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ALLOPHONY AND CONTRAST WITHOUT FEATURES

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1. INTRODUCTION

- **Allophony in adult grammars:**
  The features under focus are active in the grammar, but their distribution is limited due to e.g. positional constraints.
  - *Unmarked* features in prosodically-*weak* positions;
  - *Marked* features in prosodically-*strong* positions.
- **Contrast in adult grammars:**
  Contrast is featurally-based.
  - *Contrasts* are typically licensed in prosodically-*strong* positions.
- **Problem 1:**
  Some cases of allophony in developing grammars (laryngeal features in Amahl's English) show unexpected distributions:
  - *Marked* features in prosodically-*weak* positions.
  - *Unmarked* features in prosodically-*strong* positions.
- **Problem 2:**
  - Laryngeal *contrasts* appear to develop first in prosodically-*weak* positions.
- **Solution:**
  - Certain cases of allophony and contrast arise without the features seemingly involved being employed by the grammar.
  - A theory of prosodically-determined strong and weak licensers must be coupled with an abstract view of the syllable.

2. ALLOPHONY: PATTERNS AND PROBLEMS:

(1) **Voicing neutralization in Amahl's Stage 1 grammar** (age 2.60) (Smith 1973:37):[1]
a. Voiceless unaspirated lenis in initial position: [p t k]
b. Voiced lenis in medial position: [b d ɡ]
c. Voiceless fortis (aspirated or unaspirated) in final position: [p' t' k']

(2) a. **Voiceless unaspirated lenis:**

[pɛn]	'pen'	[tɜ:n]	'turn'	[kʌm]	'come'
[pɔ:]	'ball'	[tɔ:]	'door'	[keip']	'grape'

b. **Voiced lenis:**

[ubu:]	'open'	[nɔ:di:]	'naughty'	[kigi:]	'sticky'
[ɛbu:]	'elbow'	[ki:di:]	'greedy'	[kɛgu]	'lego'

c. **Voiceless fortis:**

[pʌp']	'bump'	[nʌt']	'nut'	[mik']	'milk'
[ku:p']	'cube'	[a:t']	'hard'	[ɛk']	'egg'

[1] Smith transcribes voiceless unaspirated lenis as [b̥ d̥ ɡ̊] and voiceless fortis as [p t k].

(3) **Prosodic reformulation of (1):**
a. Voiceless unaspirated lenis in foot-edge onset position
b. Voiced lenis in foot-internal onset position
c. Voiceless fortis (aspirated or unaspirated) in coda (?) position

(4) **Problems:**
Is Amahl's grammar backwards?
- Since foot-edge onsets are strong licensers (e.g. Harris 1997), why does this position undergo lenition?
- Since codas are weak licensers (e.g. Itô 1986), why does this position undergo fortition?

3. ANALYSIS

3.1. FOOT-INTERNAL ONSET POSITION

(5) **Danish vocalization** (Harris 1997):

a. *Obstruent in onset of stressed syllable:*

bebude	be[p]júde	'to foretell'
dedyre	de[t]ýre	'to proclaim'
igen	i[k]én	'again'

b. *Sonorant in medial unstressed position:*

peber	pé[w]er	'pepper'
modig	mó[ð]ig	'brave'
koge	kó[w]e ~ kóe	'to cook'

(6) **Ingredients:**
- Foot-internal position is a weakening environment (e.g. Harris 1997);
- Foot-internal weakening is sonorantization;
- Voiced stops are 'sonorant obstruents' in languages with SV voicing rather than laryngeal voicing; these stops often surface as lenis (Rice 1993, Avery 1996).

(7) a. **Laryngeal language** (Adult English):

p t k	b d g	m n ŋ
|	|	|
Lar	Lar	SV
|	|	|
([SG])	[vce]	[nas]

b. **SV language** (e.g. Athapaskan):

p t k	b d g	m n ŋ
	|	|
	SV	SV
		|
		[nas]

Following SPE, English is analysed as a [vce] language with [SG] assigned by rule (cf. Iverson & Salmons 1995, Kager et al. (2007) on acquisition)

(8) **Analysis:**
- Amahl's Stage 1 grammar lacks Lar and laryngeal features ([vce], [SG]);
- Voiced lenis stops (3b) do not bear Lar voicing;
- They acquire SV from adjacent vowels.

(9) **Amahl's Stage 1 representations:**

/p/ [ú b u:]$_{Ft}$ 'open' /b/ [é b u:]$_{Ft}$ 'elbow'

SV SV SV SV

3.2. FOOT-EDGE ONSET POSITION

(10) **Problem:**
- Since foot-edge onsets are strong licensers, why do stops in this position surface as lenis (3a) in Amahl's grammar instead of fortis ([tense] or [SG])?

(11) **Ingredients:**
- In adult languages, voiceless unaspirated lenis is the unmarked value of voicing.
- Evidence: it is often the type of segment that results from voicing neutralization in coda (e.g. German); it is the realization of stops after [s] (in perhaps all languages).

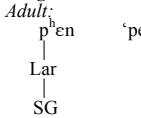
- In theories that assume underspecification, this type of segment would be underspecified for Lar.

(12) **Analysis:**
- Since Amahl's grammar lacks Lar and laryngeal features, the underspecified representation arises for free (cf. Kager et al. 2007 on child German).
- Foot-initial voiceless consonants do not surface as fortis (unlike in the adult grammar for target voiceless stops) because, without Lar, they cannot bear [SG] (or any other laryngeal feature).

(13) **Representations:**

a. **Target voiceless aspirated:**

Adult:

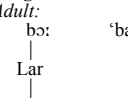


'pen'

Amahl: pɛn 'pen'

b. **Target voiced:**

Adult:



'ball'

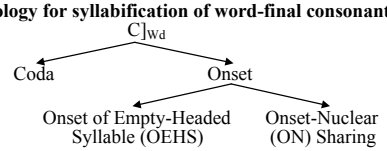
Amahl: pɔː 'ball'

3.3. CODA (?) POSITION

(14) **Problem:**
- Since codas are weak licensers, why are fortis rather than lenis allophones found in this position in Amahl's grammar?

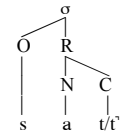
3.3.1. INGREDIENTS

(15) **Typology for syllabification of word-final consonants in adult grammars:**

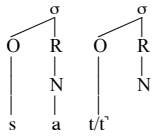


- Coda and Onset (Piggott 1991, 1999, Rice 1992, Goad 2002, Goad & Brannen 2003; cf. Kaye 1990 and GP more generally).
- OEHS and ON sharing; in the latter, the features of the final onset have spread into the following empty nucleus, yielding fortis release (Goad 2002, Goad & Brannen 2003; cf. also Hoard 1978).

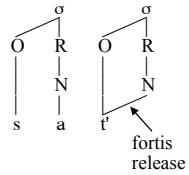
(16) a. **Coda:**



b. **OEHS:**



c. **ON sharing:**



Examples:
Thai, Selayarese — Diola-Fogny, Québec French — Yapese, European French

(17) '**Rhyme' size – Coda language: Selayarese** (Mithun & Basri 1986):
a. *Word-internally:* Rhymes maximally binary (VC)
b. *Word-finally:* Same as observed as word-internally (VC)

(18) '**Rhyme' size – Onset language: Diola-Fogny** (Sapir 1965):
a. *Word-internally:* Rhymes maximally binary (VV, VC)
b. *Word-finally:* One extra consonant is permitted (VVC, VCC)

(19) **Segmental profile – Coda language: Selayarese:**
a. *Word-internal coda:* First half of geminate, place-sharing nasal, [ʔ]:
ʔuppa 'find' ʔaɲdeŋka 'throw'
allonni 'this day' seʔla 'salt'

b. *Word-final consonant:* Placeless nasal, [ʔ]:
pekaŋ 'hook' sassaʔ 'lizard'

(20) **Segmental profile – Onset language: Diola-Fogny:**
a. *Word-internal coda:* Place-sharing nasal, place-sharing liquid:
niŋaŋŋan 'I cried' jɛnsʊ 'undershirt'
salte 'be dirty' na-laŋ-laŋ → nalalaŋ 'he returned'

b. *Word-final consonant:* Any consonant from the inventory of onsets:
jawac 'to swim' famb 'annoy'
ufeːgir 'three' wopuːs 'green caterpillar'

(21) **Release properties of final consonant – Onset languages:**
a. *OEHS – No fortis release:*
Diola-Fogny: Voiceless stops optionally unreleased (Sapir 1965)
Québec French: All stops optionally unreleased

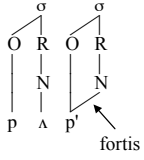
b. *ON sharing – Fortis release:*
Yapese: Voiceless stops 'aspirated' (Jensen 1977)
European French: All consonants overtly released (Tranel 1987)

3.3.2. BACK TO AMAHL

(22) **Analysis:**
- Amahl's word-final consonants are onsets (not codas), syllabified through ON sharing (argued to be the unmarked case in Goad 2002, Goad & Brannen 2003).
- The nucleus serves to host the release of the consonant; the result is a fortis output.
- Fortis output arises not from particular laryngeal features but from a particular prosodic representation.

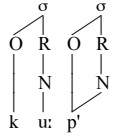
(23) **Amahl's representation: ON sharing:**

a. *Target voiceless:*



'bump'

b. *Target voiced:*



'cube'

(3') **Prosodic reformulation of (1) – Revised from (3):**
a. Voiceless unaspirated lenis in foot-edge onset position
b. Voiced lenis in foot-internal onset position
c. Voiceless fortis (aspirated or unaspirated) in word-final onset position

3.3.3. OTHER EVIDENCE FOR FINAL ONSETS IN AMAHL'S GRAMMAR

(24) '**Rhyme' size:**
a. **Stage 1 (age 2.60):**
Word-internally: Rhymes maximally binary; no codas (VV, *VC)
Word-finally: One extra consonant is permitted (VVC)

b. **Stage 2-3 (age 2.115-2.130):**
Word-internally: Rhymes maximally binary (VV, VC)
Word-finally: One extra consonant is permitted (VVC, VCC)

(25) **Adult language typology** (Goad & Brannen 2003):

Languages	*Word-internal codas*	*Word-final consonants*
Selayarese, Japanese	yes	coda
Diola-Fogny, French	yes	onset
Yapese, Kamaiurá (Amazonian)	no	onset
Unattested	no	coda

(26) **Segmental profile:**
a. **Stage 1 (age 2.60):**
Word-internal coda: none
Word-final consonant: nasal; stop

b. **Stage 2-3 (age 2.115-2.130):**
Word-internal coda: nasal; stop
Word-final consonant: nasal+stop; stop+stop

4. DEVELOPMENT OF LARYNGEAL CONTRASTS

(27) **Problem:**
- Laryngeal contrasts *appear* to develop in weak positions before strong positions: final position (Stage 1) and medial position (Stage 2) before initial position (Stage 9).
- Cross-linguistically unexpected if strong positions are positions of contrast and weak positions are positions of neutralization.

(28) **Examples from adult grammars:**
a. Onsets are positions of contrast; codas are positions of neutralization:
Laryngeal neutralization in Thai:
i. *Onset:* ii. *Coda:*
[pʰèt] 'spicy' *[sipʰ]
[pèt] 'duck' [sip] 'ten'
[bèt] 'fishhook' *[sib]

b. Onsets of stressed syllables are positions of contrast; onsets of unstressed syllables are positions of neutralization:
Flapping in North American English:
i. *Onset of stressed syllable:* ii. *Onset of unstressed syllable:*
[rətʰéɾʃən] 'retention' [lǽɾər] 'latter'
[rədémʃən] 'redemption' [lǽɾər] 'ladder'

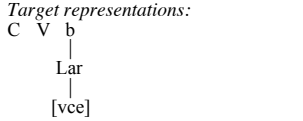
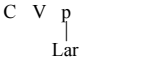
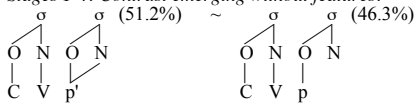
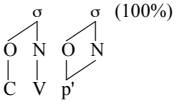
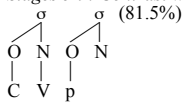
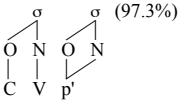
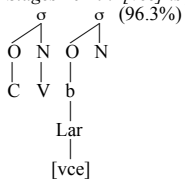
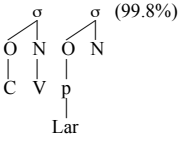
(29) **Solution for Amahl:**
- Early development in medial and final positions does not involve laryngeal features but instead presence or absence of link in representations posited in (9) and (23) resp.
- Later development (in initial position) involves projection of actual laryngeal features.

4.1. FINAL POSITION

(30) **Stop targets in final position:**

		St 1-4 (2.60-2.137) (n=41)	St 5-9 (2.139-2.196) (n=54)	St 10-29 (2.198-3.355) (n=164)
b d g	p' t' k'	**51.2**	11.1	0.6
	p t k	**46.3**	**81.5**	3.0
	b d g	2.4	7.4	**96.3**
		St 1-4 (2.60-2.137) (n=125)	St 5-9 (2.139-2.196) (n=147)	St 10-29 (2.198-3.355) (n=521)
p t k	p' t' k'	**100**	**97.3**	**99.8**
	p t k	0	2.7	0
	b d g	0	0	0.2

(31) **Representations for final position:**

Voiced targets:	**Voiceless targets:**
a. *Target representations:* 	
b. *Stages 1-4: Contrast emerging without features:* 	
c. *Stages 5-9: Contrast without features:* 	
d. *Stages 10-29: [vce] is projected:* 	

4.2. MEDIAL POSITION

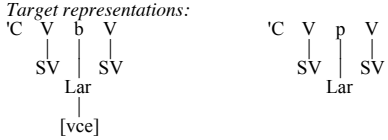
(32) **Stop targets in medial position:**

		Stage 1 (2.60) (n=19)	Stage 2 (2.115) (n=14)
b d g	b d g	**100**	**100**
	p t k	0	0
	p' t' k'	0	0
		Stage 1 (2.60) (n=30)	Stage 2 (2.115) (n=26)
p t k	b d g	**90.0**	**53.8**
	p t k	3.3	**38.5**
	p' t' k'	6.7	7.7

(33) **Representations for medial position:**

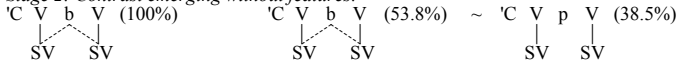
Voiced targets: **Voiceless targets:**

a. *Target representations:*



b. *Stage 1: No contrast:*

c. *Stage 2: Contrast emerging without features:*



4.3. INITIAL POSITION

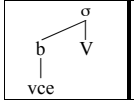
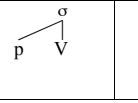
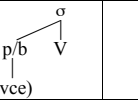
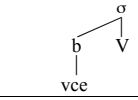
(34) **Amahl's representation of voiceless unaspirated lenis:**

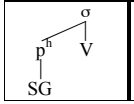
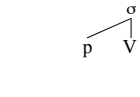
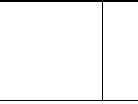
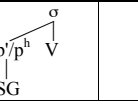
With no change in structure available, unlike in (31) and (33), no contrast can emerge until the necessary features are available.

(35) **Stop targets in initial position:**

		St 1-8 (2.60-2.175) (n=186)	St 9-12 (2.189-2.227) (n=155)	St 13-29 (2.233-3.355) (n=323)
b d g	p t k	**99.5**	**51.0**	0.6
	b d g	0.5	**46.5**	**99.4**
	p' t' k'	0	2.6	0
		St 1-12 (2.60-2.227) (n=443)	St 13-18 (2.233-2.312) (n=211)	St 19-29 (2.317-3.355) (n=189)
p t k	p t k	**82.8**	0.5	0
	p' t' k'	14.7	**52.6**	0?
	p^h t^h k^h	0	**46.9**	**100?**[2]
	b d g	2.5	0	0

(36) **Representations for initial position:**

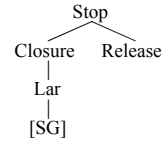
Target [b]:	*Stages 1-8:*	*Stages 9-12:*	*Stages 13-29:*
	[b]→[p]	[b]→[p]~[b]	[b]→[b]
			

Target [p^h]:	*Stages 1-8:*	*Stages 9-12:*	*Stages 13-18:*	*Stages 19-29:*
	[p^h]→[p]		[p^h]→[p']~[p^h]	[p^h]→[p^h]
				

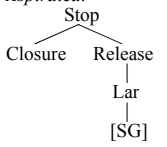
(37) **[SG] at Stages 13-18:**

- In initial position, the difference between aspiration and fortis is not featurally-based but rather reflects a difference in laryngeal timing (Avery 1996:77).
- Representations at Phonetic Implementation (Avery 1996:69):

a. *Fortis:*



b. *Aspirated:*



[2] Smith does not transcribe aspiration after Stage 19. On the basis of the following comment, I assume that this indicates that aspiration has become target-like: "The other main development [at Stage 13] was also partially a function of the completion of the acquisition of voicing contrasts. At this stage A[mahl] (usually) had the correct allophones of the voiced and voiceless segments; for instance, voiceless plosives were aspirated initially, etc." (p. 118).

4.4. [h] AND ASPIRATION

(38) **Distribution of [h] and aspiration in English** (Jensen 1993, Davis & Cho 2003, Mah in progress):

a.	[h]ábit	[k^h]ábin	b.	ve[h]ícular	ra[p^h]ídity
	[h]abítual	[k^h]abána		véhicle	rá[p]id

Davis & Cho's (2003) analysis:
Both [h] and aspirated stops are [SG]; distribution is captured by alignment of [SG] with positions of prominence (word-initial, foot-initial).

(39) **Emergence of [h] in Amahl's grammar parallels emergence of aspiration:**

Target	Amahl	St 1-13 (2.60-2.242) (n=82)	St 14-15 (2.247-2.271) (n=28)	St 16-29 (2.275-3.355) (n=82)
h	Ø	**97.6**	**53.6**	2.5
	h	0	**46.4**	**96.3**
	other	2.4	0	1.2

5. CONCLUSION

- Laryngeal allophony in Amahl's grammar arises not from particular laryngeal features being restricted to particular positions.
- An analysis based on laryngeal features cannot yield a principled account for the surprising distribution of allophones in Amahl's outputs, both the presence of unexpected allophones in certain contexts and the absence of expected allophones in other contexts.
- Laryngeal allophony instead arises from a lack of laryngeal features combined with:
  - A theory of prosodically-determined strong and weak licensers; and
  - An abstract view of the syllable: final consonants in Amahl's grammar are syllabified through ON Sharing: the nucleus following a word-final onset serves to host the release of the consonant, resulting in a fortis output.
- The observation that laryngeal contrasts appear to develop first in final (Stage 1) and medial (Stage 2) position is tied to structure, rather than to the licensing of the relevant features. A true (featurally-based) contrast does not emerge until Stage 9 for [vce] and Stage 13 for [SG].

6. PHON WISH LIST

Phon is a wonderful tool! Here are the principal challenges that I encountered in undertaking this work:

- I would like to be able to sort the results of a search.
- I would like to be able to collapse stages on the fly for certain searches.
- I would like to be able to consider different analyses for different stages in a given child's corpus without having to split the corpus into several sub-corpora (e.g. Stages A-B: child has final onsets; Stages C-E: child has final codas).

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