Intermediate Markedness in Phonological Acquisition

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1. Intermediate stages

- Children sometimes acquire marked structures of the target language in a two-step fashion:
  1. The structure is only produced in some privileged position(s).
  2. It is produced in all positions found in the target language.
- Rose (2000) observes such a stage in the acquisition of complex onsets in Québec French:

(1) **Initial**: CCV̆→✗CV̆, CCV́→✗CV́

Target	*Child*		*Gloss*
abʁikó	pupækó	(Clara)	'apricot'
klʊ̃n	kʊ̃ɲ	(Théo)	'clown'

(2) **Intermediate**: CCV̆→✗CV̆, CCV́→✓CCV́

Target	*Child*		*Gloss*
sitχʊ́j	θətχʊ́ːj	(Clara)	'pumpkin'
fʁigó	bukó	(Clara)	'fridge'
gʁyjó	kʰœjɔ́	(Théo)	'oatmeal'

(3) **Final**: CCV̆→✓CCV̆, CCV́→✓CCV́

Target	*Child*		*Gloss*
plɑ̃ʃé	plɑ̃ʃé	(Clara)	'floor'
tχuvé	kχavé	(Théo)	'found'

- Intermediate stages have been analyzed in terms of **positional Faithfulness** constraints (schema and constraints from Tessier 2009):

(4) $\text{Positional } \mathcal{F} \gg \mathcal{M} \gg \text{General } \mathcal{F}$
$\text{Max}/\acute{\sigma} \gg *\text{Complex} \gg \text{Max}$

Under this characterization, they are called **intermediate faithfulness stages** (Tessier 2009).

- Intermediate stages can also be analyzed in terms of **contextual Markedness** constraints:

(5) $\text{Contextual } \mathcal{M} \gg \mathcal{F} \gg \text{General } \mathcal{M}$
$*\text{Complex}/\breve{\sigma} \gg \text{Max} \gg *\text{Complex}$

Under this characterization, they are **intermediate markedness stages**.

- Jesney & Tessier (2007, 2008) claim that intermediate faithfulness stages cannot be learned by gradual OT learners, but this claim does not hold of intermediate markedness stages.

2. Intermediate faithfulness cannot be predicted by Gradual OT Learners

☞ **Problem** (Jesney & Tessier 2007, 2008): gradual OT learners like the GLA (Boersma 1997, Magri 2012) do not predict there should *ever* be an intermediate stage with the constraint ranking in (4).

Errors and updates predicted

- Using Magri's (2012) GLA update rule,
- A GLA-based learner in the initial stage ($\mathcal{M} \gg \mathcal{F}$) will map CCV́→✗CV́:

(6)

CCV́	*Complex	Max	Max/σ́
☞ a. CV́	(L)	∗ (W)	∗ (W)
b. CCV́	∗!		

→ $(-1, \frac{1}{3}, \frac{1}{3})$

- It will map CCV̆→✗CV̆:

(7)

CCV̆	*Complex	Max	Max/σ́
☞ a. CV̆	(L)	∗ (W)	(e)
b. CCV̆	∗!		

→ $(-1, \frac{1}{2}, 0)$

Learning path predicted

Initial: CCV̆→✗CV̆, CCV́→✗CV́

Grammar	*Error*	*Cpx	Max	Max/σ́
*Cpx≫Max,Max/σ́		8,	0,	0
	CV́	7,	$\frac{1}{3}$,	$\frac{1}{3}$
*Cpx≫Max≫Max/σ́	CV̆	10,	$\frac{5}{6}$,	$\frac{1}{3}$
	CV́	6,	$1\frac{1}{6}$,	$\frac{2}{3}$
	CV̆	5,	$1\frac{2}{3}$,	$\frac{2}{3}$
	CV́	4,	2,	1
	CV̆	3,	$2\frac{1}{2}$,	1
Max≫*Cpx≫Max/σ́	CV́	2,	$2\frac{5}{6}$,	$1\frac{1}{3}$

Final: CCV̆→✓CCV̆, CCV́→✓CCV́

☞ **Problem**: No intermediate stage: CCV̆→ ✗CV̆, CCV́ → ✓CCV́

3. Intermediate markedness can be predicted

☞ **A Solution**: if the intermediate stage is characterized in terms of **positional Markedness** constraints, the GLA will be able to predict an intermediate stage.

Errors and updates predicted

- Again, using Magri's (2012) GLA update rule,
- A GLA-based learner in the initial stage ($\mathcal{M} \gg \mathcal{F}$) will map CCV́ → ✗CV́:

(8)

CCV́	*Cpx/σ̆	*Cpx	Max
☞ a. CV́	(e)	(L)	∗ (W)
b. CCV́		∗!	

→ $(0, -1, \frac{1}{2})$

- It will map CCV̆ → ✗CV̆:

(9)

CCV̆	*Cpx/σ̆	*Cpx	Max
☞ a. CV̆	(L)	(L)	∗ (W)
b. CCV̆	∗!	∗	

→ $(-1, -1, 1)$

Learning path predicted

Initial: CCV̆→✗CV̆, CCV́→✗CV́

Grammar	*Error*	*Cpx/σ̆	*Cpx	Max
*Cpx/σ̆, *Cpx≫Max		8,	8,	0
*Cpx/σ̆≫*Cpx≫Max	CV́	8,	7,	$\frac{1}{2}$
	CV̆	7,	6,	$1\frac{1}{2}$
	CV́	7,	5,	2
	CV̆	6,	4,	3
*Cpx/σ̆≫Max≫*Cpx	CV́	6,	3,	$3\frac{1}{2}$

Inter.: CCV̆→✗CV̆, CCV́→✓CCV́

- From this stage, the grammar continues to produce updates triggered by CCV̆→ ✗CV̆ until complex onsets are produced in all environments.

4. Other conditions on constraints

- Examining English unstressed syllable acquisition (Kehoe & Stoel-Gammon 1997, Kehoe 2000) shows that if a positional Faithfulness constraint is necessary, it must remain low-ranked in the child's grammar.

Data

- All data from Kehoe (2000)

(10) **First**: ✓σ̆]; ✗TV̆, LV̆, [σ̆

Gloss	*Child*	
banána	[nánʌ]	(34m3)
élephant	[ʔʌ́fɪnt]	(34m3)
óctopus	[ɑ́ʔpʊs]	(34m3)

(11) **Second**: ✓σ̆], TV̆; ✗LV̆, [σ̆

Gloss	*Child*	
banána	[bænʌ]	(28m3)
élephant	[ɑ́fɪn]	(34f3)
óctopus	[ɑ́ʔtəpʊs]	(34f3)

(12) **Third**: ✓σ̆], TV̆, [σ̆; ✗LV̆

Gloss	*Child*	
banána	[bʌnǽnʌ]	(34f1)
élephant	[ɛ́lːfɪnt]	(34f1)
óctopus	[ɑ́ktəpʊs]	(34f1)

- In the final observed stage, children are adult-like.

Analysis

- Kehoe's (2000) analysis is as in (4) – two high-ranking poisitonal Faithfulness constraints account for the data, Max/σ́ (as StressFaith) & AnchorR.
- Max/σ́ can be accounted for using contextual Markedness: *V̆ & *SonOns/σ̆ (*LV̆)

(13)

bənǽnə	Alignσ́L	*LV̆	*V̆	Max	Contig
☞ a. nánʌ		∗	∗	∗∗	
b. bánʌ		∗	∗	∗∗	∗!
c. bənánʌ	∗!	∗	∗∗		

- AnchorR cannot be accounted for using contextual Markedness constraints, but can remain low-ranked in the grammar. Data point from 38m3 (Kehoe 2000).

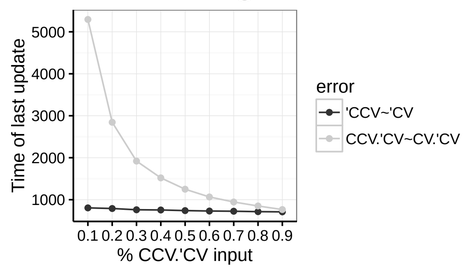
(14)

ǽnəməl	*LV̆	*V̆	*Right	Max	AnchrR
a. ǽnʌmɑ	∗∗!	∗∗	∗∗	∗	
b. ǽnʌ	∗	∗	∗	∗∗∗	∗!
☞ c. ǽmɑ	∗	∗	∗	∗∗∗	

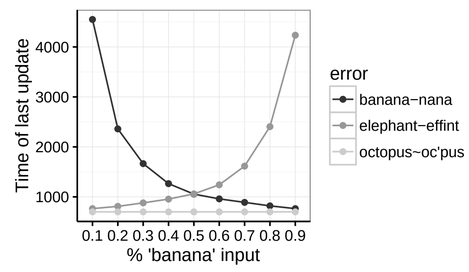
- AnchorR can remain low-ranked, and the GLA can correctly predict Kehoe's stages.

5. Discussion

- This analysis predicts that all children should go through an intermediate stage.



Québec French



English

- The more the learner attempts to produce the errors demoting multiple constraints, the shorter its intermediate stage will be.
- This may account for its relative rarity in child language corpora.
- The analysis of English predicts a pattern not present in Kehoe's (2000) data, one in which the Third stage has all medial syllables (✓σ̆], TV̆, LV̆), but no initial syllables (✗[σ̆).
- Either this is an accidental gap or the constraint set needs to be revised.
- This is just one solution to this puzzle. Other solutions include:
  - Changing the learning algorithm so that it works through HG rather than OT and allows the $\mathcal{F}$ constraints to gang up on the $\mathcal{M}$ constraint (Jesney & Tessier 2007, 2008; Tessier 2009)
  - Using a non-standard initial stage, such that

    (15) $\mathcal{M} \gg \text{Positional } \mathcal{F} \gg \text{General } \mathcal{F}$

    biasing the Positional $\mathcal{F}$ constraints to be ranked above the $\mathcal{M}$ constraints sooner (Hayes 2004, Tessier 2009)
  - Positing a fixed ranking between $\mathcal{F}$ constraints using the PMap (Steriade 2001), *e.g.*, $\Delta(\text{C} - \varnothing)/\acute{\sigma} > \Delta(\text{C} - \varnothing)/\breve{\sigma} \rightarrow \text{Max}/\acute{\sigma} \gg \text{Max}/\breve{\sigma}$, so that Max/σ́ is guaranteed to be re-ranked over $\mathcal{M}$ before Max/σ̆.

Selected References: Boersma, Paul. (1997). "How we learn variation, optionality, and probability". *Proceedings of the Institute of Phonetic Sciences of the University of Amsterdam* **21**:4358. • Jesney, Karen, and Anne-Michelle Tessier. (2008). "Gradual learning and faithfulness: Consequences of ranked vs. weighted constraints". In *Proceedings of NELS 28*, ed. Muhammad Abdurrahman, Anisa Schardl, and Martin Walkow. Amherst: GLSA publications. • Kehoe, Margaret M. (2000). "Truncation without shape constraints: the latter stages of prosodic acquisition". *Language Acquisition* **8**:2367. • Magri, Giorgio. (2012). "Convergence of error-driven ranking algorithms". *Phonology* **29**:213269. • Rose, Yvan. (2000). *Headedness and prosodic licensing in the L1 acquisition of phonology*. Doctoral Dissertation, McGill University, Montréal, Québec. • Tessier, Anne-Michelle. (2009). "Frequency of violation and constraint-based phono- logical learning". *Lingua* **119**:638.

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