–c/ contrast does not manifest primarily in the relative frequency of fricative noise, let alone in the degree of lip protrusion (Tabain 2019: 268ff.).

Example: Japanese/Korean L1 re: English L2 /s–ʃ/

- Another eventuality can arise from separating the wealth of acoustic cues and gesture calculations from the stealth of phonological representations in redeployment.
- On occasion a redeployed structure may be a poor imitation of the target structure, but succeed nonetheless at distinguishing many lexical items in the L2.
- For instance, Japanese and Korean do not use [posterior] (Brown 2000; Son 2005), but paradoxically, adult native speakers of these languages appear to be successful at learning the /s–ʃ/ contrast in most (but not all) English words (Eckman & Iverson 2013).
- This is surprising because the /s–ʃ/ contrast is based on [posterior] in English
  - Again, see Atkey (2002), Son (2005), Clements (2009: 50), Nelson & Flynn (2022).
- This paradox is resolved not by rejecting the redeployment dictum, but by leaning into it:
  - "learners are not really successful in acquiring E/š/ [= English /ʃ/]. In fact, they perceive and produce E[š] by utilizing the feature [front] in their system" (Son 2005: 192).
- That is, native speakers of Japanese and Korean learn English /ʃ/ as [front] /ɕ/.

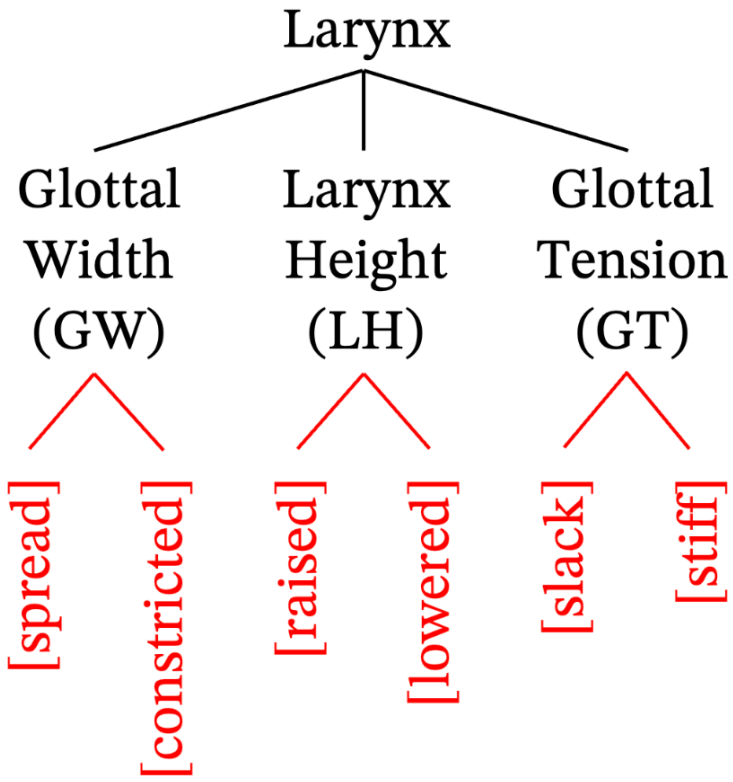
Dimensional Theory

Dimensions versus gestures

Dimensional Theory

Dimensions in (lexical) phonology

Gestures are *completed* in phonetics
(Avery & Idsardi 2001)
or postlexical phonology
(Iverson & Ahn 2007)
or phonetic–phonological level
(Purnell & Raimy 2015)



Glottal Width in English

Dimensions in (lexical) phonology

Gestural completion in phonetics
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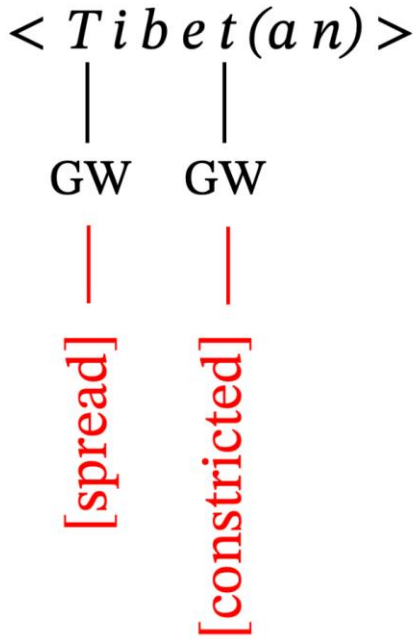

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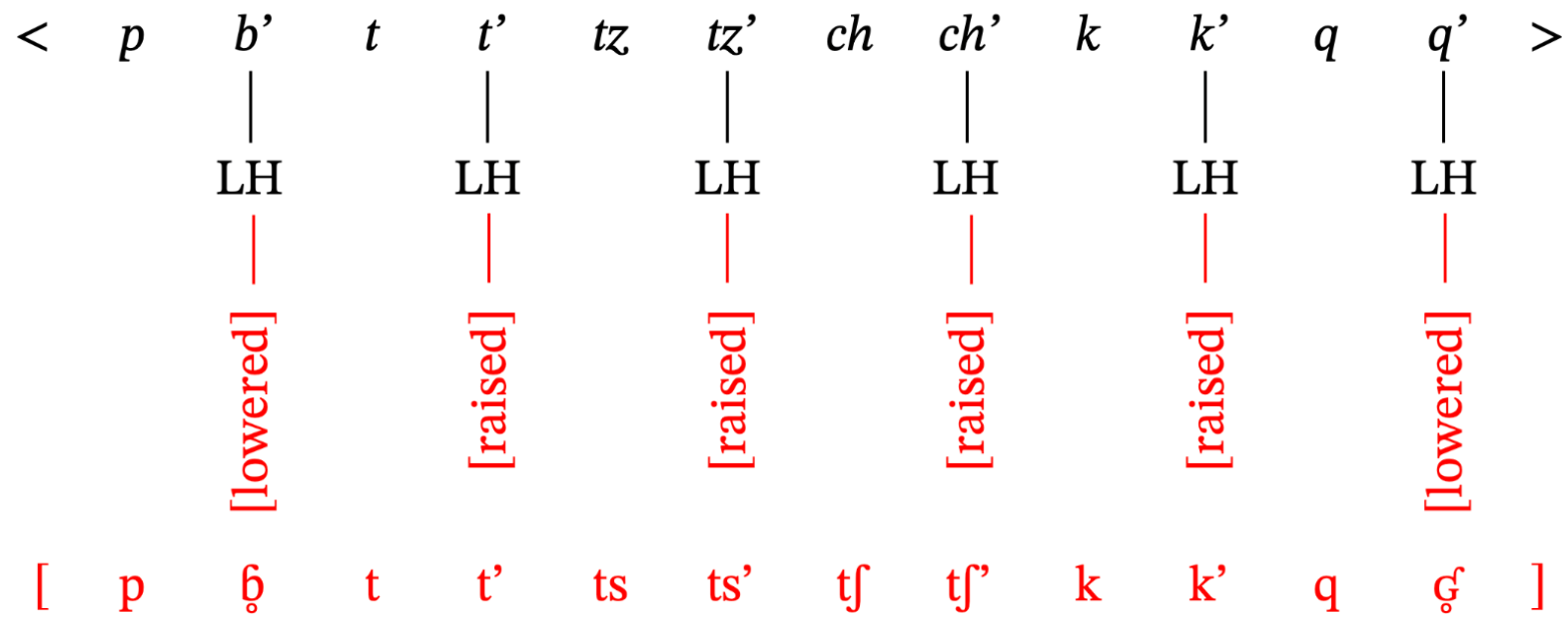
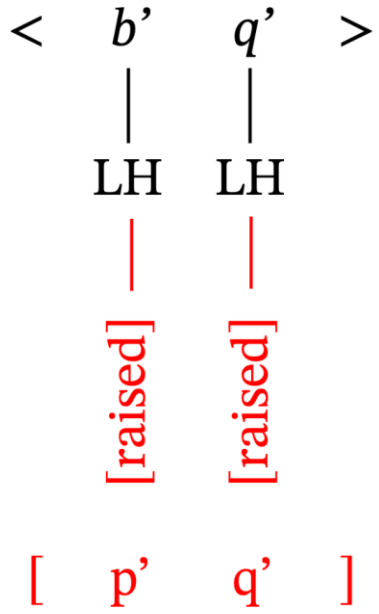
Larynx Height in Kaqchikel



"Kaqchikel has both implosives and ejectives, however the difference between them is not contrastive. Implosives are the typical realization of glottalized labial and uvular stops, while ejectives are the typical realization of glottalized coronal and velar stops" (Nelson 2023: 332)

Larynx Height in Kaqchikel



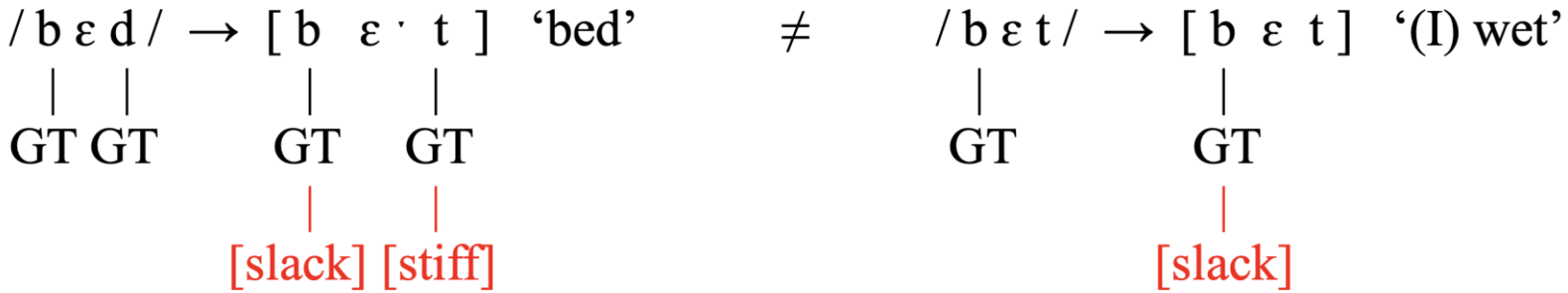
"on occasion, particularly at the ends of words, these voiceless implosives surface as ejectives like the other glottalized stops."
(Nelson 2023: 124)

Glottal Tension in Dutch (and Polish, Catalan, etc.)

Dutch has voiced [slack] stops prevocalically but it shows syllable-final devoicing.

Vowels are slightly longer before phonologically devoiced obstruents than before laryngeally unspecified ones (Warner et al. 2004; Pfiffner 2021; see also Schwartz et al. 2021).

We suggest that Dutch obstruents retain their GT specification in syllable-final position but this laryngeal specification is completed as [stiff] rather than [slack] in this context.



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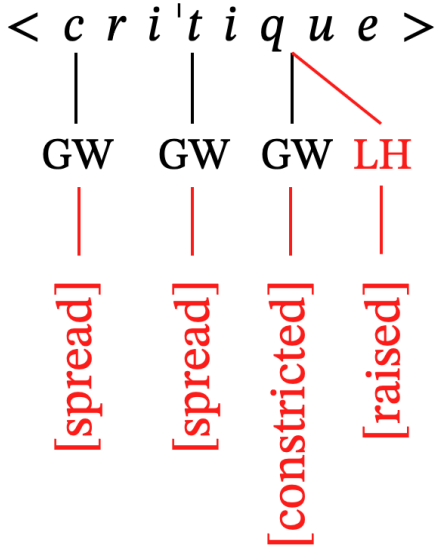
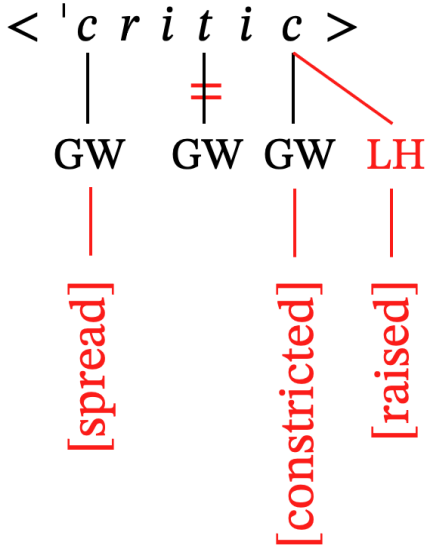
Dimensional Theory

Completion versus enhancement

LH enhancement in English

"We distinguish completion from *enhancement*. While completion merely involves the additions of gestural information to the already present dimensions, enhancement involves the addition of a dimension node" (Avery & Idsardi 2001: 47)





ω-final [constricted] is often ejective (Simpson & Sulaberidze 2022; Price et al. 2023)

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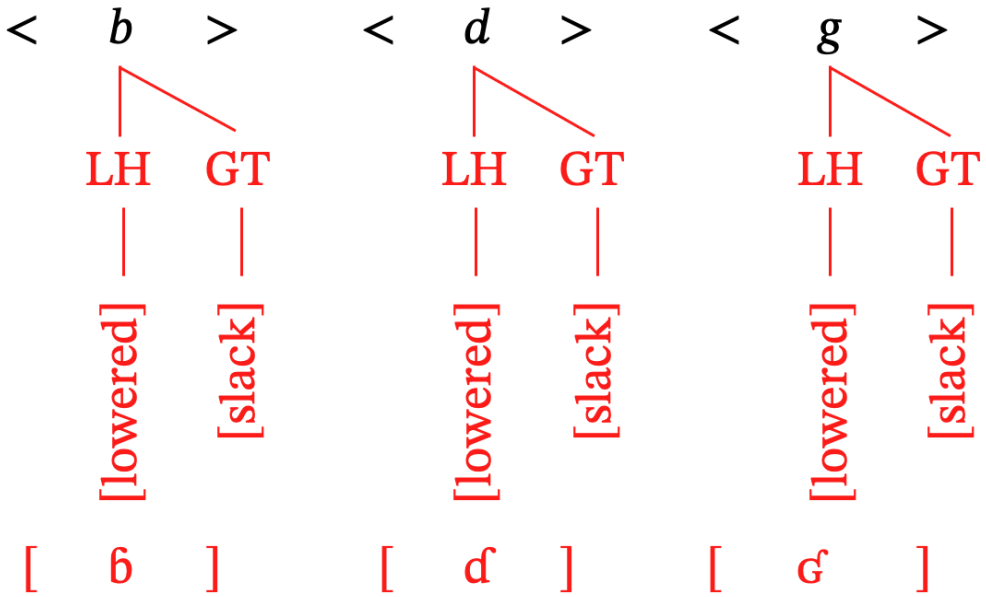
LH enhancement in English



Emmon Bach's 1996 LSA presidential address

"Spontaneous development of implosive voiced stops in the speech of pupils at the Canadian Academy (Kobe, Japan, c. 1940)"
E.g., [ɓ]*oy*, [ɠ]*irl*, [ɗ]*o*[ɠ]

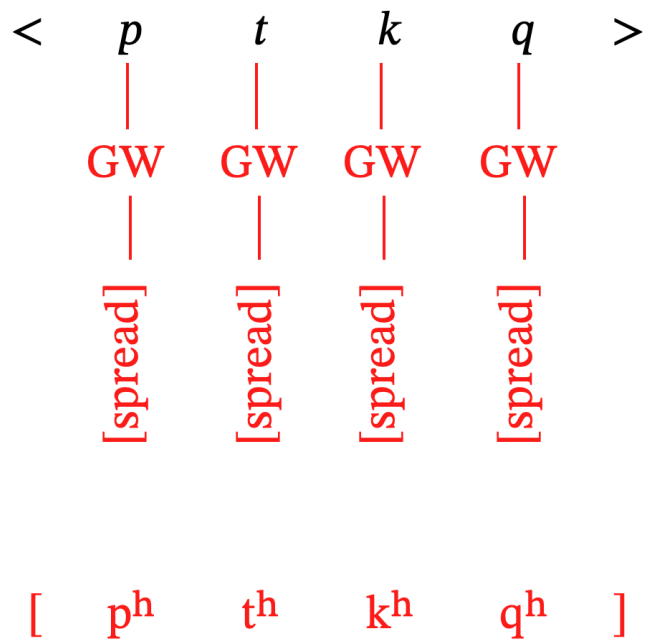
- "When I was in grade school (5th or 6th grade, I don't remember which), one of those crazy speech fashions developed and spread like wildfire through the population of schoolkids."
- "It took place in a boarding school in Japan, about as far away from West Africa as you can get, so there is no question of the kind of influences that are often invoked for such wholesale sound substitutions."
- "I have sometimes heard particular words, such as boy, pronounced this way in East Texas."

GW enhancement in Kaqchikel

<	*p*	*b’*	*t*	*t’*	*tz*	*tz’*	*ch*	*ch’*	*k*	*k’*	*q*	*q’*	>
	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	
	[spread]	[constricted]	[spread]	[constricted]	[spread]	[constricted]	[spread]	[constricted]	[spread]	[constricted]	[spread]	[constricted]	
[	p^h	p’	t^h	t’	ts^h	ts’	$tʃ^h$	tʃ’	k^h	k’	q^h	q’	]

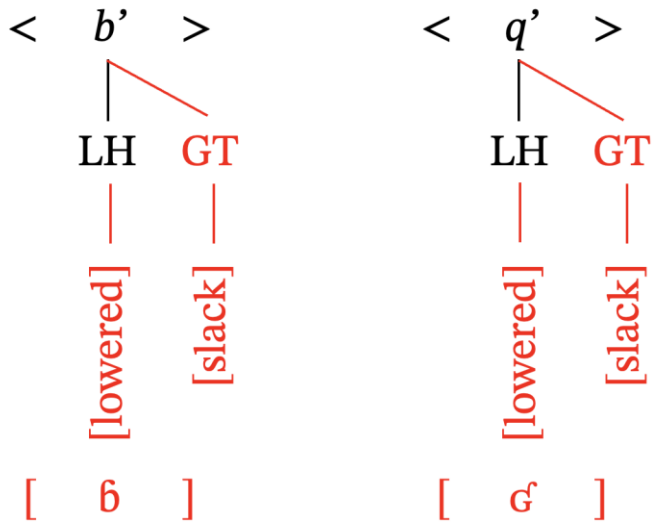
“As for the unmarked, plain series, there is an observable, systematic sound change in which plain stops are unaspirated in onset position, but aspirated in coda position. This aspiration is especially prominent in word-final codas.” (Nelson 2023: 124)

GW enhancement beyond Kaqchikel



"Aspirated stops were dealt with secondarily as they only occur allophonically and usually only in word-final position (Orie & Bricker, 2000) although **prevocalic aspiration of voiceless stops has been noted in Yukateko** (McQuown, 1967)."
(Burnett-Deas, 2009)

GT enhancement beyond Kaqchikel

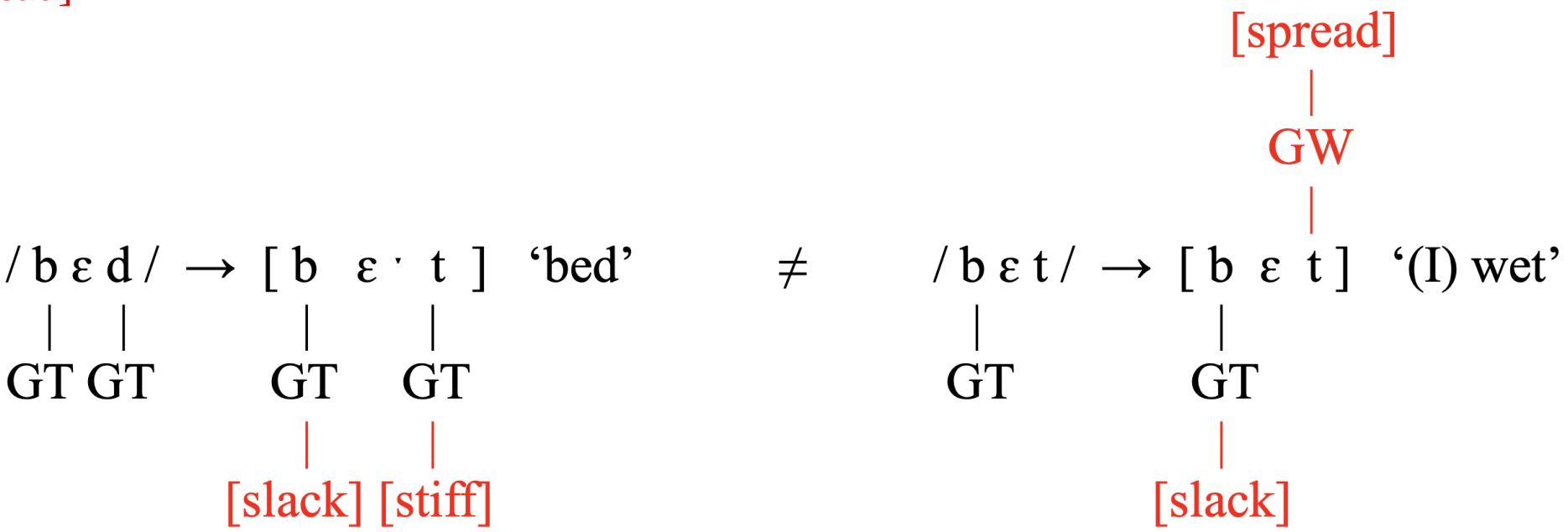


"for implosives, voicing is almost always present" (Javkin 1977: 563)

LH-[lowered] is enhanced by GT-[slack]

GW enhancement in Dutch

Coda obstruents which are laryngeally unspecified show significantly longer release bursts than phonologically devoiced obstruents do (Warner et al. 2004; Ernestus & Baayen 2006, 2007; see also Schwartz et al. 2021), so we assume that they are enhanced with Glottal-Width [spread]



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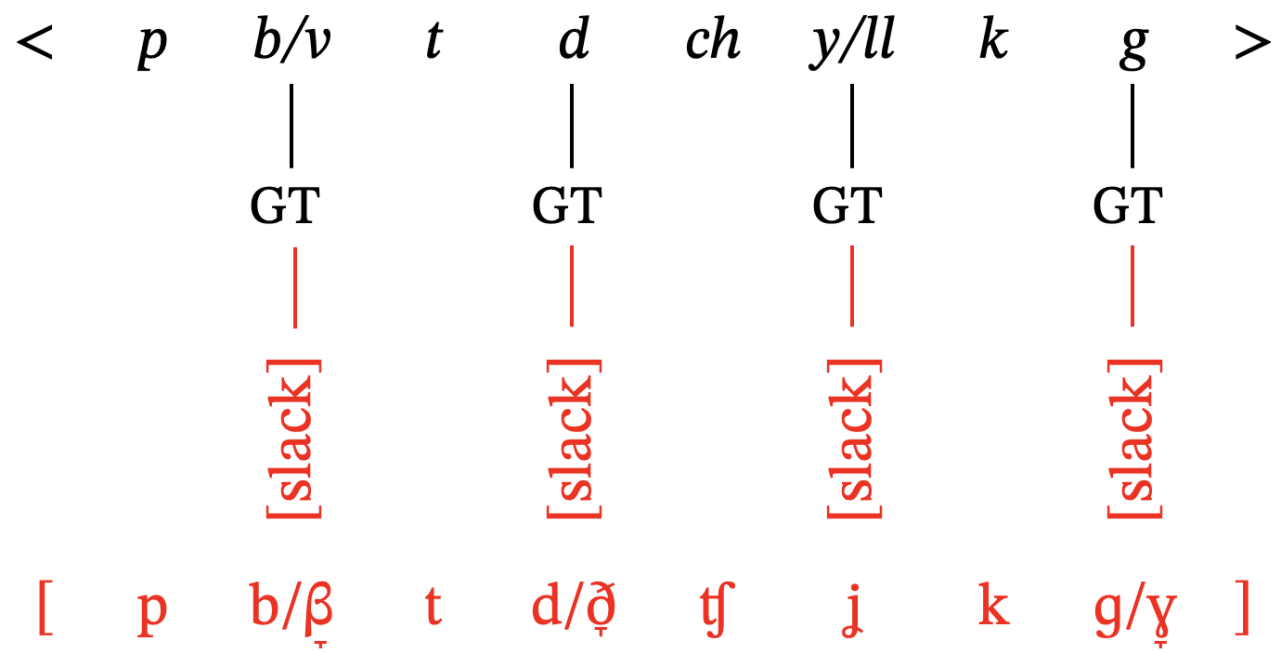
Double Dutch?

- Iverson and Salmons (2003) argue that Dutch retains the historical West Germanic dimension Glottal Width in its voiceless fricatives, but its voiced obstruents /b, d, (dz̨, g,) v, z, (z̨,) ɣ, ɦ/ are specified Glottal Tension
- "The emergence of Glottal Tension in the system, which replaces Glottal Width in the stops, can be attributed to historical effects on Dutch from its Romance neighbors, presumably" (p. 13; see also Iverson and Salmons 2008).

Phonemic laryngeal representation of Dutch obstruents
(Romance-like stops, Germanic-type fortis fricatives)

/t/	/d/	/z/	/s/
Lar	Lar	Lar	Lar
	|	|	|
	GT	GT	GW

Spanish — a canonical Glottal-Tension language



Not much enhancement, but see next talk by Natvig, Salmons & Michnowicz (2025) — next talk!

Acquiring laryngeal contrasts

English L1 vs. Spanish L1 vs. Mayan L2/L3

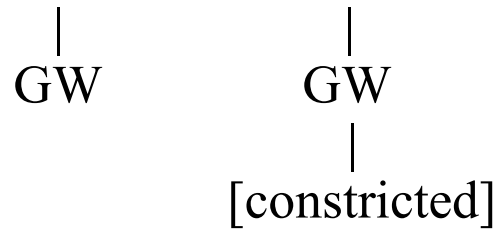
Mayan studies

- Nelson (2023a, b)
  - Who and what
    - L1 English, a Glottal-Width language; or L1 Spanish, a Glottal-Tension language
    - Plain and glottalized stops in L3 Kaqchikel, a Larynx-Height language
  - How
    - AX auditory discrimination:
      - identify phonemic identity or difference between two uttered stops
    - Phonemic categorization of Kaqchikel stops:
      - select correct phonemic category (laryngeal & place) for uttered stops

- González Poot (2011; 2014)
  - Who and what
    - L1 Spanish, a Glottal-Tension language
    - Ejectives in L2 Yucatec Mayan, a Larynx-Height language
  - How
    - AX auditory discrimination tasks
    - Forced choice picture selection tasks

Prediction

- It is reasonable to suppose that L1 English learners of Mayan ejectives/ implosives have a special advantage.
- There's a precedent for completing GW with the gesture [constricted] in their L1, e.g.:
  - 'atlas' /ˈæt.ləs/ → [ˈæʔ̰t.lɨ̆s]



- Conversely, it is reasonable to assume that L1 Spanish learners of Mayan ejectives/implosives are at a disadvantage.
- There is no clear precedent for completing the Glottal Tension dimension with the gesture [stiff] (as opposed to [slack]) in their L1.

Results

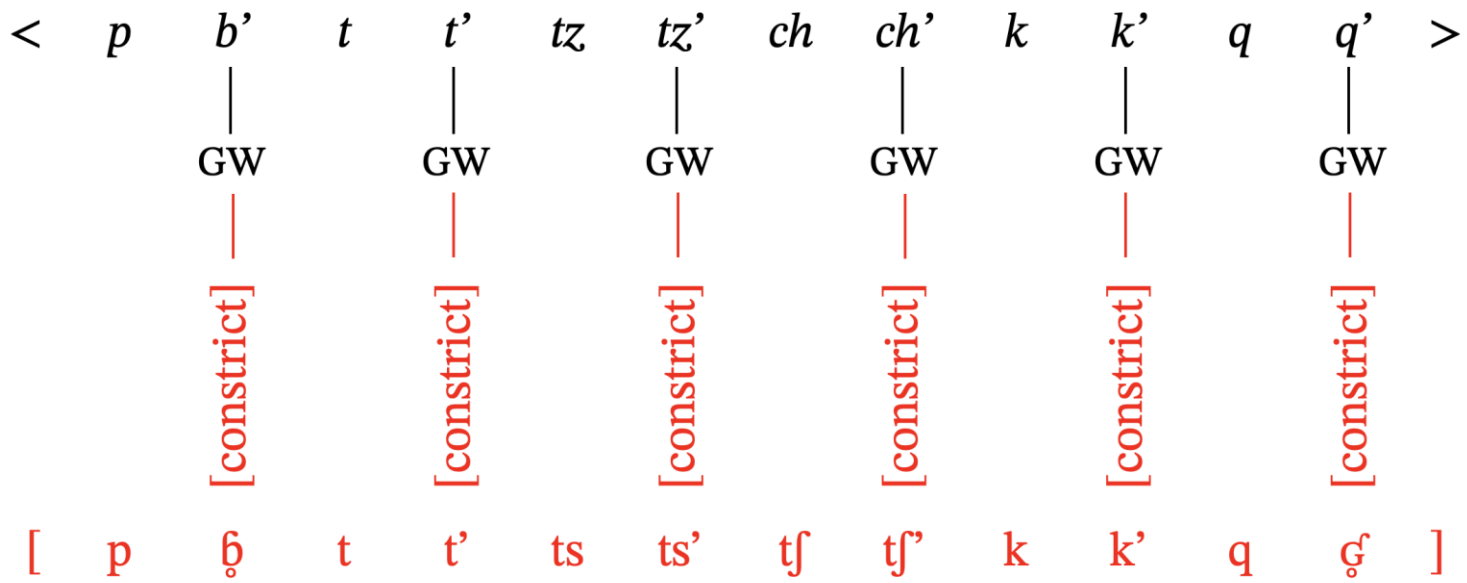
- L1 English learners are only slightly better than L1 Spanish learners at learning Mayan ejectives/ implosives, probably due to their phonetic familiarity with [constricted]-completion (Nelson, 2023b)
- The bigger, categorical picture is that L1 English learners and L1 Spanish learners are both successful at learning Mayan ejectives/implosives, because
    - "Learners from either group can redeploy the contrastive Laryngeal dimension from either of their known languages in order to account for the glottalization contrast of Kaqchikel" (Nelson, 2023b, p. 307)

Dimension redeployment

+ gestural learning

Glottal Width in L1 English L2/L3 Kaqchikel

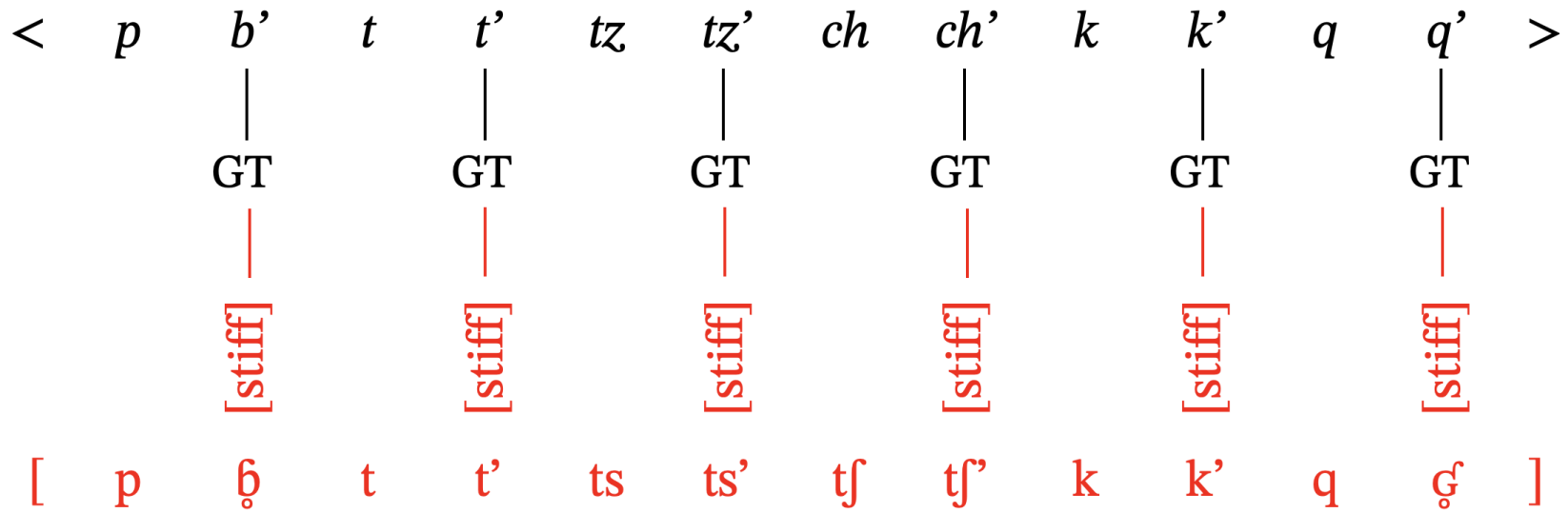
- L1 English learners acquire the Larynx-Height stops of Kaqchikel as **Glottal-Width** stops instead — they redeploy the GW dimension from their L1.



- They complete GW-stops with the gesture **[constricted]** in their L2/L3 post-lexical phonology or at the phonetic-phonological level.

Glottal Tension in L1 Spanish L2/L3 Kaqchikel

- L1 Spanish learners acquire the Larynx-Height stops of Kaqchikel as **Glottal-Tension** stops instead — they redeploy the GT dimension from their L1.



- They complete GT-stops with the gesture **[stiff]** in their L2/L3 post-lexical phonology or at the phonetic-phonological level.

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Phonetic learning

- Phonetic learning, including gesture completion and enhancement in Avery & Idsardi's (2001) sense, is not contingent on redeployment, pace Brown (2000).
- Notably, L1 Spanish learners of Mayan ejectives/implosives can learn to complete GT with [stiff] in spite of that completion gesture having no obvious precedent in their L1.
- Flege and the SLM/SLM-r (Flege & Bohn, 2021) have been showing us for years that phonetic learning is possible across the lifespan.
- But, as Archibald (2023) argues, equivalence classification is the beginning of the learning journey, not the end.
- We still need a phonological learning account, e.g. dimension redeployment!

Envoi

- If Greg and Joe are right that both Glottal Tension and Glottal Width are lexical-contrastive in Dutch, redeployment predicts that this would give Dutch speakers an advantage in acquiring the laryngeal phonology of other languages.
- On the other hand, languages without contrastive-lexical laryngeal dimensions would be at a disadvantage.
  - In practice, many such languages (e.g., Hawaiian, Plains Cree, Blackfoot, Finnish, etc.) have *h* and/or *ʔ*, which implicate laryngeal dimensions, say Glottal Width.
    - Avery and Idsardi (2001) suggested that glottals may also be specified with gestures like Glottal-Width [spread] and [constricted] even in the phonology proper.
      - We don't know if they still feel that way about the terminal features of glottals, but the point is, the laryngeal dimension of a glottal can be redeployed in phonological acquisistion.
  - But precisely because redeployment engages lexical-contrastive structure, it should be possible to identify a language without any laryngeal dimensions in its phonology
    - Even if the language in question has /h/ or /ʔ/: these could be placeless [fricative] or [stop]
    - laryngeal dimensions filled in at other levels

Thank you!
Questions?

Email us for further discussion and references or to access these slides!

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