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Prosodic conditioning in Finnish assibilation and vowel raising

Finnish assibilation: A classic argument for phonological strata and cyclicity comes from derived environment effects (DEEs), which encompass phonological processes that apply *only* or *never* in phonologically- and morphologically-derived environments. In the canonical case of Finnish assibilation, for example, /t/ is said to assibilate to [s] before /i/ in morphologically-derived environments (2a) but not morpheme-internally (2b) (Kiparsky 1973, Karlsson 1999).

/halut-i-n/ halusin 'want-past-1sg' b. /koti/ koti 'home-nom.sg' (1)a. /äiti/ /pyytä-i/ 'ask-past' äiti 'mother-NOM.SG' pyysi Finnish assibilation is also triggered in phonologically-derived environments. The key phonological process that feeds assibilation is known as word-final vowel raising, where /e/ raises to [i] at the right edge of a word (1a) (Skousen 1973, Kiparsky 1973). Assibilation can then apply to the newly-derived /ti/ sequence (1b) but is again blocked in non-derived environments (1c).

(2)	a.	Plain raising			
		/kiele/	kieli	'tongue-nom.sg'	
		/lapse/	lapsi	'child-noм.sg'	
	b.	Word-final vowel raising feeds assibilation			
		/kuute/	kuusi	'six-nom.sg'	
		/hirte/	hirsi	'log-nom.sg'	
	c.	No raising or assibilation			
		/koti/	koti	'home-nom.sg'	
		/äiti/	äiti	'mother-Nom.sg'	

However, this formulation of the conditioning environments for Finnish assibilation is oversimplified and even misguided as it ignores the roles of prosody and variability in the ti~si alternation. In this presentation, I show that assibilation is stricitly limited to applying in footexternal contexts, and that there is no need to refer to morphological structure at all. This work has broader implications for the relevance of prosodic structure for segmental alternations in Finnish as well as the types of conditioning operative in derived environment effects in general.

Prosodic conditioning: Anttila (2006) shows that Finnish assibilation is both prosodically and lexically conditioned. Data from past tense forms in (3) demonstrate that a stem X in a word of the form /X.ti/ must be minimally bimoraic in order to trigger assibilation (3b); the process cannot apply in words with monomoraic stems (3a), even if they are morphologically-derived. Within the bimoraic stems in (3b), there is inter- and intra-speaker variability as to whether or not a particular /t/ undergoes assibilation.

- (3) a. Monomoraic first syllable $/\mu$.ti/ assibilation is blocked ve.ti *ve.si 'pull-PAST'
 - b. Bimoraic first syllable /µµ.ti/ – variable assibilation 'care-past' hoi.ti *hoi.si *pyy.ti 'ask-past' pyy.si huu.ti huu.si 'shout-past' vuo.ti vuo.si 'seep-past' Trimoraic first syllable or 2+ syllables / $\mu\mu\mu$.ti, σ . σ .ti/ – obligatory assibilation c.
 - *kaar.ti kaar.si 'veer-past' *ti.la.ti ti.la.si 'order-past'

Based on these data, Anttila (2006) suggests that assibilation applies only to extrametrical coronal stops. In Finnish, feet are minimally bimoraic and trochaic, and primary stress is initial; degenerate feet are not permitted. Finnish assibilation therefore only applies foot-externally. Variability can arise if speakers differ in how they foot words with bimoraic stems such as /huuta-i/ 'shout-PAST'. If the /ti/ sequence is parsed within the foot, it will surface faithfully (4a); if it is extrametrical, then it undergoes assibilation (4b).

(4) a. (húu.ti) – syllabic trochee b. (húu)si – moraic trochee



Skousen (1973) notes a similar prosodic condition on word-final vowel raising: the process occurs only in disyllabic words, such as those in (2a, b) but not e.g. /korkeute/ \rightarrow *[korkeusi] 'height.NoM.SG'. This suggests that vowel raising, if synchronic, is limited to operating foot-internally. Words that have undergone vowel raising can then feed assibilation if their stems are bimoraic (2b). Furthermore, $e \sim i$ raising alternations were generalised to some historically non-alternating loanwords, but again only to those that were disyllabic (Skousen 1973).

(5)	piili ~ piili	\rightarrow	piili ~ piile	'needle'
	ryyni ~ ryyni	\rightarrow	ryyni ~ ryyne	'grain'
	norsi ~ norsi	\rightarrow	norsi ~ norte	'smelt'
	riisi ~ riisi	\rightarrow	riisi ~ riite	'rickets'

Therefore Finnish word-final vowel raising and assibilation are both sensitive to prosodic structure rather than morphological conditioning, making the label of 'derived environment' effect is an inaccurate characterisation of the conditioning factors that are truly at work in the system. This is good news as the disjunctive morphological and phonological conditions for Finnish assibilation have been particularly difficult for phonological theories to unify.

Similar processes: There are other DEEs which seem to better reanalysed as prosodic effects. For example, Northern Irish English dentalisation of coronals before $/(\partial)_{J}$ is said to only apply morpheme-internally, while vowel lengthening applies only across morpheme boundaries in the same dialect (Harris 1985, Bermúdez-Otero 2011). However, both dentalisation and vowel lengthening can be successfully analysed as applying foot-internally. Similarly, Turkish velar deletion is often assumed to be restricted to derived environments but in fact applies almost exclusively within two-syllable stems (Inkelas 2009).

Conclusion: In a prosodic analysis of Finnish assibilation, there is no need to make reference to any notion of 'derivedness', whether morphological or phonological. Typical cyclic analyses of DEEs (e.g. Bermúdez-Otero 2011) therefore cannot claim any advantage with respect to accounting for these facts. A framework along the lines of Prosodic Morphology (e.g. McCarthy & Prince 1998) would be sufficient to capture the prosodic factors relevant to assibilation.

The proposed analysis makes testable predictions about the interaction between prosody and segmental alternations in Finnish. This discussion also highlights the importance of determining the conditioning factors for phonological processes, and invites further investigation into other types of DEEs in order to determine whether prosodic and not derived environment factors are relevant in all cases.

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