Identifying PW-recursion with contradicting phonological evidence

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The recursive prosodic tree is seen as an instantiation of the different levels of the PW that offer various possibilities for the post-lexical prosodification of functional elements (clitics, particles, determiners, etc.) (e.g., Booij 1995, 1996, 1999; Peperkamp 1997; Vigário 1999). Domain-sensitive phonological processes can target specific layers of recursive structure, viz. maximal or minimal projections of PWs (Itô & Mester 2007, 2009, 2013). Each prosodic layer finds support in phonological evidence, such as the blocking or the optional application of a phonological process that (obligatorily) applies at the lower layer. However, the neatness in the application of phonological processes is often superficial and not corroborated by the data (Hsu 2019) which show variability. In this article we explore the contradicting nature of certain empirical evidence that is posited for the identification of recursive structures above the word and attribute the attested variability not on phonological layering per se but rather on the gradient strength of the elements involved.

In Standard Greek (SG) a prohibition against sequences of a nasal and a voiceless obstruent, *NÇ̥, causes the nasal to coalesce with the following stop into a prenasalized voiced stop (Kong et al. 2007). Voicing and coalescence (V&C) apply obligatorily within the PW, e.g. /sin-pono/ $_{\mathrm{PW}}$[si$^{\mathbf{m}}$**b**oˈno] 'feel for sb'. However, Kainada (2009) has shown that the distribution of voicing in nÇ̥ sequences between a function and a lexical word, which typically form a PW^{max} in SG (see, e.g., Revithiadou & Spyropoulos 2008 for morphosyntactic evidence), cannot be fitted into neatly distinct categories of the domain in which the phenomenon is allowed and the domain in which it is blocked. In fact, a perception experiment has revealed differences across lexical items on how many times voicing applies within a specific domain. For example, it occurred in all instances containing the negative particle [ðen] and the masc/fem.acc.sg determiners [ton/tin] (1a–c), as opposed to the other negative particle [min] (1d), which displayed voicing only 50% of the times. In contrast, the gen.pl determiner [ton] (1e) (and the gen.pl inflection in general, see 1f) seems to block voicing, mimicking the behavior of *n*-final complementizers in Kainada's research, such as [ˈan] 'if' and [ˈotan] 'when', which, as independent PWs, form PPhs with adjacent lexical words (2). In short, V&C sends mixed signals for the prosodification of fnc-word strings putting into question the significance of phonological evidence for the identification of lower level prosodic units and, especially, of recursive/layered structure.

The problem described above can be easily addressed if the exceptional prosodic behavior of the data in question is linked to the underlying properties of the 'misbehaving' items. Following the weighted constraint framework of *Gradient Harmonic Grammar/GHG* (Smolensky & Goldrick 2016), we propose that nasals have gradient input *activity level* (AL) values, ranging from 0 (non-pronounceable) to 1 (pronounceable), depending on the lexical item they belong to. For instance, the /n/ of the gen.pl marker is strong (AL1), whereas the /n/s in the acc.sg determiner and the negation /ðen/ are much weaker (AL0.4). The tableaux in (3) provide the GHG for V&C within the PW^{max}. By merging with the following voiceless stop (in violation of UNIF), a weak /n/ is reinforced during phonological computation so that it reaches the required output activity 1. Because gradient activity contributes to the total *harmony* (H) of each candidate, we get outputs in which the /n/ is realized either faithfully (Tiib) or as a pre-nasalized voiced stop (Tia) or both (Tiiia–b), depending on the particular lexical item's strength rather than the specific level of prosodic structure.

To conclude, we propose that phonological processes are sensitive not only to prosodic structure but also to the lexical items' gradiently active symbols. As a result, they may seem to be providing contradicting evidence for the identification of layered PWs.

Examples and tableaux

(1) *Variability in *nÇ̥ resolution in* ${}_{PW}^{max}$*[fnc* ${}_{PW}$*[word]]*

a.	/ðen pirazis/	[ðe ᵐ**bi**ˈɾazis]	'not tease-2SG'
b.	/ton patera/	[to ᵐ**ba**ˈteɾa]	'the-M.ACC.SG father-M.ACC.SG'
c.	/na ton pirazis/	[nato ᵐ**bi**ˈɾazis]	'SUBJ him-ACC.SG tease-2SG'
d.	/min pirazis/	[mi ᵐ**bi**ˈɾazis] ~ [mi**n** **p**iˈɾazis]	'not tease-2SG'
e.	/ton pateron/	[to**n** **p**aˈteɾon]	'the-GEN.PL father-GEN.PL'
(f.	/pateron tus/	[paˈteɾo**nt**us]$_{PW}$	'father-GEN.PL their-GEN.PL')

(2) *Prosodic structure of complementizer-word strings*

a. $_{PPh}$[$_{PW}$[ˈan] $_{PW}$[piˈɾazis]] 'if (you) tease'

b. $_{PPh}$[$_{PW}$[ˈotan] $_{PW}$[piˈɾazis]] 'when (you) tease'

(3)	DEP *w*: –5	MAX *w*: –15	UNIF *w*: –4	*NÇ̥ *w*: –2	H	
Ti. /ton$_{0.4}$ patera/ (acc.sg)						
a. ${}_{PW}^{max}$[to $_{PW}$[ᵐbaˈteɾa]]			1		–4	☜
b. ${}_{PW}^{max}$[ton$_1$ $_{PW}$[paˈteɾa]]	(1 – 0.4 =) 0.6			1	–5	
c. ${}_{PW}^{max}$ [ton$_0$ $_{PW}$[paˈteɾa]]		0.4			–6	
Tii. /ton$_{1.0}$ pateron/ (gen.pl)						
a. ${}_{PW}^{max}$[to $_{PW}$[ᵐbaˈteɾon]]			1		–4	
b. ${}_{PW}^{max}$[ton$_1$ $_{PW}$[paˈteɾon]]				1	–2	☜
c. ${}_{PW}^{max}$ [ton$_0$ $_{PW}$[paˈteɾon]]		1			–15	
Tiii. /min$_{0.6}$ pirazis/ (neg)						
a. ${}_{PW}^{max}$[mi $_{PW}$[ᵐbiˈɾazis]]			1		–4	☜
b. ${}_{PW}^{max}$[min$_1$ $_{PW}$[piˈɾazis]]	(1 – 0.6 =) 0.4			1	–4	☜
c. ${}_{PW}^{max}$ [min$_0$ $_{PW}$[piˈɾazis]]		0.6			–9	

Note on how to read DEP and MAX penalties: In Cand-3Tib violation of DEP is proportional to the amount of activity that needs to be added in order for the segment to reach activity 1: weight –5 x added AL 0.6 = –3. In Cand-3Tic the penalty of MAX equals the weight of the constraint (*w*=–15) times the lost activity: –15 x 0.4 = –6.

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