Generative Approaches to Second Language Acquisition
GASLA17

The L2/L3 acquisition of Mayan ejectives:
The redeployment of dimensions and learning of gestures

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1. Introduction

Redeployment in SLA

As a rule, “new structures” are never fully so, but are rather “assembled out of the building blocks found in the L1” (Archibald, 2018, p. 15).

(Archibald, 2005; Nelson, 2023a, b; Flynn, 2024; Wu, 2024)

Mayan challenge to redeployment

González Poot (2011, 2014) probed the acquisition of L2 Yucatec Mayan ejectives by L1 Spanish speakers.

Using a discrimination task and a lexical identification task he argued (following Howe & Pulleyblank, 2004) that the L2 learners had acquired a new contrastive phonological feature [constricted glottis], which is decidedly absent in Spanish.

Mayan challenge to redeployment

Wagner & Baker-Smemoe (2013) examined the L2 acquisition of Q'eqchi' ejectives by L1 English learners.

"Ejectives do not occur in English and thus will be a very distinct phone type that the L2 learners have to acquire." (p. 455)

And yet, the learners "distinguished between ejectives and [plain] stops accurately" (p. 464).

Mayan challenge to redeployment

Nelson (2023b) investigated the L3 acquisition of glottalized consonants in Kaqchikel by two groups of Spanish-English multilinguals, one with L1 Spanish and the other with L1 English.

Both groups successfully acquired the glottalization contrast of Kaqchikel.

Dimensions (Avery & Idsardi 2001) to the rescue

Under Avery & Idsardi's (2001) model of Laryngeal dimensions, we argue for a unified account of the preceding studies in which the acquisition path for glottalized stops, including ejectives, conforms with redeployment:

"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)

2. Background

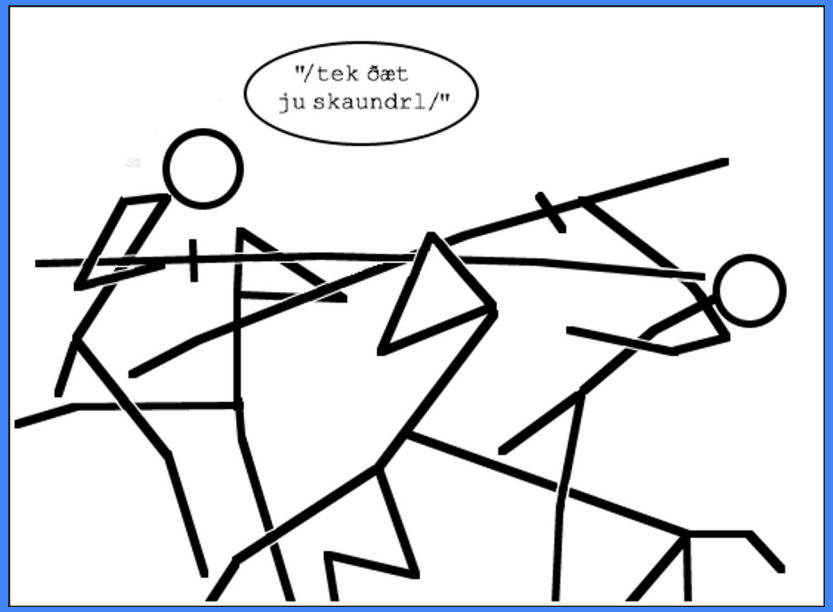
Initial and final states

The key learnability questions:

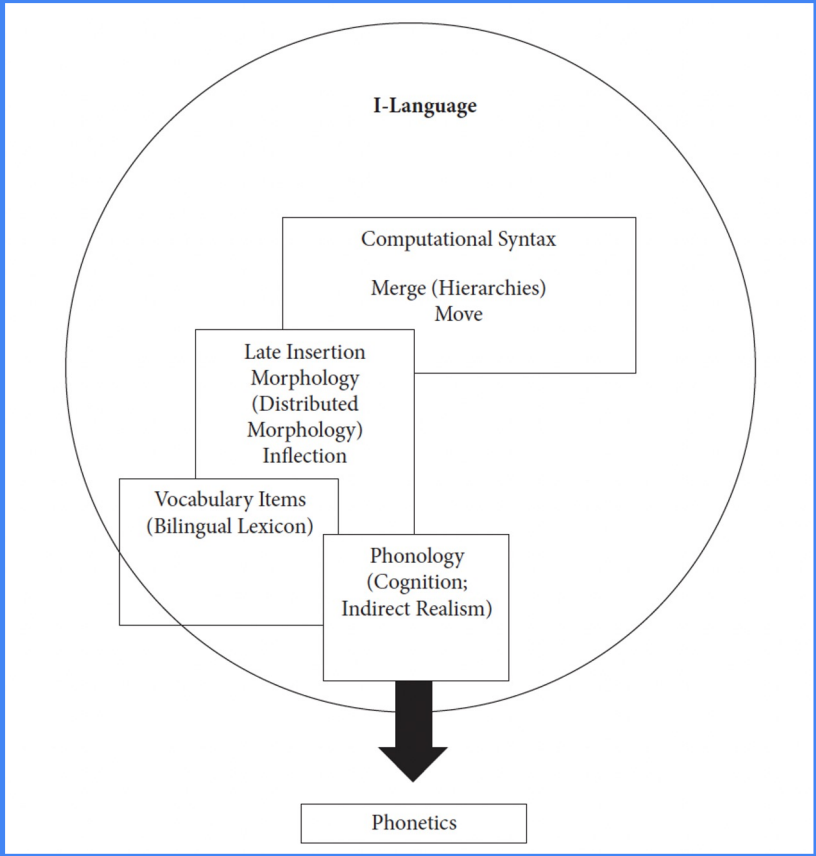
(1) What might transfer in language acquisition?

(2) What is the target grammar?

phonology vs. phonetics



Parenchyma, Hilário. 2007. Cartoon theories of linguistics—Part E—Phonetics vs. Phonology. Speculative Grammarian, Vol. CLIII, No. 1.



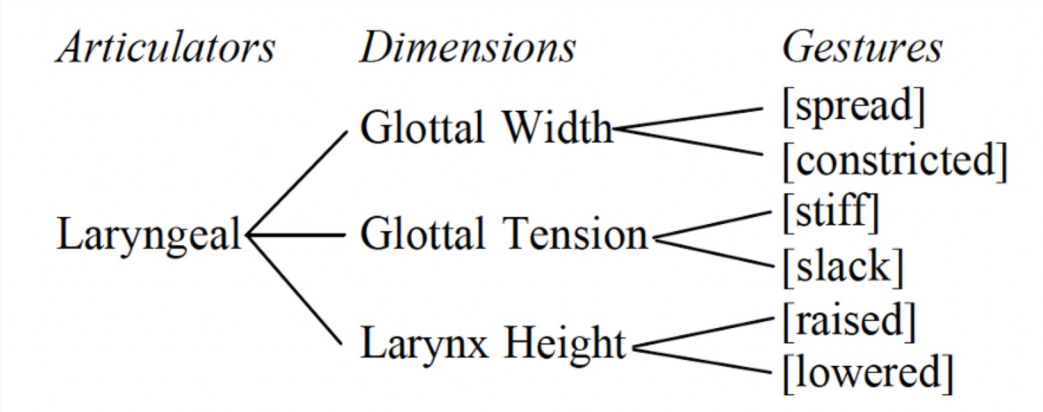
The redeployment construct in L2 acquisition concerns I-language. As a rule, building blocks are recycled from L1 phonology (Archibald, 2005) and L1 grammar (Lardiere, 2009).

By contrast, L2 phonetic learning, including re-weighting and re-mapping cues onto newly assembled phonological structures, is not contingent on redeployment, pace Brown (2000).

Avery & Idsardi (2001)

Phonological representations provide specification for contrastive dimensions and not for the phonetic features (a.k.a. gestures).

Avery & Idsardi (2001) focus on laryngeal organization.



Avery & Idsardi (2001)

(2) Predicted phonological systems

	Contrasts	*Example*	*Typical characteristics*
a.	Ø	Tamil	no contrast
b.	Ø/GT	Spanish	fully voiced versus unmarked
c.	Ø/GW	English	aspirated versus unmarked
d.	Ø/GT/GW	Thai	fully voiced, aspirated and plain
e.	Ø/GT/GW /GT+GW	Hindi	full cross-classification including voiced aspirate

Avery & Idsardi (2001)

The dimensions are responsible for contrast

The dimension layer is organized in antagonistic pairs

The terminal elements are motor instructions to the articulators known as gestures

Gestures are privative in this model

Terminologically dimensions are completed with gestures

Avery and Idsardi (2001)

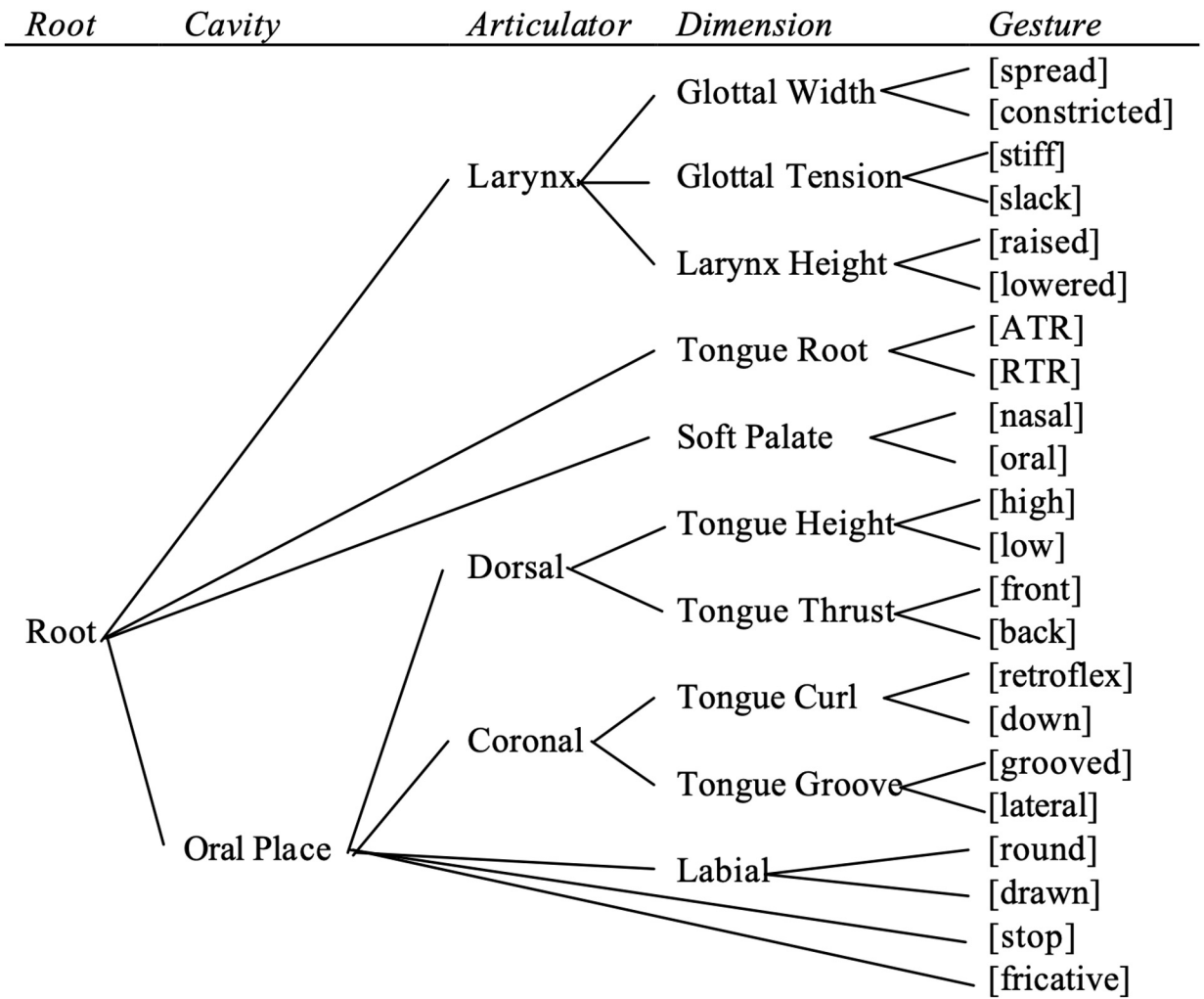


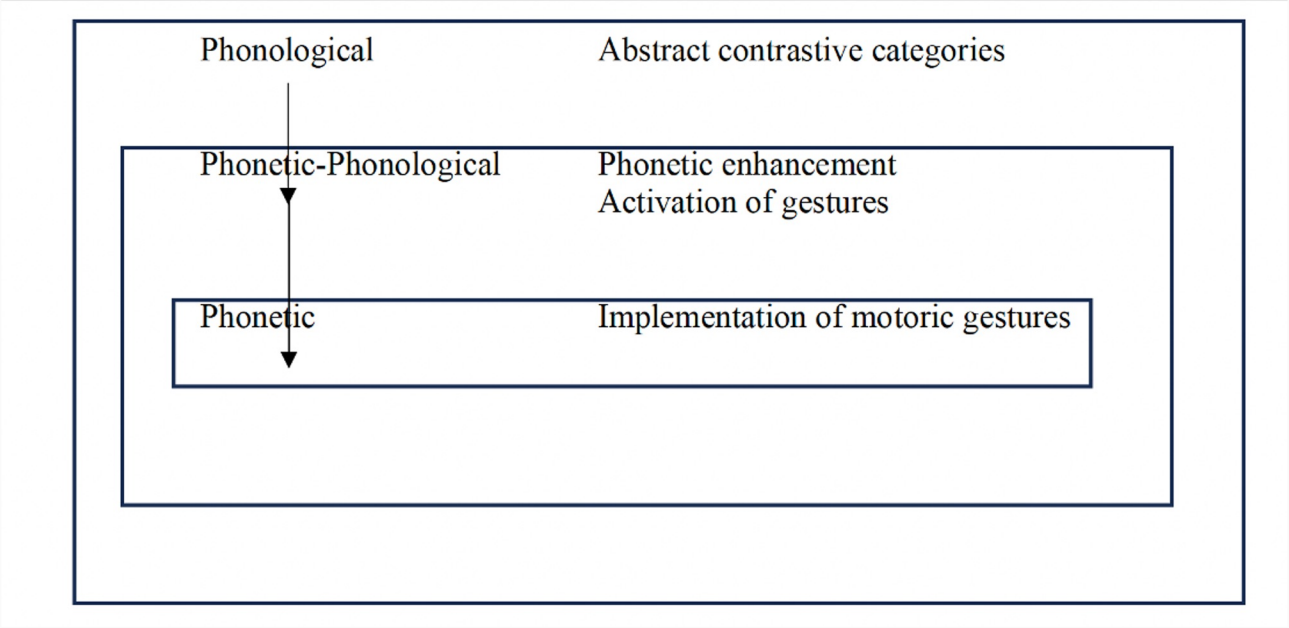
Figure 1. Segmental organization

The phonetics/phonology interface

dimensions

↓

gestures



Natvig & Salmons (2021)

Avery & Idsardi (2001)

Completion

> *“In order to become pronounceable, the mapping from phonology to phonetics must add the missing gestural specifications. We will call this process completion. Bare dimension nodes are completed through the insertion of a dependent gesture.”*

Avery & Idsardi (2001)

Default completion

> *Each bare dimension has a default completion, which is universal.*
>
> *For GT and GW the default completions are [slack] and [spread] respectively.*

Avery & Idsardi (2001)

Enhancement

> *“While completion merely involves the additions of gestural information to the already present dimensions, enhancement involves the addition of a dimension node …. Enhancement leads to the widely observed phonetic over-differentiation of contrast.”*
>
> *In general, enhancement is restricted to introducing noncontrastive dimensions.*

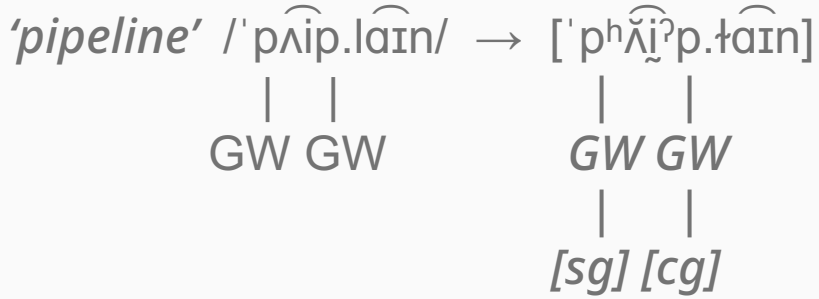
English example

‘pipeline’ /ˈpʌ͡ip.la͡ɪn/

GW GW

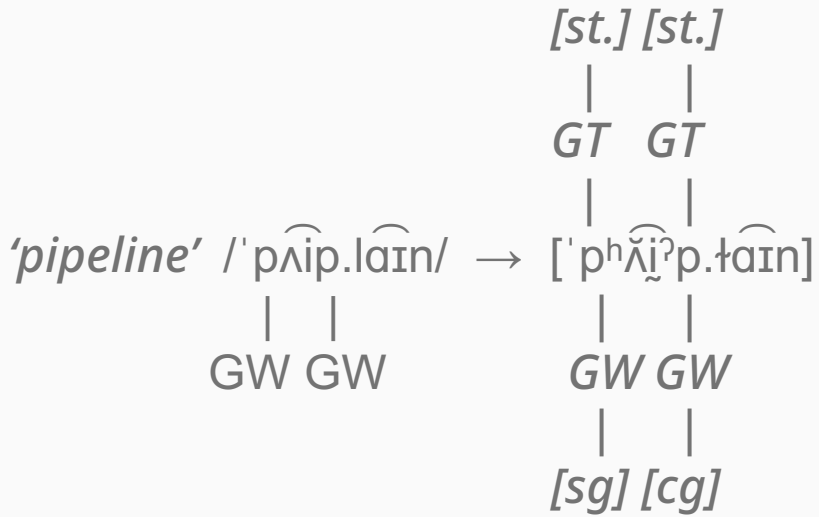
/p/ is specified Glottal Width (GW) in the phonology of English, where it may trigger phonological processes such as Canadian Raising (/pa͡ɪp/ → /pʌ͡ip/).

English example



The Laryngeal dimension Glottal Width (GW) is completed by the terminal features (called gestures) [spread] ([sg]) and [constricted] ([cg]) only in the phonetics.

English example



The noncontrastive Laryngeal dimension Glottal Tension (GT) and its gesture [stiff] are also added in English phonetics.

Cross-linguistic variation

English

Glottal Width (GW) is a contrastive dimension

Glottal Tension (GT) is used as enhancement

Japanese

Glottal Tension (GT) is a contrastive dimension

Glottal Width (GW) is used as enhancement

Versions of Avery & Idsardi's Dimension Theory have been used in recent work (Purnell, Raimy, & Salmons, 2019), including some on laryngeal contrasts (Natvig & Salmons, 2021) and on acquisition (Kwon & Starr, 2023)

3. Mayan studies

L2/L3 data

González Poot (2011; 2014)

- *L1 Spanish; L2 Yucatec Mayan ejectives*

Nelson (2023a, b)

- *L1 English or L1 Spanish; L3 Kaqchikel plain and glottalized stops*

Spanish → Yucatec ejectives

González Poot (2011) looks at the acquisition of Yucatec Mayan ejectives by NS of Spanish

Spanish lacks the Larynx Height dimension

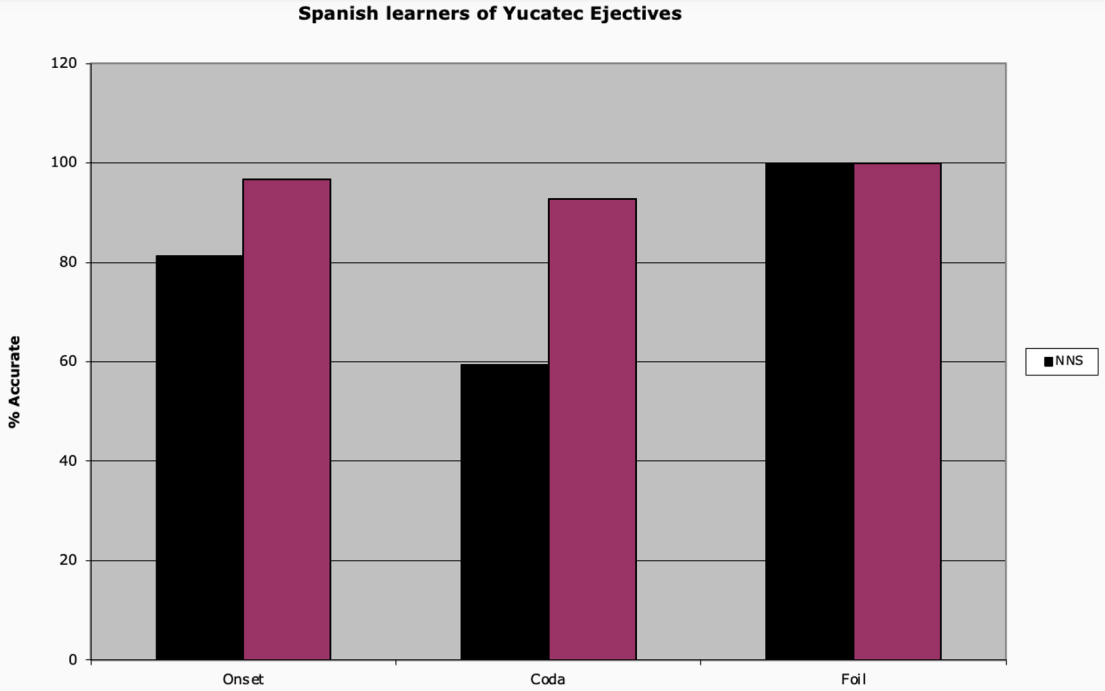
Can they acquire it in L2 Yucatec Maya?

Experimental Design

AX auditory discrimination task

Forced choice picture selection task

Yucatec Discrimination Task



NNS not significantly different from NS in onset position

However they are significantly different from the NS in coda position; the recoverability cues for ejectives are much subtler in coda position

A phonetic route to phonologization, he argued.

Kaqchikel ejectives & implosives

Nelson (2023a, b) looks at the acquisition of Kaqchikel glottalized stops by learners familiar with Spanish and English

Spanish uses Glottal Tension;
English uses Glottal Width

Does acquisition of Larynx Height differ based on L1?

Experimental Design

3 groups:

L1 Kaqchikel (NKS); L1 Spanish (NSS); L1 English (NES)

2 tasks:

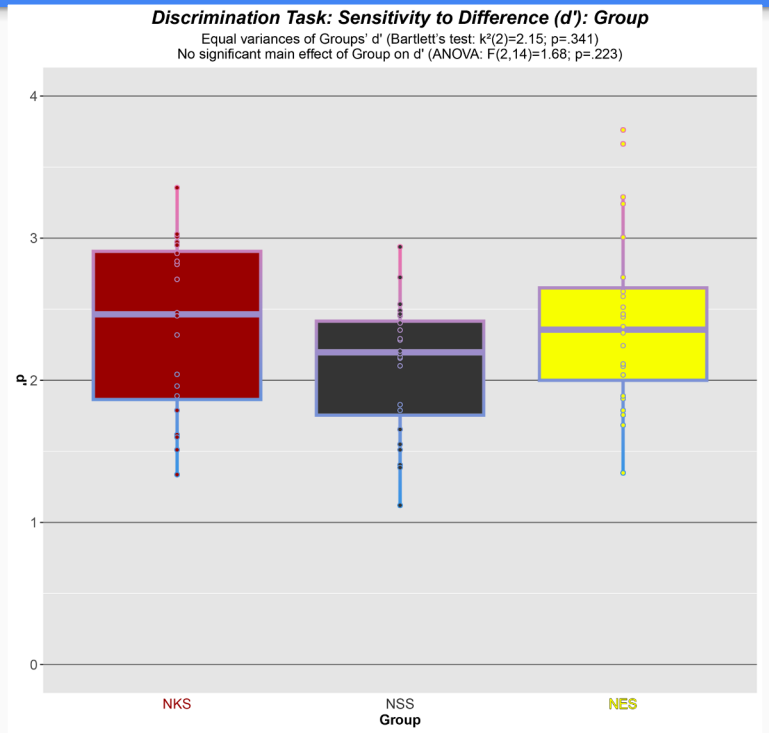
AX auditory discrimination:

identify phonemic identity or difference between two uttered stops

Phonemic categorization of Kaqchikel stops:

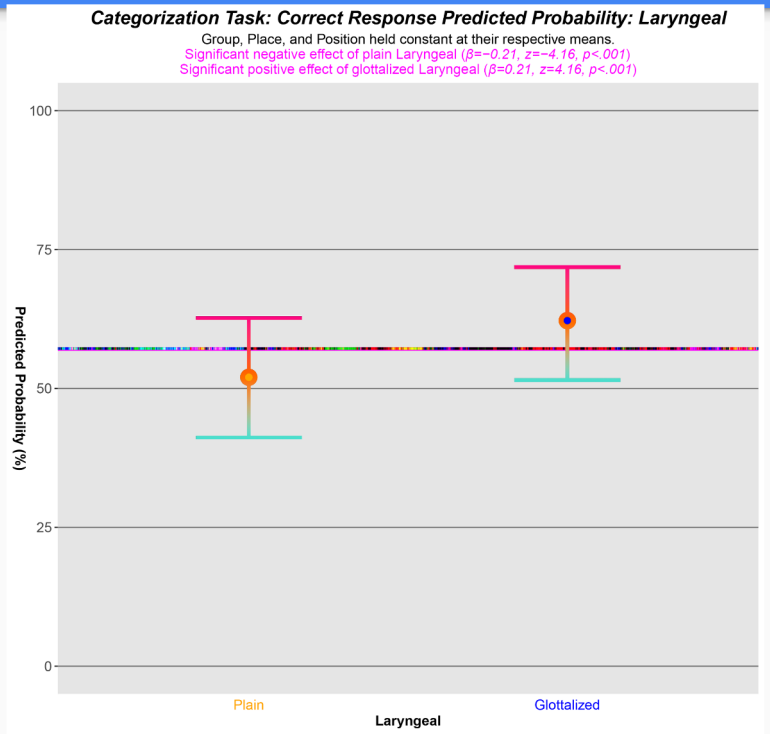
select correct phonemic category (laryngeal & place) for uttered stops

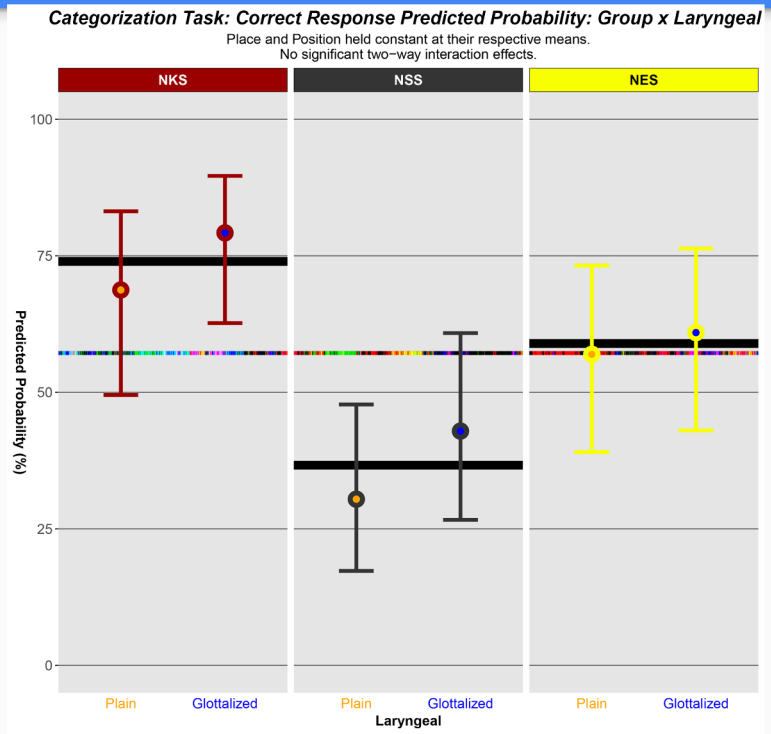
Kaqchikel Stop Discrimination



L1 groups not significantly different in discrimination of Kaqchikel stops

Categorization task accuracy





L1 groups not significantly different in accuracy of categorizing (i.e., matching place and laryngeal state) Kaqchikel stops based on Laryngeal series

All listeners categorized glottalized stops with greater accuracy than plain stops

4. Analysis

Redeployment of Laryngeal dimensions

“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)

Larynx Height in Kaqchikel

Only the dimension Larynx Height (LH) is contrastive in Kaqchikel, not the gestures. Kaqchikel speakers complete LH with [raised] (RL) and [lowered] (LL) in their L1 phonetics, e.g.:

	/	p	t	ts	tʃ	k	q	/	→	[	p	t	ts	tʃ	k	q	]
vs.	/	p̥	t’	ts’	tʃ’	k’	q̓	/	→	[	p̥	t’	ts’	tʃ’	k’	q̓	]
		|	|	|	|	|	|				|	|	|	|	|	|		
		LH	LH	LH	LH	LH	LH				LH	LH	LH	LH	LH	LH		
											|	|	|	|	|	|		
											[LL]	[RL]	[RL]	[RL]	[RL]	[LL]		

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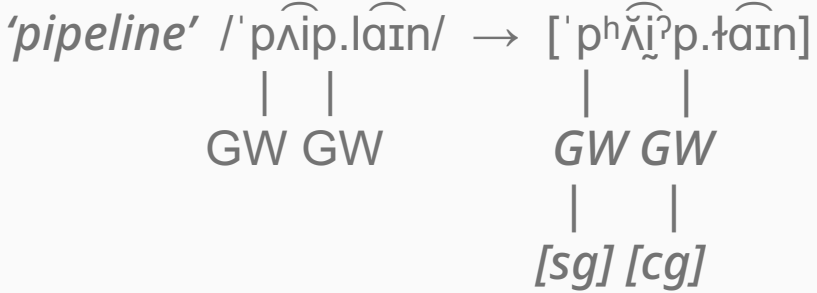
Glottal Width in English

Only the dimension Glottal Width (GW) is contrastive in English, not the gestures. English speakers complete GW with [spread] ([sg]) and [constricted] ([cg]) in their L1 phonetics, e.g.:



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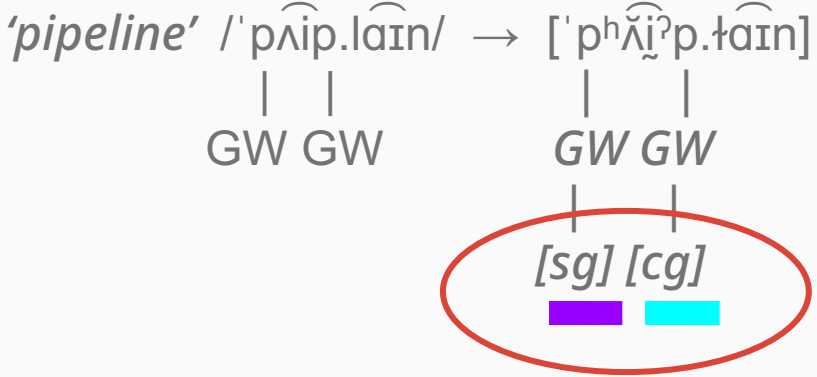
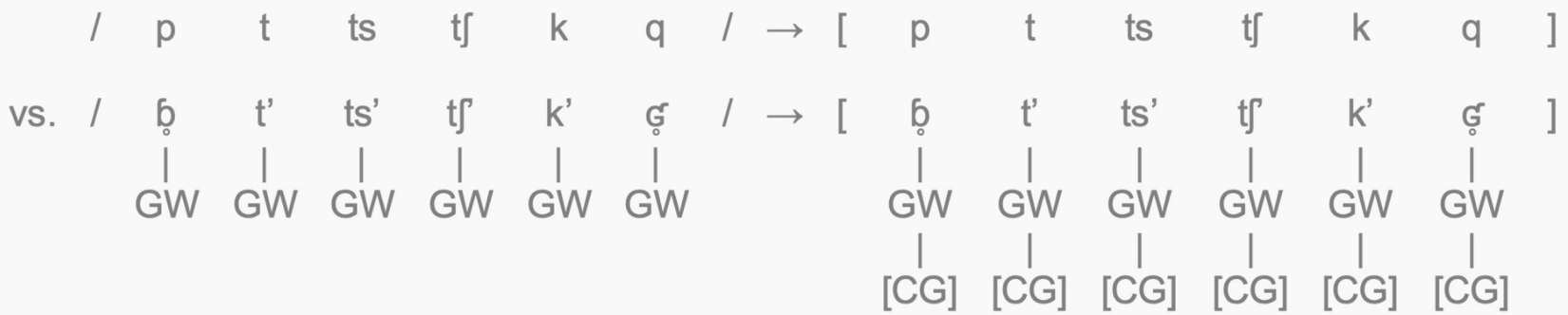


Glottal Width in L1 English L3 Kaqchikel

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] (CG) in their L3 phonetics:



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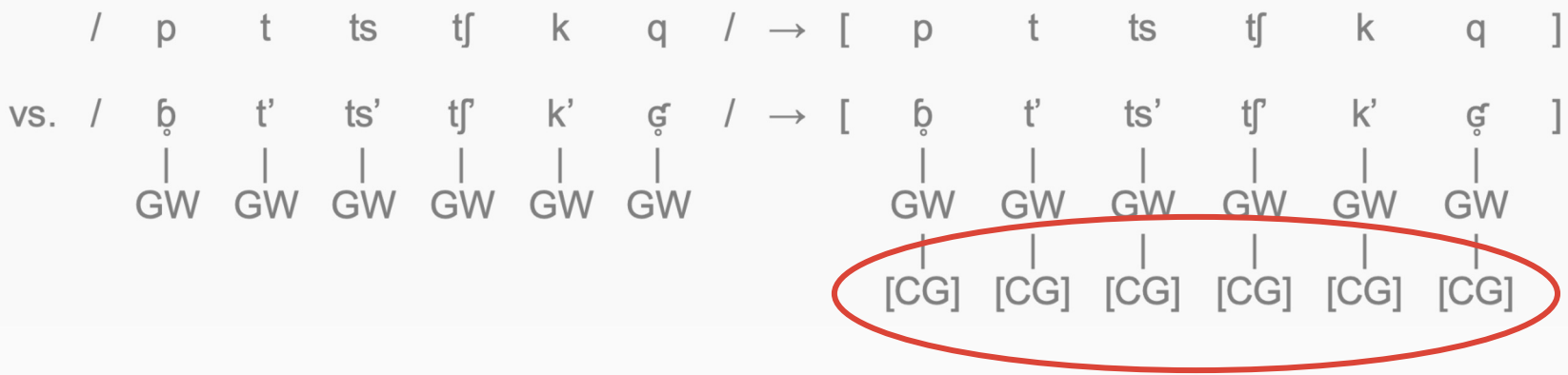
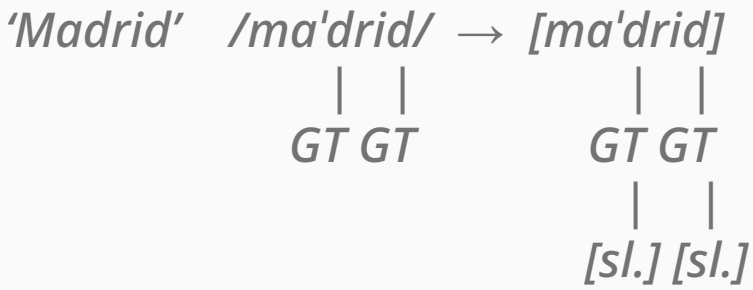


Glottal Tension in Spanish

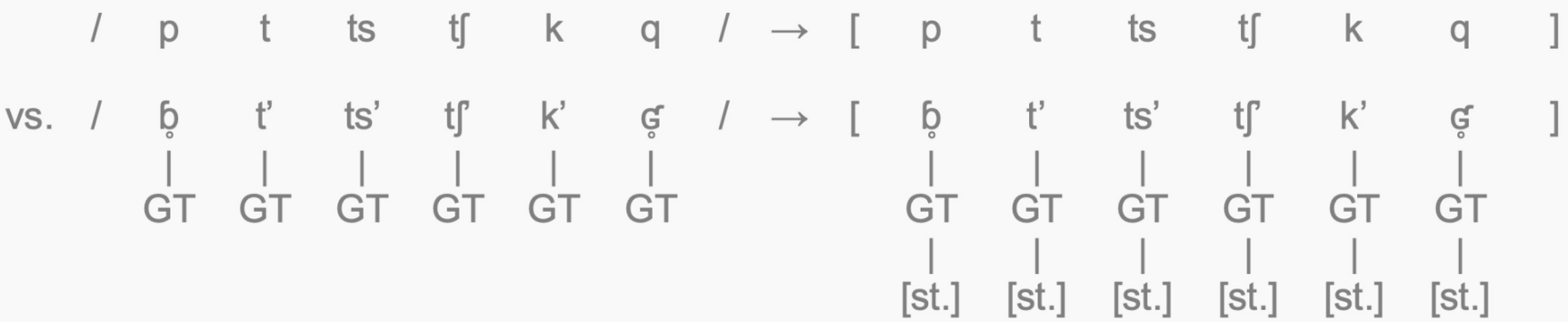
Only the dimension Glottal Tension (GT) is contrastive in Spanish, not the gestures. Spanish speakers complete GT with [slack] in their L1 phonetics, e.g.:



Glottal Tension may be completed with [stiff] in some phonetic contexts, e.g. word-finally, but this is uncertain.

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 laryngeal dimension from their L1. They complete GT-stops with the gesture [stiff] in their L2/L3 phonetics:



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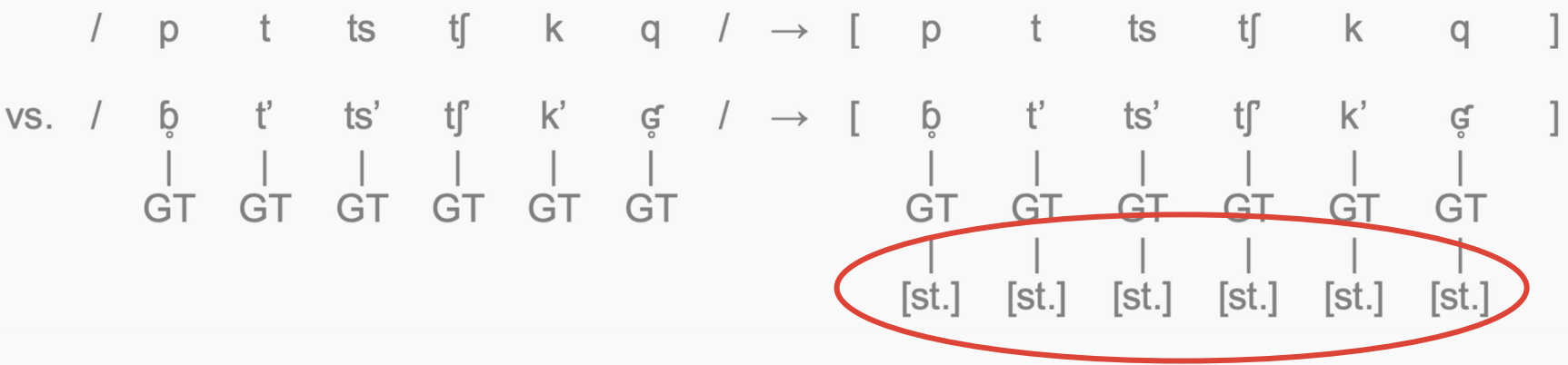
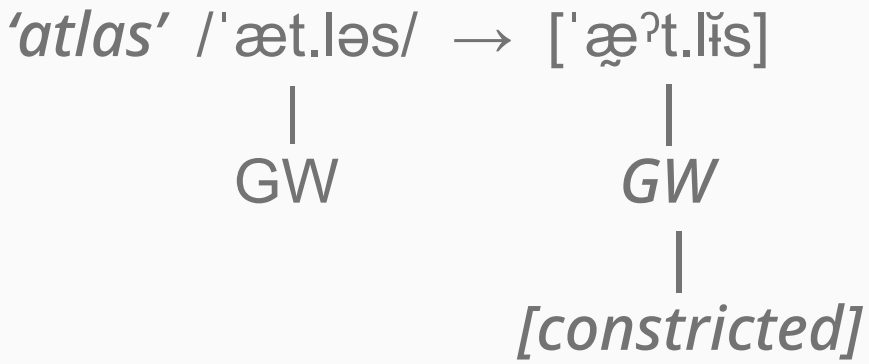


It is reasonable to suppose that L1 English learners of Mayan ejectives/ implosives have a special advantage.

There's a precedent for completing GW with the gesture [constricted] in their L1, e.g.:



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.

But that's not really the case.

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)

Phonetic learning, including gesture completion and enhancement in Avery & Idsardi's (2001) sense, is not contingent on redeployment, pace Brown (2000).

So for instance, 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.

Redeployment Fine-Tuned

We've adopted a fairly broad model of phonological redeployment in this talk

Feel free to ask about some nuances in the question period (but here are some teasers).

Redeployment Fine-Tuned

Within a domain

- *Hierarchy of difficulty (Wu, 2024)*
- *Redeployment within a domain > Triggering > Redeployment & Triggering*

Redeployment Fine-Tuned

Across domains

Nelson (2023a; 2023b) shows that the Tongue Root dimension (or [RTR] feature) can be redeployed from vowels to support new uvular consonant contrasts

Redeployment Fine-Tuned

Across domains

- *Redeployment across domains is possible:*
- *L2 inflectional morphology (Austin et al., 2022)*
- *but takes more time (Martinez, Goad & Dow, 2023)*

dimensions and gestures

The interface picture tells the story….

Thanks!

Slides and supplementary material available upon request!

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Redeployment Fine-Tuned

Integrated I-Grammar

- *redeployment from L1 and L2 to L3 (Wu, 2024)*
- *L3 French take [round] from L1 Mandarin and [tense] from L2 English*

Redeployment Fine-Tuned

Integrated I-Grammar

L3 English German has properties of both L1 Dutch and L2 German

Simon & Leuschner (2010)

Redeployment Fine-Tuned

Integrated I-Grammar

L3 English can have elements (segmental and prosodic) from L1 Arabic & L2 French

Benrabah (1991); Archibald (2022a, b)

Onsets Exploded

Within the onsets there are differences in terms of accuracy of perception:

k’/p’ > t’/tʃ’ > ts’

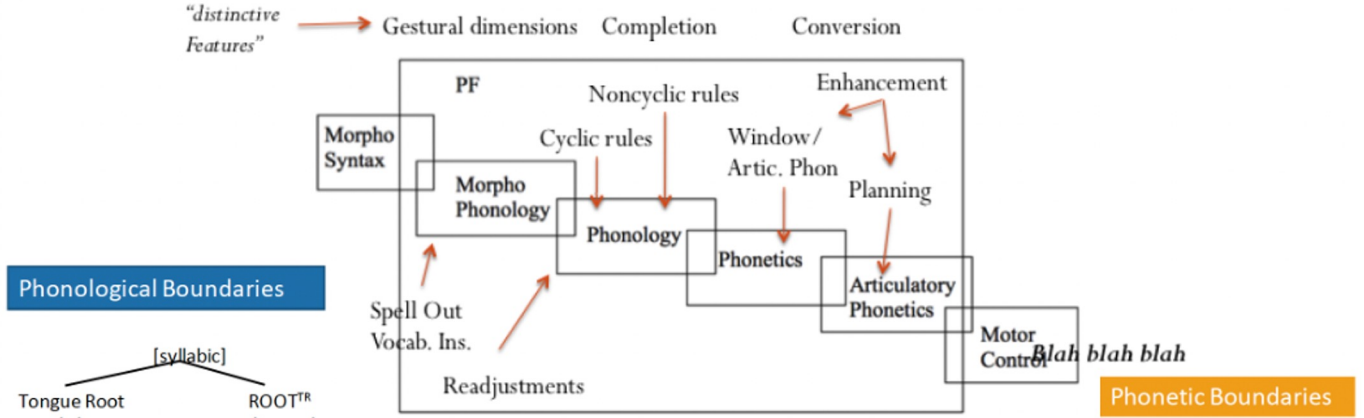
Codas Exploded

And note the pattern in codas:

tʃʼ > tsʼ > kʼ >ʼ pʼ > tʼ

PURNELL & HYPERMODULARITY

Hypermodularity and Neorealism



Redeployment Fine-Tuned

Within a domain

- *subcomponent of L1 vowel contrastive hierarchy redeployed to L2 vowel hierarchy for targetlike parsing (Wu, 2024)*
- *redeploying phonological features different than phonetic features (Martinez et al., 2023)*

Redeployment Fine-Tuned

Across domains

- *Sometimes features are shared across domains*
- *[COR] on V-Place or C-Place (Trommer, 2021; Archibald; 2022; Özcelik & Sprouse, 2017)*
- *plural allomorphy & vowel harmony*

Redeployment Fine-Tuned

Across domains

- *utterance-level pitch to lexical level tone (Braun, Galts & Kabak, 2014)*