A Binarity Binarity: Branch-counting vs. Leaf-counting

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Constraints on Binarity are commonly used to capture **size effects**: the tendency for longer strings to be parsed into more prosodic constituents, e.g., [2, 3, 8, 7, 9, 1]. Implementations of Binarity come in two major flavors (1-2):

(1) **Branch-counting = Bin-Br(K)**: Assign a violation for every node of category K with more than two branches (immediate children).

(2) **Leaf-counting = Bin-Lv(K, L)**: Assign a violation for every node of category K that contains more than two nodes of category L, where L<K.

When the children of a node of category K must be of category K-1 (Strict Layering), counting branches (1) and counting children of the next lower prosodic category (2) are equivalent. But when recursion (3c) or level skipping are permitted, the two binarities pull apart. In (3c), φ_1 has only two branches and satisfies Bin-Br, but violates Bin-Lv since it dominates four leaves ($\omega_{a,b,c,d}$). Since Bin-Br and Bin-Lv penalize different structures, they must be distinguished in analyses.

(3) [w [w [w w]]]	BinLv (φ, ω)	BinBr (φ)
a. $(_{\iota}(_{\varphi1}\omega_a\ \omega_b\ \omega_c\ \omega_d))$	* φ_1	*φ_1
b. $(_{\iota}(_{\varphi1}\omega_a\ \omega_b)(_{\varphi2}\omega_c\ \omega_d))$		
c. $(_{\varphi1}(_{\varphi2}\omega_a\ \omega_b)(_{\varphi3}\omega_c\ \omega_d))$	*φ_1	

(4) $_{X0}$[$_{X0}$[toːˀg] $_{X0}$[passageːˀr]]	BinBr (ω)	NR	Match (X^0)	BinLv (Ft)
a.☞ $_{\omega1}$[(toːg)$_{\omega2}$[(passa)(geːˀr)]]		* ω_2	*	* ω_1
b. $_{\omega1}$[$_{\omega2}$[(toːˀg)] $_{\omega3}$[(passa)(geːˀr)]]		**!$\omega_{2,3}$		* ω_1
c. $_{\omega1}$[(toːg)(passa)(geːˀr)]	*! ω_1		**	* ω_1

Branch-counting motivates size-driven recursion. Glottal accent ('stød') diagnoses the right edge of a prosodic word in Danish, revealing length-driven differences in compound phrasing: $_{\omega}$[toːg $_{\omega}$[passageːˀr]] 'train passenger' but $_{\omega}$[$_{\omega}$[passageːˀr] $_{\omega}$[toːˀg]] 'passenger train' [5]. We model this in (4). NonRecursivity outranks Match, ruling out the isomorphic (4b) and favoring flat (4c), while high-ranked Bin-Br compels the building of a recursive ω (4a) when a flat structure would create a ternary-branching ω (4c). Bin-Lv cannot motivate this structure-building, since the maximal ω still contains three feet even with recursive structure. Similar interactions occur in Irish [1], Kimatuumbi [6], and Taiwan Mandarin [10].

Leaf-counting motivates size-driven category change. Only branch-counting binarity motivates recursive structure-building for a closer syntax-prosody match, since leaf-counting binarity counts dominated nodes of a lower prosodic category at any level (cf. Dresher & van der Hulst 1998). However, leaf-counting can motivate a size-driven change of prosodic category. In (3b), the violation of Bin-Lv(φ,ω) is avoided by punting the binarity violation up to the level of ι, so that (3b,d) outperform (3a,c). Bin-Br does not distinguish (3b) from (3c). Such a category-promotion can be seen in Japanese compound phrasing [4]. Bin-Lv(ω, [Ft, σ]) causes a compound of the form [[Ft][σ Ft]] to be rooted in φ, rather than ω as for smaller compounds. This is the only use of Bin-Lv we have found that is not reducible to Bin-Br plus other constraints. We therefore suggest **restricting Bin-Lv to counting rhythmic categories (σ, Ft)**, so that only Bin-Br can count interface categories (ω, φ, ι). Furthermore, leaf-counting is more computationally complex than branch-counting; generates larger typologies; predicts a language whose prosody ignores syntax; and is most often redundant when other prosodic well-formedness constraints are taken into acount.

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