

ARTICLE

Degenerate feet in phrasal phonology: evidence from Latin and Ancient Greek

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Abstract

Degenerate feet, even when forbidden in isolated words, can arise within phrases due to resyllabification. In particular, when a stressed monosyllable of the shape C_0VC (where V is short) undergoes resyllabification in Latin and Ancient Greek, it yields a degenerate foot. While degenerate feet were tolerated in prose, they were avoided in hexameter verse. Even though a degenerate foot is a kind of light syllable, a light metrical position could not contain a foot. Verse evidence is used as a window onto the general prosodic structure of each language, revealing that speakers productively recognised degenerate feet and distinguished them from other prosodic categories.

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Degenerate (i.e. monomoraic) feet, while permitted in some languages, tend to be highly restricted in their distribution (Hayes 1995). In Ojibwe, for instance, a degenerate foot is possible only at the end of a prosodic word (PWd), as in (1) (Piggott 1980; Newell & Piggott 2014), suggesting that PARSE, which requires syllables to be footed, dominates foot binarity (FTBIN), which requires feet to be binary. (Throughout, feet are delimited by parentheses.) Non-final degenerate feet, as in ungrammatical (1c) and (1d), are gratuitous because the feet could be combined, as in (1b), satisfying PARSE without compromising FTBIN. In (1d), [(gin)] violates FTBIN because codas are non-moraic in Ojibwe.



- (1) a. (,wi:)('kwa:)(,bo:)(,zo) 'he is carried along by the current'
 b. (gin'wa:)(bi,ki)(,zi) 'it is a long metal object'
 c. * (gin'wa:)(,bi)(,ki)(,zi)
 d. * (,gin)('wa:)(bi,ki)(,zi)

As I argue here, some languages that forbid degenerate feet in isolated PWds permit them in phrasal phonology, where multiple PWds interact. Classical Latin and Homeric Greek furnish two cases, along with the metrical diagnostics to confirm that the syllables in question are in fact degenerate feet, that is, both light (monomoraic) and independently footed. Specifically, degenerate feet arise in these languages due to resyllabification. An isolated PWd can be C_0VC (throughout, V is short), as with Latin *dat* 'gives' in (2a). As the subscripts indicate, the PWd is bimoraic, satisfying FTBIN; indeed, isolated PWds are required to be at least bimoraic in Latin (Mester 1994) and Ancient Greek (Blumenfeld 2011). When prevocalic, however, as in (2b), *dat* loses its coda, which is now parsed as the onset of the following PWd. Latin, like Greek, tolerates the resulting degeneracy (subminimality). The metrical evidence reviewed below confirms that in configurations like (2b), the consonant is resyllabified (without ambisyllabicity), the vowel remains short and the first word retains its stress.

- (2) a. ('da_μt_μ) 'gives'
 b. ('da_μ)('t au_{μμ})lu_μs_μ 'Aulus gives'

Not all languages with bimoraic minima and resyllabification tolerate resyllabification-induced degeneracy like Latin and Greek do. Tamil, for instance, geminates the final consonant (if geminable) of a C_0VC word when it undergoes resyllabification, as in (3a) and (3b) (cf. Italian; Chierchia 1982). Crucially, in Tamil, such gemination is absent when FTBIN is not at stake, as with [ava] 'her' in (3c), which remains bimoraic after losing its coda (Ryan 2019: 128–132 and references therein). If the final consonant of a prevocalic C_0VC word is not geminable in Tamil, as with the rhotics, the vowel lengthens instead, as in (3e) (Rajam 1992: 85; Ryan 2019).

- (3) a. ('ṅa_μl_μ) 'good'
 b. ('ṅa_μl_μ)('l u:_{μμ}r) 'good city'
 c. ('a_μva_μ)('l u:_{μμ}r) 'her city'
 d. ('o_μr_μ) 'one'
 e. ('o:_{μμ})('r u:_{μμ}r) 'one city'

Another strategy to avoid resyllabification-induced degeneracy is to suppress resyllabification if it threatens binarity (e.g. by ranking FTBIN over ONSET). Ryan (2019) documents this situation in Māhārāṣṭrī Prakrit, which records word-final nasals differently depending on whether or not they undergo resyllabification. The final nasal of a C_0VC word, where degeneracy is threatened, is significantly less likely to resyllabify than the final nasal of a longer word, where degeneracy is not at stake. Of course, a language might also forbid cross-PWd resyllabification across the board, as Dutch does (Booij 1996).

A final logically possible strategy to avoid resyllabification-induced degeneracy is to suppress stress. In such a language, a C_0VC word, say, *tat*, would be stressed when

preconsonantal but unstressed when prevocalic, as schematised in (4). I am not aware of any case exactly like this one, though Hayes (1995: 112–113) considers possible cases of subminimal words being unable to surface with stress in any context. While uncommon at best across words, within words, contrasts like (4a) versus (4b) are commonplace.

- (4) a. ('ta_μt_μ) ('ba_μga_μ) (constructed)
 b. ta_μ('t a_μga_μ) (constructed)

Latin and Greek, as mentioned, do not employ any of these strategies to circumvent a degenerate foot when one arises due to resyllabification. Rather, they let the degenerate foot stand. A benefit of examining such languages is that their extensive and exacting metrical traditions furnish independent diagnostics of prosodic properties such as weight and stress. Whether Ancient Greek had stress in addition to pitch accent is irrelevant here; either way, I assume, along with most analysts (e.g. Steriade 1988; Sauzet 1989; Golston 1990; Devine & Stephens 1994; Blumenfeld 2004, 2011; Sandell 2020), that it had feet, as discussed in §5.

For both languages, I focus on the dactylic hexameter, as schematised in (5). The following basic description of the metre will suffice for all present purposes. Each of six metra, as enumerated, is divided into two metrical positions. The first, —, must be filled by a heavy syllable and the second, ∪, by either a heavy or pair of lights. If the latter is filled by a pair of lights, each light occupies a SUBPOSITION, in Prince's (1989) terminology. Note that 'subposition' is equivalent to saying 'light-requiring position' for this metre, since light syllables are not otherwise licensed outside of line end. The cadence comprises the final two metra. In Latin, the cadence, unlike the rest of the line, is strictly regulated for stress, being nearly always (for most authors) stressed in strong (—) positions and unstressed in weak positions (∪ and ∪).

- (5)
- | | | | | | |
|-----|-----|-----|-----|--------------|-----|
| | | | | cadence | |
| | | | | ┌──────────┐ | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| — ∪ | — ∪ | — ∪ | — ∪ | — ∪ | — ∪ |

As I will show, stressed C₀VC retains its stress even while undergoing resyllabification, resulting in a degenerate foot. While such feet were freely tolerated in prose (and thus everyday speech), they were strongly avoided in most authors' hexameters. I attribute this avoidance to a maximum size constraint on the subposition, such that it cannot contain a prosodic constituent higher than the syllable. A degenerate foot, in effect, is too large for a subposition, but too small (being light) for a heavy-requiring position. It therefore finds no comfortable place to sit in the metre, even though it freely occurs outside of verse.

To be clear, this analysis does not suppose that degenerate feet are somehow confined to poetic language, or that they are a property of the metre itself. Rather, degenerate feet are a property of the general language. Poets, in turn, can be sensitive to them, just as they are sensitive to moraic structure and other properties of the general language. In this way, verse sheds light on general prosody. Poets' special treatment of degenerate feet, as distinct from similar structures such as stressed light syllables

more generally, supports the psychological reality of the construct. I conclude that degenerate feet are more widely distributed in the world's languages than previously assumed.

I begin with the empirical facts in Latin in §1 before turning to the formal analysis of degenerate feet as induced by resyllabification in §2. The next two sections, §§3 and 4, address the verse evidence for degeneracy in Latin, including (in §4) a cline of stressability among function words. I turn to Greek in §5, demonstrating that essentially the same behaviour is found in the Homeric hexameter. Finally, §6 considers alternatives to the degenerate foot, with §7 concluding.

1. Resyllabification-induced degeneracy in Latin

Latin is a classical example of a moraic trochee language (Mester 1994). Feet are initially prominent and may be two syllables or one heavy (bimoraic) syllable. Degenerate feet are forbidden in isolated words, as supported by convergent evidence. For one, in words of three or more syllables, stress falls on the penult if the penult is heavy. If the penult is light, stress falls on the antepenult, as in (6a). With feet, this pattern is analysed as involving a right-aligned trochee subject to final syllable extrametricality (i.e. foot-based NONFINALITY: 'penalise a footed ultima'). FTBIN is then necessary to preclude the ungrammatical alternative in (6a) in which stress falls on the penult, a candidate that otherwise satisfies both NONFINALITY and TROCHEE. Second, in disyllables with an initial light, FTBIN is seen to dominate extrametricality, as in (6b). Evidence that the ultima is footed in such cases includes so-called iambic shortening (found especially in Archaic Latin), whereby a would-be light-heavy trochee becomes light-light due to FTBIN (Mester 1994).¹ On this analysis, if the stressed light syllable were footed by itself as a degenerate foot, the motivation for shortening the ultima would be lost. After all, unfooted ultimas are not shortened, as (6a) illustrates. Finally, FTBIN has been invoked to explain prosodic minimality, such as the lengthening in (6c) (Prince & Smolensky [1993] 2004). An isolated PwD cannot be a degenerate foot. Monosyllables also reinforce the violability of NONFINALITY.²

- | | | | |
|-----|----|-------------------------------------|-----------------|
| (6) | a. | ('ani)ma:, *a('ni)ma: | 'from the soul' |
| | b. | /amo:/ → ('amo), *('a)mo:, *('amo:) | 'I love' |
| | c. | /da/ → ('da:), *('da) | 'give' |

Despite being forbidden within words in Latin, degenerate feet, I argue, arise in cross-word contexts. In Latin, as in many of its descendants, a word-final consonant

¹The shortening is traditionally called 'iambic' because the input is *quantitatively* iambic – that is, a light-heavy sequence – not because stress is iambic.

²Cliticisation complicates the basic Latin stress pattern, but not in a way that requires positing degenerate feet. In particular, enclitics (e.g. *que* 'and') induce stress on a stem-final light in at least some contexts, as in *sceleràque* (probably also with stress on *sce*). If foot-based NONFINALITY were undominated, such forms would yield a degenerate foot. However, as (6) has already suggested, NONFINALITY is not undominated. Mester (1994) suggests one analysis of enclitics that obviates degeneracy, though the empirical situation is insecure (cf. Newcomer 1908; Allen 1978). At any rate, in agreement with Mester (1994), there is no strong case for degenerate feet in the context of enclitics. Even if there were, the issue is orthogonal to the treatment of phrases that follows.

resyllabifies with a following vowel-initial word (Allen 1978; Harris 1983; Peperkamp 1997; Ryan 2019; Passino *et al.* 2022).³ If a stressed monosyllable of the shape C₀VC is prevocalic, resyllabification yields a degenerate foot, as in (7a). As argued presently, such phrases are not normally parsed as (7b) (suppressing resyllabification), (7c) (lengthening the vowel) or (7d) (suppressing stress), among other possibilities (the possibility of ambisyllabicity, for one, is rejected in §2).

- (7) *dat Aulus* ‘Aulus gives’
- (‘da)(‘t au)lus
 - * (‘dat) (‘au)lus
 - * (‘da:)(‘t au)lus
 - * da(‘t au)lus

First, resyllabification applies as normal to C₀VC words. Among other evidence, this is clear from verse, where such words scan as light prevocalically. In the lines in (8), for example, *vir* ‘man’, *fer* ‘carry’ and *dat* ‘gives’ must scan as light to fit the hexameter. Slashes indicate boundaries between metrical feet. Macrons mark long monophthongs. Metrically elided vowels are underlined. Each line is followed by its scansion (– being heavy, ∪ light) and a rough gloss. If prevocalic C₀VC resisted resyllabification, as in (7b), one would expect it to be treated as heavy in verse.

- (8) a. *Vāde age, e/t ingen/tem fac/tīs fer a/d aethera / Trōiam*
 ∪∪ / – / – / ∪∪ / ∪∪ / –
 ‘Go on, and by deeds **carry** huge Troy to the heavens’
 (Virgil, *Aeneid* 3.462)
- b. *Hic vir, hi/c est, tibi / quem prō/mittī / saepiu/s audīs*
 ∪∪ / ∪∪ / – / – / ∪∪ / –
 ‘This **man**, this is he, whom you hear often to be promised to you’
 (Virgil, *Aeneid* 6.791)
- c. *prīncipi/um dat e/t hinc mō/tūs per / membra ri/gantur*
 ∪∪ / ∪∪ / – / – / ∪∪ / –
 ‘...**furnishes** the beginning, and from this, movements are conducted through the limbs’ (Lucretius, *De rerum natura* 2.262)

As (9) illustrates, these same C₀VC words scan as heavy when pre-consonantal.

- (9) a. *audē at/que adver/sum fī/dēns fer / pectus i/n hostem*
 – / – / – / – / ∪∪ / –
 ‘dare, and **bear** your brave chest against the enemy’
 (Virgil, *Aeneid* 11.370)
- b. *vir fui/t aut il/lā metu/entio/r ulla de/ōrum*
 ∪∪ / – / ∪∪ / ∪∪ / ∪∪ / –
 ‘...**man** was, or any woman more fearful of the gods’
 (Ovid, *Metamorphoses* 1.323)

³Pronunciation, not orthography, matters. For example, *h* does not block resyllabification in Latin or Greek. Likewise, throughout this article, when I refer to vowel-initial words, I include those beginning with orthographic *h*.

c. *multa vi/rum voli/tāns dat /fortia / corpora / lētō*

— / — / — / — / — / —

‘going about, he **gives** many strong bodies of men to death’

(Virgil, *Aeneid* 12.328)

Second, C_0VC does not undergo lengthening of the vowel or consonant when prevocalic, which would yield a heavy syllable. This again is clear from scansion, as in the verse lines in (8), as well as from manuscripts in which vowel length is indicated.

Finally, lexical C_0VC does not lose its stress due to resyllabification. For starters, to the best of my knowledge, no language with phrasal resyllabification works that way. In Italian, for instance, *snob horrendo* [ˈsnɔ.b or ˈrɛn.do] ‘horrible snob’ exhibits resyllabification, but the monosyllable retains its stress, as reinforced by [ɔ], which diagnoses stress (Peperkamp 1997).⁴ Likewise, in Latin, resyllabification does not, in general, trigger destressing. This is clear, once again, from metrics. Ovid, for instance, virtually requires strong positions to be stressed in metrical cadences (Sturtevant 1923). A typical cadence such as *mīlitis ūsū* [ˈmi:li.ti.ˈs u:ːsu:] ‘from use of the soldier’ would be impossible if the resyllabification induced destressing of either word (i.e. [mi:li.ti.ˈs u:ːsu:] or [ˈmi:li.ti.s u:ːsu:]), as either parse would fill a metrically strong position in the cadence with an unstressed syllable.

More to the point, C_0VC monosyllables, in particular, do not lose their stress when undergoing resyllabification, as metrical evidence further supports. Consider once again Ovid’s *Metamorphoses* (8 CE), in hexameter. Recall that stressed light syllables are rarely permitted in the cadence, though they are frequently found elsewhere in the line (Sturtevant 1923; see also §3). If, on the one hand, lexical C_0VC words retain their stress under resyllabification, one would expect them to be excluded from cadences, a context in which stress must coincide with heaviness. If, on the other hand, lexical C_0VC words lose their stress under resyllabification, they should be free, like unstressed function words, to occupy cadences when prevocalic, being unstressed light syllables.

In *Metamorphoses*, lexical $C_0VC\#V$ never occupies the cadence, whereas function $C_0VC\#V$ often does. As representative function words, I take all C_0VC prepositions from the text, namely, *ad* ‘to’, *in* ‘in’, *ob* ‘against’, *per* ‘through’ and *sub* ‘under’.⁵ As representative lexical words, I take all C_0VC nouns and verbs from the text, namely, *dat* ‘gives’, *det* ‘gives’ (subjunctive), *fac* ‘make’, *fer* ‘carry’, *flet* ‘weeps’, *it* ‘goes’, *nat* ‘swims’, *vir* ‘man’,⁶ *scit* ‘know’, *stat* ‘stand’ and *stet* ‘stand’ (subjunctive).⁷ Corpus

⁴To be sure, the threat of subminimality can trigger prosodic fusion in some languages under some conditions. For example, in Kabardian (Gordon & Applebaum 2010), a CV word such as /ʃˈv/ ‘new’ is subminimal. If possible, it will fuse with a host, as in [wəˈnɛʃˈv] ‘new house’. But this fusion, which is highly restricted morphosyntactically, is not induced by resyllabification.

⁵*Ab* ‘from’ is set aside because it is usually *ā* before a consonant.

⁶Counts for *vir* include counts for both possible spellings of the word, namely *vir* and *uir*. Throughout this article, any Latin word spelled with *v* was also checked in its *u*-variant.

⁷This list excludes any C_0VC word with a long vowel or any variant with a long vowel. For example, *os* was excluded, being orthographically ambiguous between *os* ‘bone’ and *ōs* ‘mouth’. Forms of the copula *esse* were not counted as lexical verbs. Words ending with *m*, such as *cum* ‘with’ and *rem* ‘thing’, were excluded because final /Vm/ is subject to elision (especially in longer forms), suggesting that the rime might have at least optionally been realised as [V̄:]. Any word possibly ending underlyingly with a cluster or

counts are provided in (10). While $C_0VC\#V$ prepositions are roughly equally frequent inside and outside of the cadence, lexical $C_0VC\#V$ occurs only outside of the cadence. This significant difference between lexical and functional words (Fisher's exact test $p < 0.0001$) suggests that stressed C_0VC retains its stress even when prevocalic.

- (10) *Prevocalic C_0VC words in Ovid's Metamorphoses in the pre-cadence versus in the cadence*

	pre-cadence	cadence
preposition	360	527
lexical	36	0

A second and independent argument that lexical C_0VC retains its stress under resyllabification concerns Virgil's hexameter. Virgil avoids lexical C_0VC before a vowel altogether, regardless of position in the line. In Virgil's three hexameter works, the *Eclogues*, *Georgics* and *Aeneid* (collectively c. 37–19 BCE), lexical C_0VC (using the same lists as above) occurs prevocalically six times. Preconsonantly, by contrast, it occurs 119 times. In other words, non-line-final lexical C_0VC precedes a vowel 5% of the time. This rate differs significantly from that of prepositions, which precede a vowel 41% of the time (Fisher's exact test odds ratio = 14, $p < 0.0001$). Corpus frequencies are provided in (11). This difference in Virgil's treatment of lexical and functional C_0VC arguably reflects stress: Virgil strongly disfavors stressed monosyllables in light-requiring positions, even when they are rendered light by resyllabification.⁸ A formalisation of this avoidance is presented in §3.

- (11) *C_0VC words in Virgil's Eclogues, Georgics and Aeneid before a vowel versus before a consonant*

	prevocalic	preconsonantal
preposition	764	1,299
lexical	6	119

In conclusion, the final consonant of a C_0VC word resyllabifies when prevocalic, regardless of whether the word is lexical or functional. If the word would otherwise be stressed, it retains its stress under resyllabification. In a foot-based formalism, these conditions necessitate a degenerate foot.

2. Resyllabification-induced degeneracy: analysis

As a simple representative example, consider *it as* 'the coin (*as*) goes (*it*)'. The winner [(*i*)(*t as*)] in (12) exhibits a degenerate foot induced by resyllabification. (To save space, when a PWD dominates nothing but a foot, they are notated on the same line as '*f, ω*.) Resyllabification is driven by ONSET, which penalises a syllable with an

geminata was excluded (e.g. *as* 'coin', *cor* 'heart' and *mel* 'honey'). On word-final geminates in (Archaic) Latin, see Allen (1978: 75–77).

⁸I previously made this point in Ryan (2019) based on a smaller corpus, namely, the first six books of the *Aeneid*.

empty onset. Because Latin permits isolated words to begin with vowels, ONSET must be dominated by faithfulness constraints precluding prothesis and aphaeresis (not shown).⁹ ONSET must, in turn, dominate any constraint penalizing resyllabification (Ito & Mester 2009), including ALIGN-R below. The tableau also includes ‘weight by position’ (WBP: coda consonants are moraic), which dominates * μ /C (consonants must not be moraic), a ranking necessary to account for the weightiness of codas in Latin.

ALIGN-R in (12) is short for ALIGN(*lex*, R, ω , R) ‘the right edge of a lexical word coincides with the right edge of a PWd’. A penalty is incurred by each misaligned segment. A separate constraint ensures that lexical words are parsed into PWds: MAX(*lex*, ω) ‘a lexical word corresponds with a PWd’ (Ito & Mester 2019). This constraint checks the existence of a coindexed PWd, not its alignment. While a more traditional formulation of MATCH (Selkirk 2011) might wrap these two functions (alignment and existence) into a single MATCH constraint, I follow Ito & Mester (2019) in separating them, as they must be ranked differently: Alignment is violable; existence is not. The indexation to lexical words reflects the fact that, as Selkirk (2011) puts it, ‘lexical category words are standardly parsed as PWds (ω), while functional category words like determiners, complementizers, prepositions, auxiliary verbs, etc. – in particular the monosyllabic versions of these – are not.’ Additional candidates without footing of the first word are considered later in this section.

⁹Relevant constraints include DEP, MAX _{σ} , and ANCHOR.

(12)

/it as/	ONSET	MAX(<i>lex</i> , ω)	WBP	* μ /C	ALIGN-R	FTBIN
<p>a. i t a s</p>	*			*	*	*
<p>b. i t a s</p>	*			**!		
<p>c. i t a s</p>	*		*!	*		*
<p>d. i t a s</p>	**!			**		

Given the two rankings $\text{ONSET} \gg \text{ALIGN-R}$ and $\text{WBP} \gg *_{\mu}/\text{C}$, ambisyllabicity is untenable. Candidates (12b) and (12c) exhibit ambisyllabicity of the resyllabified consonant. That is, [t] is shared by two syllables. In (12b), [t] is moraic; in (12c), it is not. Of these two candidates, (12b) is incorrect on empirical grounds. As discussed in §1, resyllabified consonants do not contribute to weight, ruling out (12b). Candidate (12c), however, has the appropriate weight profile. Nevertheless, (12c) is ruled out analytically. Because WBP must dominate $*_{\mu}/\text{C}$, (12b) is more harmonic than (12c), and, as just mentioned, (12b) cannot win. If ALIGN-R (or FTBIN) were ranked above WBP or $*_{\mu}/\text{C}$, (12b) would win, which cannot be allowed. In short, because (12b) must lose, both (12b) and (12c) must lose. Resyllabification cannot induce ambisyllabicity in Latin.

Candidates (12b) and (12c) also violate CRISPEGE (not shown), which in this case penalises spreading a consonant across syllables (Ito & Mester 1999). The ranking of CRISPEGE is irrelevant here, in that (12a) wins regardless of how it is ranked.

Next, as the tableau in (13) illustrates, lexical *it* cannot cliticise to the following PWD. $MAX(lex, \omega)$ requires *it* to project its own PWD, ruling out candidate (13b). (For clarity, ω is indexed to the lexical word, if any, that stands in correspondence with it for the purposes of assessing $MAX(lex, \omega)$ and $ALIGN-R$; if no lexical word corresponds to ω , ω is left unindexed.) The alternative indexation in (13c) satisfies $MAX(lex, \omega)$ by indexing *it* to the maximal ω , but is then eliminated by $ALIGN-R$, given that the nearest right edge of a PWD is two segments away, across *as*. Additional possible indexations can be similarly eliminated.

(13)

	/it as/	ONSET	$MAX(lex, \omega)$	WBP	* μ/C	ALIGN-R	FTBIN
a.		*			*	*	*
b.		*	*!		*		
c.		*			*	**!	

Function words are free to cliticise, as in (14), which replaces *it* ‘goes’ with *et* ‘and’. $MAX(lex, \omega)$ and $ALIGN-R$, as defined, ignore function words. (This is not to deny that function words might be stressed for other reasons, as discussed in §4.) In (14), FTBIN favours PWD adjunction, the correct outcome.

(14)

/et as/	ONSET	MAX(<i>lex</i> , ω)	WBP	* μ /C	ALIGN-R	FTBIN
<p>a. e t a s</p>	*			*		*!
<p>b. e t a s</p>	*			*		

The analysis as it stands is incomplete, in that it predicts that a function word like *et* is free to be stressed or unstressed when preconsonantal. In (15), the three candidates, the first two with stress on *et* and the last without, are tied. At first glance, this might not seem a bad prediction, since function words like *et* can, in fact, be stressed or unstressed depending on how they are used. Nevertheless, a lack of stress is the default outcome (modulo overriding factors such as narrow focus; see §4). Thus (15c), with cliticisation of the function word, should win in the base case. Various constraints could be added to militate against stressing a function word in order to break the tie in favour of (15c). One is DEP(ω , *lex*), which penalises a PWd that does not correspond to a lexical word (Ito & Mester 2019). Any constraint militating against feet or stress (even indirectly, as with alignment) would also work, appropriately lowly ranked. Output–output correspondence in stress is yet another possibility.

(15)

/et dat/	ONSET	MAX(<i>lex</i> , ω)	WBP	* μ /C	ALIGN-R	FTBIN
<p>a. e t d a t</p>	*			**		
<p>b. e t d a t</p>	*			**		
<p>c. e t d a t</p>	*			**		

Finally, consider the fact that lengthening is a possible repair for degeneracy for isolated words but not for words affected by resyllabification. For example, /da/ ‘give’ is lengthened to [(‘da:)], necessitating that FTBIN dominate DEP- μ . But given this ranking, what precludes /it as/ above from lengthening to *[(‘i:)(‘t as)]? Higher-ranking output–output correspondence, specifically DEP_{OO}- μ , penalises lengthening if the word surfaces elsewhere without length. Thus, free-standing [(‘it)] precludes *[(‘i:)(‘t as)], but no output *[(‘da)] is found to stand in the way of [(‘da:)]. See Breiss (2021) on prosodic output–output correspondence more broadly.¹⁰

¹⁰An anonymous referee brings up another difference between cases like /da/ (with lengthening) versus /it/ (without lengthening): in only the former is the lengthening word-final. Another strategy would therefore be to allow a mora to be inserted only word-finally.

3. Degeneracy avoidance in the Latin hexameter

As discussed in §1, in Virgil's hexameter, C₀VC words freely occur prevocally if they are function words (41%), but rarely if they are lexical words (5%). This difference can be explained by stress. If C₀VC is unstressed, as with the function word *ab* 'from' in (16a), resyllabification does not create a degenerate foot. If lexical monosyllables lost their stress prevocally, as with *dat* 'gives' in (16b), Virgil would have no reason to avoid them prevocally. However, lexical monosyllables retain their stress under resyllabification, as in (16c), permitting one to explain the rarity of that configuration in Virgil's epics as reflecting a constraint against degenerate feet.

- (16) a. a('b o:):ri:s 'from shores'
 b. * da('t o:):ra:s 'gives shores'
 c. ('da)('t o:):ra:s 'gives shores'

This avoidance does not extend to stressed light syllables in general. Ryan (2017: 590, see also Mercado 2021) finds that stressed light syllables occur in Virgil's *Aeneid* at nearly the same rate as in prose (indeed, in the pre-cadence, they are overrepresented relative to prose). Thus, Virgil's avoidance of forms like (16c) is not due to the coincidence of lightness and stress; it is specific to degenerate feet. Moreover, lexical monosyllables with long vowels (C₀V:C) are not avoided before vowels. They occur prevocally 57% of the time.¹¹ Thus, Virgil's avoidance of forms like (16c) is not due to the coincidence of monosyllabicity and stress.

Despite the avoidance of degenerate feet in Virgil's (and certain others') hexameter corpora, such avoidance is not characteristic of Latin in general, judging by prose, nor is it found in the verse of all poets. Figure 1 shows the rate at which C₀VC is found prevocally for lexical *versus* functional words for several authors. As a sample of hexameter authors, I take (roughly chronologically) Ennius, Horace, Virgil, Ovid, Lucan, Valerius Flaccus, Statius, Juvenal and Silius Italicus. As a prose sample, I take Caesar, Cicero, Nepos, Livy, Seneca and Quintilian. Approximate end dates are provided in the figure.¹² The lists of prepositions and lexical words are the same as in §1. Prose corpora were split into lines by sentence punctuation.

As Figure 1 reveals, most of the hexameter corpora – with the exceptions of Ennius, Horace and possibly Juvenal – exhibit strong avoidance of lexical C₀VC before a vowel, whereas none of the prose corpora does. In particular, hexametrists Virgil, Lucan, Valerius Flaccus, Statius and Silius Italicus nearly (though never categorically) forbid lexical C₀VC in prevocalic position. Ovid likewise shows a significant difference between lexical and functional C₀VC, though in his case, lexical

¹¹This rate is based on the lexical C₀V:C monosyllables *bōs* 'cow', *dās* 'give', *dēs* 'give (subjunctive)', *dīc* 'say', *dīs* 'rich', *dōs* 'dowry', *dūc* 'lead', *crās* 'tomorrow', *crūs* 'leg', *fās* 'breathe', *iūs/jūs* 'law', *mōs* 'manner', *Pān* (a deity), *pēs* 'foot', *scīs* 'know', *sōl* 'sun', *spēs* 'hope', *rēs* 'thing', *rōs* 'dew', *rūs* 'countryside', *vēr* 'spring' and *vīs* 'force'.

¹²Specific works are as follows: Ennius' *Annales* fragments, Horace's *Sermones* (Satires 1 and 2), Virgil's *Ecllogues*, *Georgics*, and *Aeneid*, Ovid's *Metamorphoses*, Lucan's *Pharsalia*, Valerius Flaccus' *Argonautica*, Statius' *Thebaid*, Juvenal's *Satires*, Silius Italicus' *Punica*, Cicero's oratorical works, Caesar's war commentaries, Nepos' *De viris illustribus*, Livy's *Ab urbe condita*, Seneca's *Epistulae morales ad Lucilium*, *Quaestiones naturales*, and *Dialogi* and Quintilian's *Institutiones* and *Declamationes maiores*. All were accessed at the Latin Library (<https://www.thelatinlibrary.com>) on 10 May 2022.

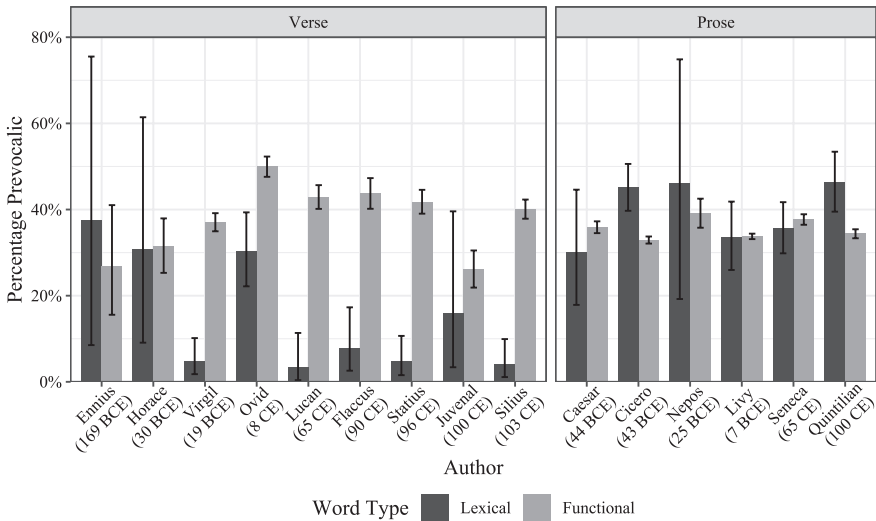


Figure 1. Percentage of C_0VC words that are prevocalic as opposed to preconsonantal, arranged by genre (labels at top), author (at bottom) and word type (shading). Within each genre, authors are arranged by rough *termini ad quem*, usually the end of the author's life (to save space, 'circa' is omitted). Throughout, error bars are 95% confidence intervals based on the binomial.

C_0VC remains frequent before vowels. The two earliest hexameter corpora examined here, by Ennius and Horace, exhibit no discernible avoidance of lexical C_0VC before a vowel, though the error bars are large due to the small sizes of the corpora (just 515 lines in the case of Ennius). Ennius (c. 169 BCE or earlier) is substantially earlier than the other authors, being the sole representative here of Old Latin.

It therefore appears that avoidance of lexical C_0VC before a vowel is specific to verse, reflecting the poetic grammars of certain hexametrists.¹³ These poetic grammars, I claim, possess a constraint forbidding feet in metrical subpositions: *SUBPOS \supset FOOT. (Because degenerate feet always project to degenerate PWDs in Latin, *SUBPOS \supset PWD would work equally well here.) This constraint belongs to a family of position size maxima (Hanson & Kiparsky 1996). By excluding degenerate feet from subpositions, the constraint effectively excludes degenerate feet from anywhere in the line, as such feet already could not occur elsewhere, being light. To account for the varying strength of *SUBPOS \supset FOOT for different poets, the constraint could be weighted, as in Harmonic Grammar (Pater 2009). A constraint against stress

¹³Verse *versus* prose cannot be compared for any individual author here, as each author's works fall entirely or nearly entirely on one side or the other. That said, given the range of authors and dates and the near consistency of the split between verse *versus* prose, it is unlikely that the split can be attributed instead to dialect or chance.

in subpositions would not be a viable substitute for *SUBPOS \supset FOOT. As discussed earlier in this section, stressed lights are not generally avoided in subpositions.¹⁴

This analysis based on *SUBPOS \supset FOOT makes no predictions about degeneracy avoidance outside of verse. After all, subpositions are not found in prose (or, insofar as they might be found in clausulae, they need not be subject to the same constraints as in verse). Moreover, because different poets have different metrical grammars even for the same metre, *SUBPOS \supset FOOT need not be active, or active to the same degree, for every poet and every type of verse. Individual poets, even when part of the same metrical tradition, vary in their permissiveness of licences and their sensitivity to linguistic factors in ways that do not necessarily reflect differences of dialect (see e.g. Hayes *et al.* 2012 on the iambic pentameters of Shakespeare vs. Milton). In the present case, *SUBPOS \supset FOOT would have different weights for, say, Ovid and Virgil. But the lack of evidence for *SUBPOS \supset FOOT in Horace's verse does not imply that Horace's language lacks degenerate feet. It suggests only that his poetic grammar is insensitive to the category. Meters are not sensitive to every kind of linguistic structure available to the poet (consider the marginal role of pitch accent in most quantitative metres; e.g. West 1987: 2; Arnold 1905: 6).

4. Varying stress propensities of function words

The previous section identified five hexametrists who strongly (but not categorically) avoid lexical C₀VC before a vowel, namely, Virgil, Lucan, Valerius Flaccus, Statius and Silius Italicus. So far, I have employed prepositions as representative function words and nouns and verbs as representative lexical words. In this section, I consider additional word types of shape C₀VC, namely, adverbs, pronouns and conjunctions. Here, adverbs include *bis* 'twice', *sat* 'enough, well' and *ter* 'thrice'; pronouns include *id* 'it', *quid* 'what', *quis* 'who' and *quod* 'which'; and conjunctions include *an* 'whether', *at* 'yet', *et* 'and', *sed* 'but', *tot* 'so many', *ut* 'that' and *vel* 'or'. As Figure 2 shows, these additional types are intermediate in behaviour between lexical words and prepositions. Across authors, they are more vowel-avoiding than prepositions, but less vowel-avoiding than nouns or verbs. For most authors, the two contrasts just mentioned are significant, as the non-overlapping error bars in Figure 2 suggest.

Figure 3 shows the rate for each individual word, combining the works of the five authors into a single corpus. The rarer the word (judging by its count in each author's corpus), the larger its error bar. Note that some words that appear to be outliers for their category, such as *stet* 'stand' (subjunctive) for lexical words, are sparsely attested ($n = 9$ in this case) and thus less reliable. Furthermore, categorisation is not always straightforward. Lexical words here include nouns and verbs; adverbs are kept separate. Among adverbs, *bis* 'twice' and *ter* 'thrice' pattern more like lexical words, whereas *sat* 'enough, well' patterns more like a preposition.

¹⁴Indeed, as an anonymous referee observes, such a constraint, if it were active throughout the line, would entail that a large portion of Latin lexicon could not be employed in hexameter verse, violating the principle of FIT, by which languages favour metres that allow for expansive use of their vocabularies (Hanson & Kiparsky 1996).

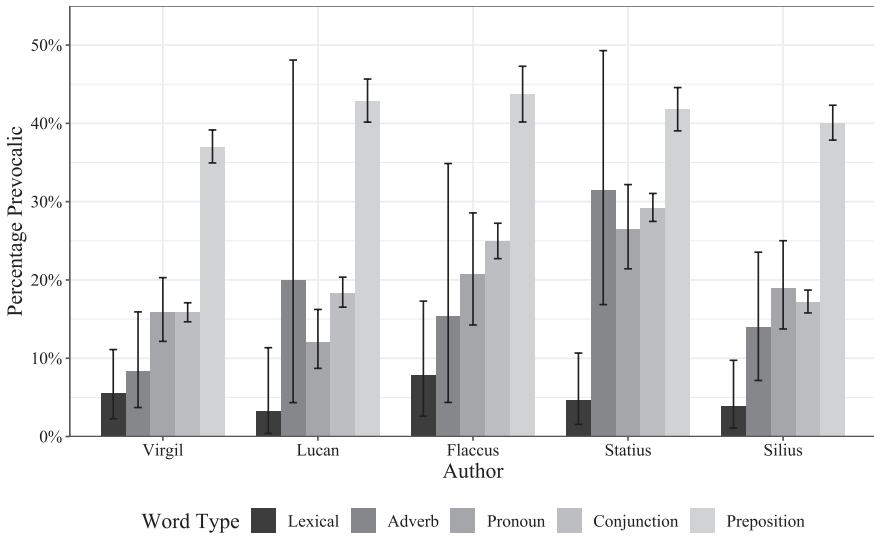


Figure 2. Prevocalic rates of five word types for five hexameter authors. ‘Lexical’ here comprises nouns and verbs; adverbs are separate.

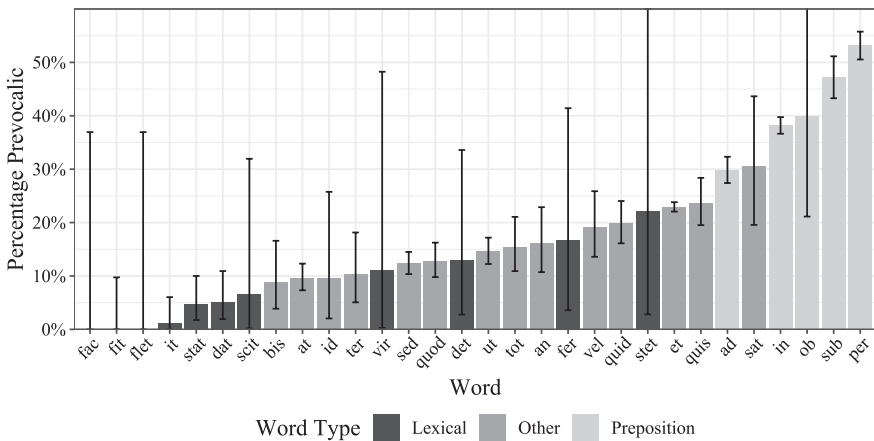


Figure 3. Prevocalic rates by word, pooling the corpora in Figure 2. Prepositions (lightest shading) tend to exhibit the highest rates, lexical words (i.e. nouns or verbs, darkest shading) the lowest. Other word types (adverbs, pronouns and conjunctions) tend to be intermediate.

On the present analysis, words’ varying rates of prevocalism reflect their varying propensities for stress. These stress propensities are general to the language – indeed, they are highly general across languages – and need not be stipulated by this analysis by, for instance, indexing *SUBPOS▷FOOT to individual words. The different treatment of lexical *versus* functional words vis-à-vis stress and cliticisation has been treated

extensively (Selkirk 1996, 2011; Truckenbrodt 2007; Ito & Mester 2019). Meanwhile, pronouns and conjunctions vary in stress, as determined in part by pragmatic factors such as focus, givenness, topic, demonstrativity and so forth (Lee *et al.* 2008). In sum, the range of prevocalic rates in Figure 3 reflects a ‘cline of clisis’, to use the term from Gunkel & Ryan (2017). The more likely a C₀VC word is to be stressed, the more it will be avoided prevocalically, as it is only stressed C₀VC words that incur violations of *SUBPOS▷FOOT under resyllabification.

5. Degeneracy avoidance in the Ancient Greek hexameter

Like Latin, the Ancient Greek hexameter, as represented here by the *Iliad* and *Odyssey*, distinguishes degenerate feet from other light syllables. The basic template for the metre is the same as in (5), though Greek, unlike Latin, is a pitch accent language. I assume, following most modern analyses, that Ancient Greek word prosody – not just its poetic metrics – is organised around feet, which are invoked to motivate pitch accent placement, prosodic minimality, syllable timing and other phenomena (Steriade 1988; Sauzet 1989; Golston 1990; Devine & Stephens 1994; Blumenfeld 2004, 2011; Sandell 2020; but cf. Steriade 2014). Here, all that is relevant is that monosyllables can be footed, normally so as lexical words, and sometimes as function words, just as in Latin and other languages.

As before, the present concern is monosyllables of the shape C₀VC. Short-voweled monosyllables exhibit three accentual patterns, namely, acute (high or rising), grave (lowered or cancelled high; cf. Devine & Stephens 1994; Probert 2003, 2006) and none (certain clitics). An accented monosyllable is acute when at the end of an intonation group or hosting an enclitic; otherwise, it is grave. Regardless of accent and word type, resyllabification normally applies in C₀VC#(h)V throughout the line, as confirmed by scansion.

Figure 4 shows prevocalic rates of monosyllables in the combined Homeric corpus, aggregated by word type (lexical, pronoun, preposition or conjunction). The corpus and word lists were prepared as follows. The two Greek texts were downloaded from the Perseus Digital Library.¹⁵ Repeated lines were removed after the first instance. All words of shape C₀VC were taken as data, excluding those with long vowels (even when length is not orthographically apparent, as with some alphas, iotas and upsilons), apocopic forms such as *pot'* (for *pote* ‘at some time’) and allomorphs confined to preconsonantal or prevocalic position (e.g. *kád* for *katá* ‘against’ before *d*). The emphatic enclitic *per* was excluded because it does not fit well with any of the categories in the figure.¹⁶ Finally, any token of prevocalic C₀VC scanning as heavy was excluded.¹⁷

¹⁵www.perseus.tufts.edu, accessed 14 May 2022. Further post-processing was facilitated by James Tauber’s greek-accentuation module for Python.

¹⁶Even though it is not shown, *per* agrees with the generalisations in this section, being prevocalic 65% of the time when unaccented and 5% of the time when acute.

¹⁷This includes any prevocalic C₀VC in the (normally heavy) line-initial position, the site of some irregularity (West 1982). It also includes a number of tokens preceding a (historical) digamma (*w), which is not indicated in orthography but which usually blocks resyllabification. For example, *hoi* ‘they’ scans as if it were *hwoi*. Using a list of common digamma-initial words from Monro (1891), any bigram with a

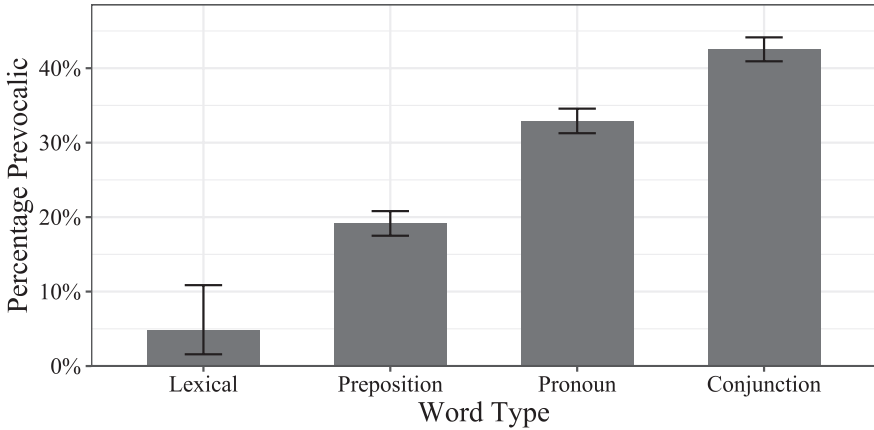


Figure 4. Prevocalic rates for Greek monosyllables, aggregated by word type.

After these exclusions, the following C_0VC words remain. Lexical words include *bán* ‘go, mount’, *dós* ‘give’, *p^hán* ‘speak’, *p^ht^hán* ‘come’, *stán* ‘stand’ and *t^hés* ‘put’.¹⁸ Because there is only one adverb, *trís* ‘thrice’, and it patterns with the lexical words, the adverb is counted as lexical in this section. Pronouns include *hén* ‘one’, *min* ‘him/her/it’, *són* ‘your’, *sós* ‘your’, *sp^hin* ‘for them’, *tís* ‘who’, *tis* ‘someone’ and *tón* ‘him’. Prepositions include *en* ‘in’, *es* ‘into’, *ksún* ‘with’, *prós* ‘towards’ and *sún* ‘with’. Finally, conjunctions include *án* (modal particle), *gár* ‘for, since’, *ken* (modal particle), *mén* ‘whereas’ and *tár* ‘and so’.

As Figure 4 reveals, lexical C_0VC words, unlike the other word types, are almost categorically avoided before vowels. Their prevocalic incidence is 4.8% (5 of 104 tokens), almost exactly matching Virgil’s rate of 5.0% (6 of 119 tokens) in (11) and that of several other Latin hexametrist in Figure 1. The analysis is likewise the same. Due to $MAX(lex, \omega)$, a lexical word, regardless of accent, must correspond with a PwD. If the lexical word is C_0VC and prevocalic, the PwD is rendered light by resyllabification, as in (17). The resulting syllable, being light, cannot occupy any position in the metre that requires a heavy syllable. But it also cannot occupy a light-requiring subposition, given $*SUBPOS \supset FOOT$ (weighted as necessary to permit exceptions). It follows that degenerate feet are disfavoured throughout the hexameter.

(17) $(d\acute{o})_{\omega}(s \text{ ap}o\phi^{h_t}i\acute{m}e\acute{n}o)_{\omega}$ ‘grant that he meet his demise’

The presence of pitch accent in Greek raises a possible confound for this analysis that I now address. Hypothetically, one could imagine that lexical monosyllables might be more likely to be acute than other monosyllables and that it might be their acuteness

digamma-initial second member was excluded. Additionally, all remaining tokens of prevocalic monosyllables except (as accented) *án*, *en*, *gár*, *ken*, *mén*, *min* and *tis* were checked by hand. Among the 444 tokens scanned, 1.6% involved digammas not already captured. The error rate for the remaining words is likely similar.

¹⁸The *n*-final forms are neuter singular aorist active participles. The *s*-final forms are second-person singular aorist active imperatives.

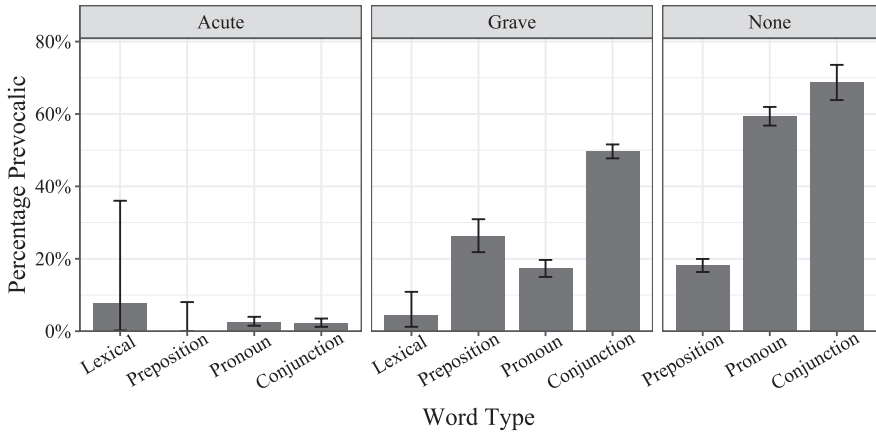


Figure 5. Prevocalic rates for Greek monosyllables, grouped by accent type (top) and word type (bottom).

rather than their lexicality driving their underrepresentation before vowels. Figure 5 breaks down word type by accent type, showing that accent type does matter, but not in a way that undermines the generalisation just posited. To wit, two generalisations are now evident: first, lexical C_0VC is avoided prevocalically regardless of accent (acute or grave), as already stated. Second, acute C_0VC is avoided prevocalically regardless of word type. Even C_0VC function words are nearly unattested before vowels when they are acute.

Analysing this second generalisation is beyond the scope of this article, but possibly represents another way in which degenerate words are avoided in subpositions. Recall that monosyllables are acute in two contexts, namely when final in an intonation group and when hosting an enclitic.¹⁹ Both contexts have been analysed in other languages as being associated with prominence. First, Selkirk (1996) and Ito & Mester (2019) treat the non-reducibility of function words when final in the phonological phrase in English. Second, clitics are pre-stressing (requiring their host to be footed) in some languages (Mester 1994). That said, I leave these matters in Ancient Greek to future research. What is important here is that the lexicality gradient persists even when accent is controlled, as with grave accent in Figure 5.

Finally, as in Latin, beyond lexical categories, individual Greek C_0VC words vary in their prevocalic propensities, presumably reflecting varying propensities to be stressed. Figure 6 shows the rates for individual monosyllables in Greek. Note that each word has a separate entry for each accent pattern that it takes. For example, *tis* ‘who’, which is rarely prevocalic, is separate from *tis* ‘someone’, which is often prevocalic.

¹⁹These contexts need not be expressed disjunctively. Assuming that an enclitic projects to a recursive PwD, a non-disjunctive generalisation is that an acute ultima of a maximal PwD becomes grave when non-final in the intonation group. Ultimas before enclitics are not affected because they are not final in their maximal PwDs.

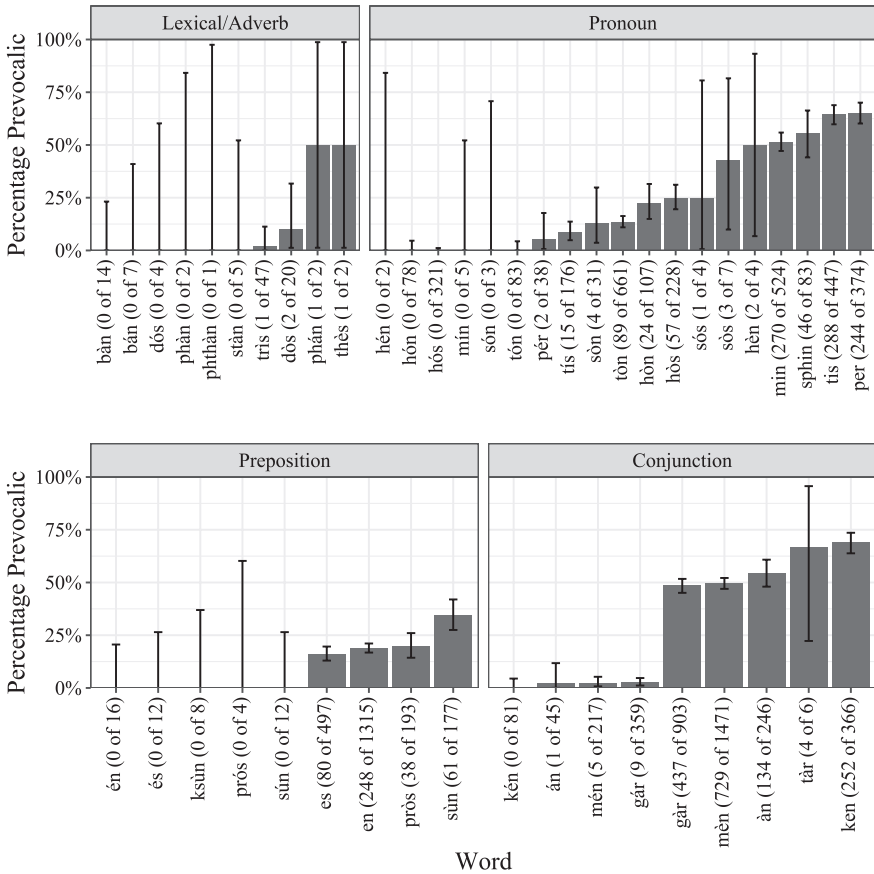


Figure 6. Prevocalic rates for Greek monosyllables, showing individual words. The labels at bottom also indicate the prevocalic and total frequencies of each word. The bimodality within conjunctions (and to some extent within the other categories) can be motivated by acute versus non-acute accent, as addressed by the previous figure: if a C_0VC conjunction (or other word type) is acute, it is unlikely to immediately precede a vowel.

6. Discussion

A degenerate foot, despite being a kind of light syllable, is penalised in light-requiring positions in metre, being nearly banned by some poets. The present analysis does not maintain that the poets avoid degenerate feet simply because such feet are marked. (If that were the case, there would be no explanation for why the poets avoid one type of marked structure but not numerous others, nor would there be an explanation for the confinement of the avoidance to verse.) Rather, the poets avoid degenerate feet because they exceed the tolerance of a light-requiring metrical position. That is, a light-requiring position (subposition in this case) cannot dominate a prosodic category higher than the syllable.

Such avoidance is phonetically natural in the sense that a degenerate foot is presumably the longest type of light syllable in the language. At least three factors potentially conspire to make degenerate feet longer than other light syllables in Latin and Greek. First, on the present analysis, a degenerate foot arises only in a monosyllable, and monosyllables tend to be longer cross-linguistically than syllables that are part of longer words and therefore subject to polysyllabic shortening (Lehiste 1970; Mori 2002; Braver & Kawahara 2014). Second, degenerate feet are stressed, and stressed syllables tend to be longer than their unstressed counterparts, as evidenced in Latin by reductive sound changes (Weiss 2020: 119–132). Finally, degenerate feet, being always word-final on this analysis, have the potential to undergo phrase-final lengthening (cf. Delattre 1966; Lindblom 1968; Wightman *et al.* 1992), whereas non-word-final light syllables lack this potential.

With this phonetic rationale in mind, this section briefly addresses the viability of alternative possible analyses of the avoidance of stressed $C_0VC\#V$ in verse that do not depend on the foot. First, as mentioned in §3, $*SUBPOS \supset PWD$ would work just as well as $*SUBPOS \supset FOOT$ here, since degenerate feet are always coextensive with degenerate PWds on this analysis. Thus, if one rejects the foot but not the Pwd, an alternative is available that trivially modifies the present analysis.

Consider next a purely grid-based approach, without any bracketing for feet or PWds. As (18) illustrates, the avoidance of stressed $C_0VC\#V$ does not reflect the avoidance of a particular rhythmic configuration, at least not one expressed by the standard grid. For example, avoided type (18a) *dat amīca* has the same rhythmic profile as unavoided type (18b) *data porta*. To address the excessive crudeness of the traditional grid, one might pursue one of two strategies, invoking either monosyllabicity or phonetic duration.

(18) a. <i>dat amīca</i> ‘friend gives’ × × × × × × × × da.t #a mi: ka	b. <i>data porta</i> ‘door given’ × × × × × × × × da.t a #por ta
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First, consider a constraint like $*SUBPOS \supset STRESSED MONO$ ‘a subposition cannot contain a stressed monosyllable’. The first issue with this constraint is that it defeats the intent of the purely grid-based strawman by invoking what can only be construed as a type of Pwd, namely, the monosyllable. As just discussed, if one allows reference to the Pwd, then a constraint like $*SUBPOS \supset PWD$ suffices, which has the effect of excluding degenerate PWds from the hexameter without invoking monosyllabicity. Another objection to an analysis in terms of $*SUBPOS \supset STRESSED MONO$ is that it stipulates the description, giving up a fair amount of restrictiveness in so doing. For instance, the constraint $*SUBPOS \supset STRESSED MONO$ implies the simpler constraint $*SUBPOS \supset MONO$, banning all monosyllables from subpositions. I am not aware of such a metre.²⁰ The $*SUBPOS \supset FOOT$ analysis, in which a position type exhibits a prosodically defined maximum (Hanson & Kiparsky 1996), avoids such overgeneration. ‘Monosyllable’, not being a prosodic category, is not available as a predicate.

²⁰The avoidance of monosyllables in line-final position is not a function of position type.

A final possible line of analysis that eschews the foot is to refer directly to (normalised) phonetic duration, defining duration ranges for metrical positions (cf. Flemming 2001; Ryan 2014). On such an approach, stressed monosyllables would exceed the durational tolerance of a light-requiring position. Restrictiveness, once again, is a concern. For example, if the cutoff for light positions can be drawn at whichever point is necessary to preclude stressed monosyllables, what prevents other cutoffs, such as excluding stressed monosyllabic C_0V , but only if the vowel is low? Another concern is the abstract computation of duration, that is, normalisation. For example, one would presumably not want positional tolerances to vary as a function of speech rate, as raw duration would predict. Moreover, categories tend to overlap. For instance, the shortest heavies are often shorter than the longest lights, even when considering mean durations (Hayes 1999; Gordon 2002). Thus, a structure-free approach appears to be a non-starter. That said, poetic practice can be sensitive to fine-grained phonetic detail (Ryan 2011), leaving open the question of how best to integrate phonetic and phonological phenomena in metrics.

7. Conclusion

In Latin and Ancient Greek, lexical monosyllables of the shape C_0VC remain PWds when they undergo resyllabification, thereby becoming degenerate feet. Verse evidence confirms that such monosyllables retain their stress even while becoming light. PWd minimality (here in the form of FTBIN) is thus conditional in these languages, being suspended under certain conditions in a phrasal context. As discussed in the introduction, however, not all languages with PWd minima and resyllabification permit phrase-internal violations of minimality like Latin and Greek do.

Hexametrists in both the Latin and Greek traditions avoided degenerate feet in their verse due, I maintain, to a constraint against a subposition dominating a foot. Meanwhile, prevocalic lexical C_0VC was permitted freely outside of verse, revealing that the languages in general tolerated degeneracy. Beyond lexical words, as this article recognises, function words vary in their propensities to be stressed. The more likely a C_0VC function word is to be stressed, the more it is avoided before a vowel in the hexameter, reflecting the same degeneracy effect observed more rigidly for lexical words. With this new evidence for degenerate feet being induced by resyllabification in languages that otherwise do not permit degeneracy, the degenerate foot receives additional support, being more widely distributed in the typology than previously acknowledged.

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