24.961 Stress-3 Stress in Windows

[1] Kager (2012): many languages restrict stress/accent to a window of two or three syllables at the right or left edge of the word.

- right edge: Aklan binary, Modern Greek, Italian, Spanish ternary
- left edge: Onati Basque binary, Choguita Raramuri ternary
- accent location in window is determined by syllable weight, lexical encoding, as well as distance from word edge
- accent may be realized by stress or pitch and hence is an abstract quantity
- maximal window is three syllables but found to be symmetric at both edges (cf. Gordon 2002)
- final syllable can be obligatorily unstressed but not the initial syllable

[2] examples

Macedonian: antepenult stress with exceptional lexical stress in loanwords

vodéničar	'miller'	vodeníčar-ot	'miller def.
konzumátor	'consumer'	konzumatór-i-te	'consumers def.'

Piraha (Everett & Everett 1984)

(15)	CVV >	GVV >	VV >	CV >	GV	(C = voiceless; G = voiced)
	1	2	3	4	5	

(16)	a.	4-4-[3-2-**1**]	ko.so.ii.gai.'tai	'eyebrow'
	b.	4-[**1**-4-4]	ʔi.'tii.ʔi.si	'fish'
	c.	1-1-[**1**-4-3]	ʔoo.hoi.'hoi.hi.ai	'caterpillar'
	d.	1-[**1**-5-5]	pii.'hoa.bi.gi	'frog'
	e.	4-[**1**-4-3]	ʔi.'sii.ho.ai	'liquid fuel'
	f.	4-[5-5-**2**]	ʔo.ga.ba.'gai	'want'
	g.	4-[4-**2**-4]	ʔa.pa.'baa.si	'square'

In case the heaviest syllable in the word falls outside the window, it fails to attract the primary stress:

(17)	a.	1-1-5-[4-**3**-4]	pia.hao.gi.so.'ai.pi	'cooking banana'
	b.	1-[**2**-4-3]	poo.'gai.hi.ai	'banana'
	c.	1-[**3**-5-5]	kao.'ai.bo.gi	'jungle spirits'

The default stress position in Pirahã is rightmost. This is evidenced by windows that contain more than a single heaviest syllable (i.e. a tie), in which case the rightmost of these is stressed.

(18)	a.	[2-1-**1**]	bai.toi.'sai	'wildcat'
	b.	[1-1-**1**]	pao.hoa.'hai	'anaconda'
	c.	5-[1-5-**1**]	ba.hoi.ga.'toi	'pig'
	d.	1-[2-5-**2**]	kao.bii.ga.'bai	'almost falling'
	e.	4-1-5-[3-4-**3**]	ka.pii.ga.ii.to.'ii	'pencil'
	f.	4-4-[3-3-**3**]	ʔo.ho.aa.aa.'aa	'searching intensely'
	g.	[4-4-**4**]	ko.ʔo.'pa	'stomach'
	h.	[5-5-**5**]	gi.go.'gi	'what about you'

Azkoita Basque (Hualde 1998)

- stress rightmost syllable in trisyllabic window at left edge of word except that word-final syllable is not stressed

/gizon/	'man'
gi.ˈzo.na	'the man-ABS'
gi.zo.ˈnai	'the man-DAT'
gi.zo.ˈna.na	'the man-GEN+ABS'
gi.zo.ˈna.kin	'the man-COM'
gi.zo.ˈnan.ts̻a.ko	'the man-BEN'

[3] analytical options to define two and three-syllable window

- binary feet plus extrametricality of edge syllable, rhythmic constraints on lapses, layered feet (see below)
- problem noted by Green & Kenstowicz (1995) for foot-binarity plus extrametricality: extrametricality must be "revoked" in case final syllable is strongest in word in Piraha: ('pii.ai).ia 'scissors' but ?o.gi.'ai 'big'
- same problem for OT: Non-Finality » Align-Ft-Right fails to license stress on ?o.gi.'ai
- Green (1995) proposes Lapse constraint: *adjacent unstressed syllables not separated by a foot boundary: *(ss)ss#, *#ss(ss)
- entails midpoint pathology (Eisner 1997, Hyde 2008)
    - the Lapse constraint prevents lexical stress from drifting too far from the edge of the word so that it remains within the window
    - but as the word gets longer, stress will be drawn to the middle of the word to avoid a lapse on each edge of the word
    - no language attested has this bizarre system

Free lexical stress in three syllable forms

/σσσ̲/	LAPSE / PARSE-2	FAITH-ACCENT	FT= TROCHEE	ALIGN-WORD-L
(ˈσ σ) σ		*!		
(σ ˈσ) σ		*!		
σ (ˈσ σ)		*!		
☞ σ (σ ˈσ)				

Peripheral unstressability in four-syllable form: default overrules peripheral accent

/σσσσ̲/	LAPSE/ PARSE-2	FAITH-ACCENT	FT= TROCHEE	ALIGN-WORD-L
(ˈσ σ) σ σ	*!			
(σ ˈσ) σ σ	*!			
☞ σ (ˈσ σ) σ		*		
σ (σ ˈσ) σ		*	*!	
σ σ (ˈσ σ)	*!			
σ σ (σ ˈσ)	*!			

[4] grid-only with anti-lapse constraints also faces this problem (Gordon 2002)

A second model is based on symmetrical anti-lapse constraints. Anti-lapse

(58)	a.	x	b.	x	c.	x
		x x x x #		x x x #		x x #
		extended lapse		lapse		no lapse

- Final three-syllable window: *Extended-Lapse-R » Faith-Accent » Align-Head-L
- initial three-syllable window: *Extended-Lapse-L » Faith-Accent » Align-Head-R
- Extended-Lapse keeps stress from drifting too far away from edge and then Faith or Head-alignment locates stress in the window

Problem: when both Extended Lapse constraints are top-ranked then the best window is one in the middle of a word with five syllables

Window reduced in words of length 4 and 5 syllables

/σσ̲σσ/	*Extended-Lapse-L	*Extended-Lapse-R	Faith-Accent	Align-Head-R
'σ σ σ σ		*!		
☞ σ 'σ σ σ				
σ σ 'σ σ			*!	
σ σ σ 'σ	*!			

/σσ̲σσσ/	*Extended-Lapse-L	*Extended-Lapse-R	Faith-Accent	Align-Head-R
'σ σ σ σ σ		*!		
σ 'σ σ σ σ		*!		
☞ σ σ 'σ σ σ				
σ σ σ 'σ σ	*!			
σ σ σ σ 'σ	*!			

- in four-syllable words a lexical accent on the second syllable can survive since both extended lapse constraints are satisfied; but when the word is five syllables there is an extended lapse on the right and so a violation occurs
- the candidate with accent placed in the middle of word satisfies both extended lapse constraints
- But the window is regained when the word is longer than five syllables since now among the competing candidates every word will violate one or the other of Extended Lapse constraints and hence there is a tie that will be resolved by the lower-ranked faithfulness or alignment constraints

/σσ̲σσσσ/	*Extended-Lapse-L	*Extended-Lapse-R	Faith-Accent	Align-Head-R
'σ σ σ σ σ σ		*	*!	*****
☞ σ 'σ σ σ σ σ		*		****
σ σ 'σ σ σ σ		*	*!	***
σ σ σ 'σ σ σ	*!		*!	**
σ σ σ σ 'σ σ	*!		*!	*
σ σ σ σ σ 'σ	*!		*!	

Thus, free-ranking of natural constraints predicts an unattested stress system in the typology.

[5] The problem is not just limited to lexical accent but can arise more generally in any system where the two opposite-edge lapse constraints dominate alignment (Stanton 2014); stress is drawn to middle of word just in case it can remove lapses at both edges; but in longer words this is not possible and so the default edge orientation will reassert itself

*Lapse-L » *Lapse-R » Align-L

Ss sSs Ssss Sssss

*Extended-Lapse-L » *Extended-Lapse-R » Align-L

Ss Sss sSss ssSss Ssssss

[6] Kager's suggested solution is to represent the two and three-syllable windows with a weakly-layered foot: a ternary foot with a single binary foot inside. Nonfinality is restricted to final unstressability.

Shapes of the Weakly Layered foot

	head + adjunct	adjunct + head	no adjunct
binary head, trochee	(['σ σ] σ)	(σ ['σ σ])	(['σ σ])
binary head, iamb	([σ 'σ] σ)	(σ [σ 'σ])	([σ 'σ])
unary head	(['σ] σ)	(σ ['σ])	(['σ])

- Gen is "hard-wired" to only allow a single "adjunct" syllable on either the left or right edge of foot and the internal "head" foot is restricted to two syllables (cf. foot binarity)
- amounts to binary feet with at most one recursion
- Ito & Mester (2012) propose similar restrictions on the depth of recursion in phrasal phonology

Kager's (2012) constraint set:

Constraint set for the Weakly Layered Model

a.	HD-BIN	Heads are binary under syllabic or moraic analysis.
b.	ALIGN-HD-L	Heads are left-aligned with feet.
c.	ALIGN-HD-R	Heads are right-aligned with feet.
d.	HD=TROCHEE	Heads begin with strong syllable.
e.	HD=IAMB	Heads begin with weak syllable.
f.	PARSE-SYL	Syllables are parsed by feet.
g.	ALIGN-WORD-L	Words are left-aligned with a foot.
h.	ALIGN-WORD-R	Words are right-aligned with a foot.
i.	NON-FINALITY	Stress must not fall on the final syllable.
j.	FAITH-ACCENT	A lexical accent should be realized as primary stress.

- no lapse and clash constraints
- word-to-foot alignment constraints keep main stress foot at an edge while separate constraints on foot form locate the stressed syllable within this maximally trisyllabic foot domain; in the "foot-free" model all constraints are constraints on stress since there is no foot or grouping by hypothesis
- the mid-point pathology does not arise in Kager's model since no consistent ranking of the constraint set will produce this syndrome: to get third-syllable stress in a five syllable word with lexical accent, the constraints defining the default must dominate Faith for lexical stress; but then they will also override lexical stress within the window; if Faith for lexical accent is top ranked then lexical accent can surface independent of the window

[6] Stanton (2014)

- over-generation in the typology of grammars predicted with lapse constraints does not automatically entail weakly layered feet or more generally metrical grouping
- the evidence needed to motivate the ranking with both lapse constraints undominated does not appear in the data readily available to the learner
- thus, such grammars are theoretically possible but not reachable for learnability reasons (a familiar argument form; cf. Lightfoot's 1979 Degree-0 learnability)
- to learn the ranking where Extended Lapse constraints are top-ranked, long words (six or seven syllables) are needed and they will be much less frequent in most (non-agglutinating) languages compared to shorter words
- for binary-lapse dominant constraints the long-word argument does not hold and the claim is that it is difficult to infer the appropriate ranking change (aka the "credit" problem) with the Gradual Learning Algorithm
- other pathologies: given Kager's 2001 constraints licensing lapses at the stress peak, a possible ranking will shift location of main stress in odd-parity words to license a lapse. But this is also not attested. (not clear if this bears on the grouping question)

[7] weakly-layered feet have been proposed for ternary stress rhythms (Kager & Martinez-Paricio 2014)

classical grammar: dactyl (Sss) anapest (ssS) amphibrach (sSs)

Cayuvava (dactyl) ((Ss)s)

3*n*	ˌpo.po.he.ˈce.βa.ka	‘inside of cow’
3*n*+1	ma.ˌra.ha.ha.ˈe.i.ki	‘their blankets’
3*n*+2	i.ki.ˌta.pa.re.ˈre.pe.ha	‘the water is clean’

Chugach Alutiq (amphibrach) (sS)s)

3*n*+2	ta.ˈqa.ma.lu.ˈni	‘apparently getting done’
3*n*	a.ˈku.tar.tu.ˈnir.tuq	‘he stopped eating *akutaq*’
3*n*+1	ma.ˈŋar.su.qu.ˈta.qu.ˈni	‘if he (REFL.) is going to hunt porpoise’

Tripla Bangla (dactyl) ((Ss)s)

3*n*+2	ˈʃɔ.ma.lɔ.ˌsɔ.na	‘criticism’
3*n*	ˈo.nu.kɔ.ˌro.ni.jɔ	‘imitable’
3*n*+1	ˈo.no.nu.ˌda.βo.ni.jɔ	‘unintelligible’

Winnebago (anapest) (s(sS))

3*n*+1	(hi.(dʒo.ˈwi)).re	‘fall in’
3*n*+2	(ho.(ki.ˈwa)).(ro.ˈke)	‘swing (noun)’
3*n*	(ho.(ki.ˈwa)).(ro.(ro.ˈke))	‘swing (verb intr.)’

[8] feet as contexts for segmental phonology (cf. Kenstowicz 1993, Vaysman 2008, Davis 2009, and many more)

- Davis & Cho (2003) distribution of aspiration in English can be defined as foot-initial if a foot-initial adjunct is postulated: (p^{h}o(t^{h}áto)), (Mèdi)(t^{h}er(ránne))an, (T^{h}àta)(ma(góuchi))
- Onset in the adjunct? at^{h}ómat^{h}on, aut^{h}ómat^{h}a, octop^{h}us

- Kenstowicz & Sandalo (2014: in Brazilian Portuguese intensity/duration measures of vowels in various stress positions: tonic > pretonic > posttonic medial > final: (s(Ss))s
- Martinez-Paricio (2014): Chugach-Alutiq pitch-accents; L falls on adjunct

Tone patterns in Chugach Alutiiq words with all light syllables

a. ta. ˈqu. ma. lu. ˈni
| | |
H L H
'apparently getting done'

b. pi. ˈsu. qu. ta. ˈqu. ni
| | | |
H L H L
'If he (refl.) is going to hunt'

c. a. ˈku. ta. ˈmek
| |
H ¡H
'kind of food' (abl sg)

d. a.ˈta. ka
| |
H L
'my father'

a. ˈan. ci. quˈa
| | |
H L H
'I'll go out'

b. taˈa. ta. ˈqa
| |
H ¡H
'my father'

a. ((ta. ˈqu)$_{FtMin}$. ma)$_{FtNon\text{-}min}$ (lu. ˈni)$_{FtMin}$
| | |
H L H

b. ((pi. ˈsu)$_{FtMin}$. qu)$_{FtNon\text{-}min}$. ((ta. ˈqu)$_{FtMin}$. ni)$_{FtNon\text{-}min}$
| | | |
H L H L

c. (a. ˈku)$_{FtMin}$. (ta. ˈmek)$_{FtMin}$
| |
H ¡H

d. ((a. ˈta)$_{FtMin}$. ka)$_{FtNon\text{-}min}$
| |
H L

a. (ta ˈa) (ta. ˈqa)
(µ µ) (µ µ)
| |
H ¡H

b. ((ˈa n) ci) (qu ˈa)
((µ µ) µ) (µ µ)
| | |
H L H

actors of ternary feet could propose an alternative analysis based on WLP, in

Davis, Stuart & Mi-Hui Cho. (2003). The distribution of aspirated stops and/h/in American English and Korean: an alignment approach with typological implications. *Linguistics* **41**. 607–652.
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