Avoiding Boundaries: Antepenultimate Stress in a Rule-Based Framework

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This article is part of a larger study investigating antepenultimate stress and final nonparsing (extrametricality). Here we examine the rule-based implementation of final nonparsing in Idsardi 1992. We present an in-depth analysis for Macedonian, a language well known for antepenultimate stress. We argue that nonparsing does not account for all the data, and we propose enriching the inventory of avoidance constraints to directly derive peripheral ternarity. This analysis allows us to account for several details that are not addressed by previous analyses (Idsardi 1992, Halle and Kenstowicz 1991). We also consider crosslinguistic ramifications and suggest that some cases of ternarity result from generalized boundary avoidance.

Keywords: Macedonian language, antepenultimate stress, extrametricality, edge avoidance constraints, ternary stress

1 Introduction

Standard Macedonian is often cited as an example of a language with antepenultimate stress. In words of three or more syllables, stress falls on the antepenult; in shorter words, it falls on the initial (1).[1]

(1) *Stress in single words*

a. táp	'dull'	e. ríd	'hill'
b. tátko	'father'	f. rídot	'the hill'
c. tátkovtsi	'fathers'	g. rídovi	'hills'
d. tatkóvtsite	'the fathers'	h. ridóvite	'the hills'

The traditional approach for handling this type of pattern is to give the final syllable some special status that keeps it from being parsed. The original implementation of this was extrametri-

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[1] Macedonian forms presented in this article and not otherwise attributed were elicited from native speakers.

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cality (Hayes 1979, 1982, 1995), in which an extrametricality rule marks a final syllable invisible to subsequent metrification. An alternative to extrametricality is edge marking (Idsardi 1992), which inserts a constituent boundary next to a word edge prior to other metrification rules. When a right-hand boundary is placed to the left of the rightmost syllable, that syllable is excluded: xxx)x#.

A different approach concentrates not on the final syllable itself, but on the distance between the right edge of the word and the foot. In languages with antepenultimate stress, this distance may not be null. This is the approach taken in Optimality Theory, making its debut as the constraint NONFINALITY (''Feet are not word-final''; McCarthy and Prince 1993). Subsequently, the same types of parse have been generated in Optimality Theory using ideas of clash and lapse avoidance. In Hung 1995, the RHYTHM constraint, holding that every stressed syllable should be followed by an unstressed syllable, works to avoid stress clashes. A foot-level version holds that every footed syllable should be followed by an unfooted syllable. In systems that allow secondary stresses, this will result in foot structures similar to those generated by Hayes's (1995) weak local parsing algorithm: binary feet are separated by single unparsed syllables, giving rise to stress on every third syllable. In languages that do not allow secondary stresses, such as Macedonian, the result is a single antepenultimate stress. Similarly, ternarity and final nonparsing have also been derived using constraints on lapse (Green and Kenstowicz 1995, Elenbaas and Kager 1999).

A clash avoidance approach also accounts for ternary rhythm in Idsardi's (1992) rule-based approach. Idsardi's clash avoidance constraints block application of stress rules if the result would violate a constraint. The simplest of these constraints is Avoid (x(, which prohibits nonmatching parentheses separated by a single grid mark.[2] This blocks metrical structure that would give rise to adjacent stresses. Avoid (x(is referred to as a *local* avoidance constraint since the elements subject to it are separated by only one mark. A *nonlocal* variant also exists: Avoid (xx(. The nonlocal constraint can be used to derive ternary rhythm within a word by forcing iterative constituent construction (ICC) to skip three rather than two syllables before inserting a new boundary. However, Avoid (xx(cannot be used to generate antepenultimate stress. This is because the formal definition of Avoid (xx(does not make reference to the end of the word (#). Therefore, it does not violate the constraint to insert a boundary two syllables away from the right edge of a word: a structure such as (xxx(xxx(xxx(xx would be perfectly acceptable. In sum, although it is possible to build word-internal ternary constituents using the clash avoidance approach as found in Idsardi 1992, it is not possible to build ternary constituents word-finally.

We suggest an addition to Idsardi's (1992) framework, which will allow antepenultimate stress to be derived using the clash avoidance approach. Basically, we propose adding nonlocal edge avoidance constraints like Avoid (xx#. The effect of this constraint is to block application of a rule that would otherwise result in penultimate stress placement. This constraint not only

[2] Since a single parenthesis is all that is needed in Idsardi's (1992) framework to define a constituent, the structure (x(x defines two constituents and gives rise to a stress clash at some level of representation; *matching* parentheses that are separated by a single mark—that is, (x)—define a single constituent and are not subject to avoidance constraints.

allows us to provide a more comprehensive rule-based analysis of antepenultimate stress in Macedonian, but also fills a gap in the typology of avoidance constraints used in this framework. As shown in (2), Idsardi proposes two types of avoidance constraints: clash avoidance and edge avoidance. As noted above, clash avoidance constraints block rules that would insert boundaries too close to existing constituents. Edge avoidance constraints are similar: they block rules that would insert boundaries too close to word edges. This is useful, for example, in languages that have both extrametricality and syllable weight: edge avoidance ensures that heavy finals cannot escape extrametricality by attracting stress onto themselves. However, whereas clash avoidance constraints can be either local or nonlocal, edge avoidance constraints are only local. The proposed edge avoidance constraint would fill this gap.

(2) *Inventory of avoidance constraints*

	Local	Nonlocal
Clash avoidance	Avoid (x(	Avoid (xx(
Edge avoidance	Avoid (x#	Avoid (xx# *(proposed)*

To demonstrate the necessity of nonlocal edge avoidance constraints, we offer an in-depth analysis of antepenultimate stress in Standard Macedonian in Idsardi's (1992) framework. We show that an analysis using the proposed constraint not only is capable of deriving the basic Macedonian antepenultimate pattern, but also accounts for certain idiosyncrasies of Macedonian stress placement that have defied previous analysis in this framework. These include the analysis of exceptional stress placement, the ''monosyllabic head effect'' (Franks 1987, 1989), and certain cases of variable stress placement.

2 An Edge Avoidance Analysis of Macedonian

2.1 Basic Parameter Settings

The following parameter settings will be used to derive the basic stress placement facts of Macedonian:

(3)

Line 0:	Edge:LLL	ICC:R→L; Avoid (xx#	Head:L
Line 1:	Edge:RRR		Head:R

To see how these parameters work, consider the derivation of the four Macedonian words in (4).

(4) *Sample derivations*

	'dull'	'father'	'fathers'	'the fathers'
1. Project	x	x x	x x x	x x xx
	tap	tatko	tatkovtsi	tatkovtsite
2. Edge:LLL	(x	(x x	(x x x	(x x xx
	tap	tatko	tatkovtsi	tatkovtsite

3. ICC:R→L				(x (x x x
				tatkovtsite
4. Head	x	x	x	x
Line 1	x)	x)	x)	x x)
	(x	(x x	(x x x	(x (x x x
	tap	tatko	tatkovtsi	tatkovtsite
5. Conflation	x	x	x	x
	x)	x)	x)	x)
	(x	(x x	(x x x	(x x x
	tap	tatko	tatkovtsi	tatkovtsite

In step 1, grid marks are projected for every vowel. In step 2, in accordance with the setting Edge:LLL, a left-hand boundary is placed to the left of the leftmost mark. This ensures that stress is correctly assigned to words of fewer than three syllables, such as [táp] 'dull' and [tátko] 'father'. Note that Edge:LLL is not blocked in bisyllables; this indicates that Avoid (xx# is parameter specific, applying only to ICC. In step 3, ICC inserts left-hand constituent boundaries in a binary pattern from right to left, where possible. Normally, this would result in iterating stresses on every vowel located 2*n* syllables from the right edge (e.g., (xx(xx(xx(xx#, etc.). However, inclusion of Avoid (xx# blocks ICC from placing a boundary to the left of the penultimate syllable. Instead, ICC places its first boundary one syllable further left, producing antepenultimate rather than penultimate stress. In step 4, line 1 grid marks are added and word-level stress is assigned. Since Macedonian does not allow secondary stresses, all metrical structure outside of the main-stressed constituent is removed in step 5.[3]

Macedonian also has a number of lexically specified exceptions to stress, as shown in (5). As illustrated, there are two types of exceptional stress: final and penultimate. Exceptional stress never occurs to the left of the antepenult.

(5) *Exceptional final and penultimate stress*

a. onolkáv	'so big'	d. apsána	'jail'
b. advokát	'lawyer'	e. talentíran	'talented'
c. eptén	'completely'	f. letóvo	'this summer' (adv.)

Following Franks (1987, 1991), we assume that exceptional stress in Macedonian is encoded using lexically specified constituent boundaries. We assume the following types of representations for exceptional final and penultimate stress, where the symbol ⟪ indicates a lexically specified boundary:

[3] Idsardi's (1992) instantiation of conflation differs from Halle and Vergnaud's (1987) in that conflation is not envisioned as deletion of a grid line. Instead, prosodic circumscription (McCarthy and Prince 1986, 1990) is used to isolate the main-stressed constituent. The prosodic structure of the residue is then deleted.

(6) *Sample lexical representations*

Final stress	Penultimate stress
x x (x	x (x x
onolkav	apsana

This differs from Idsardi's (1992) representations for exceptional stress in Macedonian in that our representations cannot be generated using edge marking alone; we will compare our approach with Idsardi's in section 3.4.

Note that the lexical boundary in words like [apsána] violates Avoid (xx#. Avoid (xx# blocks rule application; since the boundary producing penultimate stress in [apsána] is part of a lexical entry, and not assigned by rule, the constraint has no effect.

When an exceptionally stressed word is subject to suffixation, stress generally falls on the same syllable as in the citation form, as in (7a–e). However, exceptional stresses never occur to the left of the antepenult. As a result, if two syllables are suffixed to a word with exceptional penultimate stress, stress moves rightward and surfaces on the antepenult, as in (7f).

(7) *Exceptional stress under suffixation*

a.	advokáti	'lawyers'	d.	apsánata	'the jail'
b.	advokátite	'the lawyers'	e.	talentírani	'talented (pl.)'
c.	onolkávata	'the one of such a size (fem.)'	f.	talentiránite	'the talented ones'

This pattern is correctly derived by the analysis already presented: exceptional stresses surface in their lexically specified locations except when there are enough unstressed syllables to their right to allow application of ICC without violating Avoid (xx#. This is illustrated in (8) for three forms of the Macedonian word for 'talented'.

(8) *Derivations for exceptional stress*

	Stem	Stem + 1 σ	Stem + 2 σ
1. Project	x x (x x talentiran	x x (x x x talentirani	x x (x x x x talentiranite
2. Edge:LLL	(x x (x x talentiran	(x x (x x x talentirani	(x x (x x x x talentiranite
3. ICC			(x x (x(x x x talentiranite
4. Head Line 1	x x x) (x x (x x talentiran	x x x) (x x (x x x talentirani	x x x x) (x x (x(x x x talentiranite
5. Conflation	x x) (x x talentiran	x x) (x x x talentirani	x x) (x x x talentiranite

The derivation for [talentiránite] also demonstrates why exceptional stresses in Macedonian are

limited to final and penultimate positions: even if an exceptional stress were lexically specified somewhere to the left of the antepenult, there would be so many unstressed syllables to the right that ICC would be able to apply to them. The lexical stress would ultimately be removed during conflation.

2.2 Stress in Forms with Clitics

Stress in forms with clitics is also generally antepenultimate. However, the stressability of a clitic is determined by its location. Clitics that follow their host are stressable, but clitics that precede their host are not: even if a proclitic is attached to a word of two syllables or fewer and is therefore in penultimate or antepenultimate position, it cannot bear stress. This is illustrated by the sample words in (9). Note that the position of a clitic is determined by tense: clitics follow nouns and tenseless verbs (i.e., gerunds or imperatives) but precede tensed verbs. Importantly, it is possible for the same clitic to occur in both positions in different constructions. Such is often the case, for example, with direct and indirect object clitics. This means that analysis of the clitic data must rest on finding the proper stress parameters and not on specifying different characteristics for proclitics versus enclitics, such as specifying one group [+cyclic] but the other [−cyclic] (cf. the analysis of Dakota in Halle and Vergnaud 1987).

(9) *Stressability of clitics* (Koneski 1976, Lunt 1952)

Enclitics count for stress

a.	brátutʃed	‘cousin’
b.	bratútʃed mu cousin 3SG.MASC.DAT	‘his cousin’
c.	dónesi	‘bring!’
d.	donési ja bring! 3SG.FEM.ACC	‘bring it (fem.)!’
e.	donesí mu ja bring! 3SG.MASC.DAT 3SG.FEM.ACC	‘bring it (fem.) to him!’

Proclitics do not count for stress

f.	(tój) mu rétʃe he 3SG.MASC.DAT told	‘(he) told him’
g.	(tój) oti dóʃol he thence walked	‘(he) came from there’
h.	(tíe) si se sméat they REFL.DAT REFL.ACC laugh	‘(they) are laughing to themselves’
i.	im go prikaʒúvale 3PL.DAT 3SG.NEUT.ACC told	‘(they) told them about it’
j.	(tój) mu go dál he 3SG.MASC.DAT 3SG.MASC.ACC gave	‘(he) gave it to him’
k.	go dónese 3SG.MASC.ACC brings	‘(he/she) brings it’

The variable stressability of clitics can be accounted for by assuming that all clitics in Macedonian are [−cyclic] in Halle and Vergnaud's (1987) sense. In this view of cyclicity, [−cyclic] morphemes must respect the metrical structure of their host while [+cyclic] morphemes trigger deletion of preexisting metrical structure and reapplication of the entire cyclic rule block. In Idsardi 1992, the metrical structure that must be respected noncyclically is precisely that of line 0: all metrical structure above this line is deleted noncyclically. If we specify Macedonian clitics [−cyclic], we obtain the following generalization: to receive stress, a clitic must be located *both* close to the right edge of the word *and* further right than the rightmost constituent of the host. Enclitics naturally satisfy both conditions. Proclitics can satisfy the first condition if they are added to a word that is short enough, but will *never* satisfy the second: they will always be located to the left of some cyclically built constituent. This means that any constituent built over a proclitic can never be the rightmost constituent in the word; such structure will always be removed by conflation. This outcome is illustrated in (10) for the form [mu rétʃe]. As shown, the unstressability of proclitics is a result of line 0 edge marking: the parenthesis placed by LLL edge marking in the cyclic block must be retained in the noncyclic block. This effectively ensures that there will always be a constituent to the right of the rightmost proclitic.

(10) *Unstressability of proclitics*

	Cyclic block	Noncyclic block
1. Project	x x retʃe	x (x x mu + retʃe
2. Edge:LLL	(x x retʃe	(x (x x mu retʃe
3. ICC		
4. Head Line 1	x x) (x x retʃe	x x) (x (x x mu retʃe
5. Conflation	x x) (x x retʃe	x x) (x x mu retʃe

In contrast, enclitics are unaffected by cyclic edge marking. As a result, stress shifts rightward noncyclically whenever there are enough unstressed syllables at the right edge to support ICC. This is illustrated for the form [donési mu] in (11). Note that correct stress placement in the noncyclic block crucially depends on the main-stressed constituent remaining open on its right edge at the end of the cyclic block. This allows the constituent to be *truncated* in the noncyclic block, which changes stress placement while still respecting cyclically built metrical structure. None of the existing structure is changed; an extra parenthesis is simply inserted one syllable to the right.

(11) *Stressability of enclitics*

	Cyclic block	Noncyclic block
1. Project	x x x donesi	(x x x x donesi + mu
2. Edge:LLL	(x x x donesi	
3. ICC		(x(x x x donesi mu
4. Head Line 1	x x) (x x x donesi	x x x) (x(x x x donesi mu
5. Conflation	x x) (x x x donesi	x x) (x x x donesi mu

This approach would be impossible in an analysis using final nonparsing, since in that case the main-stressed constituent would be closed on its right edge by edge marking: (xx)x. Given this structure, shifting stress one syllable to the right requires reorganization of existing metrical structure and therefore would require that clitics be [+cyclic].

2.3 Stress in Enlarged Stress Domains

In Standard Macedonian, it is not always the case that every lexical word carries a unique stress. Instead, stress can be assigned to combinations of two lexical words, as in (12a–c), or to combinations of two lexical words with intervening clitics, as in (12d–f). Note that the negative particle [ne] is not a clitic in Macedonian, but a stressable word (see Garde 1968, Groen 1977). These combinations are referred to by Franks (1987, 1989) as *enlarged stress domains* (ESDs). This type of construction is particularly common for combinations of *wh*-word + verb or negation + verb (plus associated clitics).

(12) *Enlarged stress domains* (Koneski 1976)

a. kiseló mleko ‘yogurt’
   sour milk
b. suvó grozje ‘raisins’
   dry grape
c. prvatá veʧer ‘the first night’
   $\text{first}_{\text{def}}$ evening

d.	(tój)	ne mú retʃe		'(he) didn't tell him'
	he	NEG 3SG.MASC.DAT told		
e.	(táa)	ne gó vide		'(she) didn't see him'
	she	NEG 3SG.MASC.ACC saw		
f.	koj	gó vide		'who saw him?'
	who	3SG. MASC.ACC saw		

As illustrated, stress placement in ESDs is also generally antepenultimate, as in [kiseló mleko] or [ne gó vide]. However, if the final word in an ESD is monosyllabic, stress is generally penultimate, as shown in (13). Franks refers to this phenomenon as the *monosyllabic head effect* (MHE).

(13) *Monosyllabic head effect in ESDs* (Koneski 1976, Panoska and Dzhukeski 1977)

a.	okolú	rid		'around a hill'
	around	hill		
b.	prviót	den		'the first day'
	$\text{first}_{\text{def}}$	day		
c.	vtoriót	den		'the second day'
	$\text{second}_{\text{def}}$	day		
d.	ne mu	gó	zel	'(he) didn't take it from him'
	NEG 3SG.MASC.DAT	3SG.NEUT.ACC	took	
e.	ne bi	mú	dal	'(he) shouldn't give him'
	NEG COND	3SG.MASC.DAT	gave	
f.	ʃto bi	mú	zel	'what should he take from him?'
	what COND	3SG.MASC.DAT	took	

To account for antepenultimate stress in ESDs like [kiseló mleko], we assume that ESD formation is a [+cyclic] morphological process. This means that ESD formation triggers the Stress Erasure Convention, which deletes the metrical structure assigned to the two words individually. The entire ESD is then subject to the cyclic stress block, as illustrated in (14).

(14) *Derivations for ESDs not subject to the monosyllabic head effect*

1.	Project	x x x x x
		kiselo#mleko
2.	Edge:LLL	(x x x x x
		kiselo#mleko
3.	ICC	(x x(x x x
		kiselo#mleko
4.	Head	x
	Line 1	x x)
		(x x(x x x
		kiselo#mleko

5. Conflation

```
        x
       x)
      (x   x x
kiselo#mleko
```

We analyze the occurrence of ESDs in Macedonian as indicating that Macedonian stress is assigned at some prosodic level above that of the single word. We do not, in contrast, equate ESD formation with compounding. True compounds do occur in Macedonian, but they do not have the same properties as ESDs. One difference is placement of the definite article. In Macedonian, forms of the definite article (*-ta, -to, -*(*i*)*ot*) always encliticize to the first word in a noun phrase, as shown in (15a–b). In ESDs, articles are placed after the first member (15c–d); in true compounds, articles are placed after the second member (15e–f).

(15) *Article placement*

	Anarthrous	Arthrous	Gloss
a.	mlada ʒena	mladata ʒena	'young woman'
b.	mlad ʧovek	mladiot ʧovek	'young man'
c.	prv den	prviot den	'first day'
d.	nova godina	novata godina	'new year'
e.	golo-glava	golo-glavata	'bare-headed (fem.)'
f.	svetlo-ʒolti	svetlo-ʒoltite	'light-yellow (pl.)'

True compounds do not show the same accentual patterns as ESDs. Particularly, true compounds are not subject to the monosyllabic head effect, while ESDs are. This is illustrated by true compounds ending in a monosyllabic member, such as [pétrovden] 'St. Peter's Day' (< [pétrov] 'belonging to Peter' + [dén] 'day') or [góloglav] 'bare-headed (masc.)' (< [gól] 'bare' + linking vowel + [glav] 'head'). Both of these diagnostics point to the conclusion that true compounds in Macedonian are treated as single words, while ESDs are treated as two separate words that just happen to share a single stress. For this reason, we assume that the process of ESD formation does not delete the word boundary between the two members of an ESD, as in [kiseló#mleko] above.[4] Note that this brings to light an important fact concerning the nature of edge avoidance constraints: Avoid (xx# rules out penultimate stress; it does not rule out final stress. If it did, we would expect pre-antepenultimate stress in [kiseló#mleko] in order to avoid placing a parenthesis too close to the medial word boundary. This means that the constraint we are proposing, Avoid (xx#, does not overlap in application with Idsardi's (1992) local version, Avoid (x#.

The fact that the individual members of an ESD maintain their status as separate words is important in accounting for the monosyllabic head effect. In our analysis, Macedonian antepenultimate stress is a result of the occurrence in this language of a constraint blocking penultimate

[4] We assume that the medial # does not define a constituent boundary; this seems reasonable since it is not defining the edge of a stress domain.

stress placement. The same mechanism blocks antepenultimate stress in an ESD whose rightmost member is a monosyllable: although stress would be antepenultimate with respect to the ESD, it would be penultimate with respect to the first member.

(16)
```
      x   (x x       x
  # p r v  i  o t # den #
```

However, penultimate stress placement is possible: the final word boundary no longer triggers Avoid (xx# because the last two marks of the ESD are not strictly adjacent but are instead separated by a word boundary. Intuitively, placing stress on the ultima of the first member ensures that neither member has penultimate stress. The fact that the ESD as a whole has penultimate stress is allowable because the formal definition of Avoid (xx# is not met by sequences spanning a word boundary.

(17)
```
      x   x (x       x
  # p r v i   o t # den #
```

2.4 Variable Stress Placement

There is one type of exception to the monosyllabic head effect. If an ESD ends in a monosyllabic word, and if the ESD as a whole is precisely three syllables long, stress can be either penultimate or antepenultimate, as shown in (18). We refer to this phenomenon as *E-3 variation* (*e*xactly *3* syllables).

(18) *E-3 stress variation* (Koneski 1976)

a.	ne bí zel	né bi zel	‘he shouldn’t have taken’
b.	ʃto bí dal	ʃtó bi dal	‘what should he take?’
c.	prekú dzid	préku dzid	‘through a wall’

The analysis already provided predicts that these words should show the monosyllabic head effect and have penultimate stress. To account for the possibility of antepenultimate stress in these forms, we propose that forms with three or fewer syllables can optionally be stressed according to a second set of parameters.

(19)

Line 0:	Edge:LLL	Head:L
Line 1:	Edge:RRR	Head:R

Although this approach requires an additional set of parameters, we feel it is still superior to alternatives, in terms of both empirical adequacy and economy of analysis. We compare it with alternatives in more detail in section 3.3. The effect of these parameters is to make ICC:R→L optional for shorter words. This is intuitively appealing, since ICC can never apply in non-ESD forms of three or fewer syllables. Stress in such words is instead the result of Edge:LLL in line 0 (see (4)). This system is equivalent to saying that Macedonian has two stress placement systems: stress is initial for forms with three or fewer syllables, but antepenultimate for longer forms. The shorter words are stressed identically in both systems. As already shown, the unusual status of

ESDs as a single stress domain comprising two separate words allows ICC to apply in certain cases where it otherwise would not. This allows the existence of the second system, and its optionality, to come to light: When trisyllabic ESDs are stressed using the optional second system, they receive initial (i.e., antepenultimate) stress, as in [né bi zel] (18a) or [né zela] '(she) didn't take', as shown in (20). When they are stressed using the default system, stress placement depends on whether the monosyllabic head effect comes into play or not, as shown in (21): if the final member is a monosyllable, a trisyllabic ESD has penultimate stress, as in [ne bí zel]; if not, it has antepenultimate stress, as in [né zela].[5]

(20) *Variable stress placement: optional short word parameters*

	ESD with MHE	ESD without MHE
1. Project	x x x	x x x
	ne#bi#zel	ne#zela
2. Edge:LLL	(x x x	(x x x
	ne#bi#zel	ne#zela
3. Head	x	x
Line 1	x)	x)
	(x x x	(x x x
	ne#bi#zel	ne#zela
4. Conflation	x	x
	x)	x)
	(x x x	(x x x
	ne#bi#zel	ne#zela

(21) *Variable stress placement: default parameters*

	ESD with MHE	ESD without MHE
1. Project	x x x	x x x
	ne#bi#zel	ne#zela
2. Edge:LLL	(x x x	(x x x
	ne#bi#zel	ne#zela
3. ICC	(x (x x	
	ne#bi#zel	

[5] Note that Avoid (xx# is sensitive to the medial word boundaries in forms like ne#bi#zel, but ICC (as illustrated in (20)) is not. This is because word boundaries are explicitly named in the formulation of Avoid (xx#, but not in that of ICC. As formalized in Idsardi 1992, the right-to-left version of ICC simply tries to insert a parenthesis to the left of each grid mark, but is blocked if this would result in a unary constituent. Therefore, ICC is sensitive to word boundaries only inasmuch as they typically define the edges of prosodic constituents. In a language like Macedonian, where word boundaries do not necessarily define stress domains, it is expected that ICC can apply over a word boundary that does not align with the edge of the form being metrified.

4. Head	x	x
Line 1	x x)	x)
	(x (x x	(x x x
	ne#bi#zel	ne#zela
5. Conflation	x	x
	x)	x)
	(x x	(x x x
	ne#bi#zel	ne#zela

3 Alternative Analyses

In the preceding section, we have shown that the edge avoidance approach to Macedonian stress is capable of deriving not only the basic antepenultimate pattern, but also idiosyncrasies involving exceptional stress, the stressability of enclitics and proclitics, enlarged stress domains, and E-3 stress variation. In this section, we consider alternative analyses based on the use of edge marking to exclude the final syllable, and we demonstrate that only the edge avoidance approach successfully deals with all the data.

3.1 Alternative Parameter Settings

An edge-marking analysis of Macedonian stress would employ the parameter Edge:RLR to effectively exclude the final syllable from metrification. Such an analysis is given by Idsardi (1992). Idsardi's parameter settings and sample derivations for one-, two-, and three-syllable words are provided in (22) and (23).

(22) *Parameters: edge-marking approach*

Line 0:	Edge:RLR	ICC:R→L	Head:L
Line 1:	Edge:RRR		Head:R

(23) *Sample derivations: edge-marking approach*

	'water bearer'	'watery'	'platoon'
1. Project	x x x x	x x	x
	vodenitʃar	voden	vod
2. Edge	x x x)x	x) x	)x
	vodenitʃar	voden	vod
3. ICC	x (x x)x		
	vodenitʃar		
4. Head	x	x	
Line 1	x)	x)	
	x (x x)x	x) x	)x
	vodenitʃar	voden	vod

5. Conflation	x	x	
	x)	x)	
	x (x x)x	x) x	x
	vodeniʧar	voden	vod

In step 1, a mark is projected for every syllable. In step 2, a right boundary is placed to the left of the rightmost mark via Edge:RLR. In step 3, binary constituents are formed from right to left where possible. Because the final syllable in [vodeniʧar] is isolated via edge marking, ICC skips this syllable, resulting in antepenultimate stress. Main stress is assigned in step 4. If any secondary stresses were assigned, they would be removed in step 5. Note that [vod] emerges with no constituents; assuming that stress is defined relationally (i.e., the tallest column of marks indicates stress), this can be claimed to be a correct surface form.

3.2 Forms with Clitics

Although this analysis works for noncliticized forms, it makes incorrect predictions concerning clitics. Recall that enclitics count for stress, but proclitics do not, and that this is accounted for in the proposed analysis by making clitics [− cyclic]. If we make the same [− cyclic] assumption in the edge-marking approach, we incorrectly predict that stress will be penultimate in forms followed by an enclitic, as shown in (24). Antepenultimate stress is correctly assigned to [dónesi] in the cyclic block. In the noncyclic block, the line 0 metrical structure of [dónesi] is retained. The enclitic [mu] is isolated in step 2 of the noncyclic block by edge marking. In step 3, ICC fails to apply, since there are not enough free marks over which to build a binary constituent. As a result, main stress is incorrectly assigned to the syllable [si] in step 4.

(24) *Incorrect results for enclitics*

	Cyclic block	Noncyclic block
1. Project	x x x	(x x)x x
	donesi	donesi + mu
2. Edge	x x)x	(x x)x)x
	donesi	donesi mu
3. ICC	(x x)x	
	donesi	
4. Head	x	x
Line 1	x)	x x)
	(x x)x	(x x)x)x
	donesi	donesi mu
5. Conflation	x	x
	x)	x)
	(x x)x	x) x
	donesi	*donesi mu

If we instead assume that clitics are [+cyclic], forms with enclitics will correctly be stressed on the antepenult, but proclitics will incorrectly be treated as stressable. This is illustrated in (25) for [mu rétʃe] (9f) and [mu go dál] (9j).

(25) *Incorrect results for proclitics*

1. Project	x x x mu + retʃe	x x x mu + go + dal
2. Edge	x x)x mu retʃe	x x)x mu + go + dal
3. ICC	(x x)x mu retʃe	(x x)x mu + go + dal
4. Head Line 1	x x) (x x)x mu + retʃe	x x) (x x)x mu + go + dal
5. Conflation	x x) (x x)x *mu retʃe	x x) (x x)x *mu + go + dal

If one considers only proclitics, it is possible to correct stress placement by lexically marking clitics, such as [mu], as poststressing, perhaps via lexical LRR edge marking: x(. This would ensure that a new constituent is started immediately to the right of every clitic. As a result, the syllable to the right of the rightmost clitic would be stressed. If more than one proclitic is present, superfluous clitic-induced stresses would be removed during conflation. However, this incorrectly predicts final stress for forms that have more than one enclitic. Consider, for example, [donesí mu ja] (9e) versus incorrect *[donesi mu já] in (26).

(26) *Incorrect predictions based on poststressing*

	Form with proclitics	Form with enclitics
1. Project	x(x(x mu + go + dal	x x x x(x(donesi + mu + ja
2. Edge	n/a	n/a
3. ICC		(x x(x x(x(donesi mu ja
4. Head Line 1	x x x) x(x(x mu go dal	x x x x) (x x(x x(x(donesi mu ja

5. Conflation	x	x
	x)	x)
	x x(x	x x x x(x(
	mu go dal	*donesi mu ja

3.3 Enlarged Stress Domains and E-3 Variation

In the analysis we have proposed, ESD formation is [+cyclic]; unexpected stress patterns pertaining to ESDs (such as the monosyllabic head effect and E-3 variation) arise from the fact that ESDs comprise two separate words even though the two receive a joint stress. An alternative analysis has been proposed by Halle and Kenstowicz (1991) and Kenstowicz (1991), using a Halle and Vergnaud (1987)–style metrical framework. Idsardi (1992) also adapted essentially the same analysis to his framework for his analysis of Macedonian. In all these versions, ESD formation is noncyclic and is interpreted as a cliticization process. Following Halle and Vergnaud (1987), cliticization of one word to another is equated with erasure of the metrical structure of whichever word is considered to be the clitic. In this case, the second member of the ESD is considered the clitic. This means that in an ESD, the line 0 metrical structure of the first member is preserved, but no metrical structure for the second member is.

The basic idea of this approach mirrors Steriade's (1988) analysis of encliticization in Latin. Assuming that a foot has been cyclically built one syllable from the end of the word (as a result of either extrametricality or edge marking), only the final syllable is left free for subsequent metrification during the noncyclic block. This is illustrated in (27) using Idsardi's (1992) analysis for the form [okolu] 'around' (first column). If the second member of the ESD consists of two or more syllables, correct antepenultimate stress results noncyclically, as shown for [okolú gora] 'around a mountain'. However, if the second member consists of only one syllable, penultimate stress results, as shown for [okolú rid] 'around a hill'. In such a form, antepenultimate stress cannot occur without violating the metrical structure of the cyclic block since the antepenultimate syllable is already footed.

(27) *Sample derivations for ESDs: edge-marking approach*

	Cyclic block	Noncyclic: stem + 2	Noncyclic: stem + 1
1. Project	x x x	(x x)x x x	(x x)x x
	okolu	okolu + gora	okolu + rid
2. Edge	x x)x	(x x)x x)x	(x x)x)x
	okolu	okolu gora	okolu rid
3. ICC	(x x)x	(x x)(x x)x	
	okolu	oko lu gora	
4. Head	x	x	x
Line 1	x)	x x)	x x)
	(x x)x	(x x)(x x)x	(x x)x)x
	okolu	oko lu gora	okolu rid

5. Conflation	x	x	x
	x)	x)	x)
	(x x)x	x x (x x)x	x x x)x
	okolu	oko lu gora	okolu rid

This approach appears to work if one considers only ESDs that do not contain clitics—recall that ESDs contain two words *plus their associated clitics.* Once one considers ESDs containing clitics, the proposed mechanism for ESD formation reveals itself to be unworkable. The crucial evidence comes from ESDs such as those in (28) (repeated from (12)), where clitics intervene between the two members of an ESD.

(28) *ESDs containing medial clitics*

a.	(tój) ne mú	retʃe	'(he) didn't tell him'
	he NEG 3SG.MASC.DAT	told	
b.	(táa) ne gó	vide	'(she) didn't see him'
	she NEG 3SG.MASC.ACC	saw	
c.	koj gó vide		'who saw him?'
	who 3SG. MASC.ACC	saw	

In an ESD like [ne mu gó zel] (13d), the second nonclitic word, [zel] '(he) took', is monosyllabic and therefore the monosyllabic head effect comes into play. Stress is therefore penultimate rather than antepenultimate. Under the analysis we propose, this results from the fact that an incorrect form with overall antepenultimate stress also has penultimate stress with respect to the first member, violating Avoid (xx#: *ne mú go#zel.[6] The correct derivation provided by our analysis is illustrated in (29).

(29) *Correct derivation for [ne mu gó zel], proposed analysis*

1. Project	x x x x
	ne#mu go#zel
2. Edge:LLL	(x x x x
	ne#mu go#zel
3. ICC	(x x (x x
	ne#mu go#zel
4. Head	x
Line 1	x x)
	(x x (x x
	ne#mu go#zel
5. Conflation	x
	x x)
	(x x (x x
	ne#mu go#zel

[6] We assume that only words, and not clitics, retain word boundaries in ESD formation.

We point out for purposes of comparison that this derivation parallels the one already provided in (20) for [ne bí zel], with the exception that no variation in stress placement is predicted because the optional short word parameters are not applicable to [ne mu gó zel].

Under the alternative edge-marking analysis, the correct surface stress placement in forms like [ne mu gó zel] can only arise if the verb [zel] is encliticized to the entire string [ne mu go]. Also required is that the string [ne mu go] be stressed as a single word during the cyclic block, with stress surfacing on [ne]. If these two assumptions are met, then the clitic [go] will be the only element free for metrification—along with [zel]—during the noncyclic block. This is illustrated in (30).

(30) *Necessary derivation for ESDs with clitics: edge-marking approach*

	Cyclic block	Noncyclic block
1. Project	x x x ne mu go	(x x)x x ne mu go + zel
2. Edge	x x)x ne mu go	(x x)x)x ne mu go zel
3. ICC	(x x)x ne mu go	
4. Head Line 1	x x) (x x)x ne mu go	x x x) (x x)x)x ne mu go zel
5. Conflation	x x) (x x)x ne mu go	x x) x x x)x ne mu go zel

Although this derivation produces the correct results, it is not a possible derivation in Macedonian. This is because the clitics [mu] and [go] cannot encliticize to [ne] in the manner illustrated above. Native speakers clearly judge that the medial clitics in this sort of ESD are associated with the second member, in this case [zel]. Two further pieces of evidence, both discussed by Rudin et al. (1999), support this intuition.

The first piece of evidence concerns possible non-ESD pronunciations. ESD formation is not obligatory in Macedonian: the two members of an ESD can optionally be pronounced with separate stresses, as illustrated in (31) (where (31a–f) repeat (12a–f)).

(31) *ESD optionality*

a. kiseló mleko	kíselo mléko	'yogurt'
b. suvó grozje	súvo grózje	'raisins'
c. prvatá veʧer	pŕvata véʧer	'the first night'

d.	(tój) ne mú retʃe	(tój) né mu rétʃe	'(he) didn't tell him'
e.	(táa) ne gó vide	(táa) né go víde	'(she) didn't see him'
f.	koj gó vide	kój go víde	'who saw him?'
g.	ne sme mu gó dale	né sme mu go dále	'we haven't given it to him'

The last form, [né sme mu go dále] 'NEG AUX.1PL 3SG.MASC.DAT 3SG.NEUT.ACC gave', clearly shows that the medial clitics are associated with the verb, [dale] 'gave', and not with [ne]. If they were associated with [ne], we would expect stress on the antepenultimate syllable of the clitic string: *[ne smé mu go]. If they are associated with [dale], the correct stress placement results. (Recall that proclitics cannot be stressed for independent reasons; see section 2.2.)

The second piece of evidence has to do with placement of the yes-no question particle *li.* This particle is located after the first phonological word of a questioned element, as in (32), taken from Baerman and Billings 1998.

(32) Svekŕ̥va mi *li* ce gi tʃita?
mother-in-law 1SG.DAT Q FUT them read
'Will *my mother-in-law* read them?'

The particle *li* occurs after the clitic [mi], which has been encliticized to [svékr̥va] to show inalienable possession. As discussed earlier, enclitics count for stress, so stress shifts one syllable to the right, producing [svekŕ̥va mi]. Hence, both stress placement and *li* placement show that [mi] is an enclitic, occurring at the end of a prosodic word. The *li* particle can never be placed between a verb and its proclitics, as shown by the examples in (33). This is true whether the string is pronounced as an ESD (33c–d) or not (33a–b). This shows that the postclitic position in such forms is medial to a prosodic word, not final.

(33) Li *placement with ESDs*

a. né *li* sme mu go dále?
b. *né sme mu go *li* dále?
c. ne sme mu gó dale *li*
d. *ne sme mu gó *li* dale

Finally, the edge-marking approach does not account for the stressability of the medial clitics found in an ESD. Recall that in non-ESD forms, proclitics can never be stressed: compare [sme mu go dále] with *[sme mu gó dale]. When the same string is incorporated as part of an ESD, the clitics can be stressed: [ne sme mu gó dale]. Under the analysis we have proposed, this follows naturally from the fact that ESD formation is [+cyclic] while clitics like [mu] and [go] are [−cyclic]. When only [−cyclic] proclitics are added to a word, they cannot count for stress because they are always located to the left of the structure built over the host word; any structure built over the proclitics is removed during conflation. However, all the metrical structure of the host word is deleted when the [+cyclic] phenomenon of ESD formation takes place. As a result, clitics in ESDs count for stress. This makes ESDs similar to English forms such as *governmental* (Aronoff 1976, Halle and Vergnaud 1987), where the [−cyclic] suffix *-ment* does not count for

stress placement unless a [+cyclic] affix like *-al* is later added (e.g., *góvern, góvernment,* but *governméntal*).

3.4 E-3 Variation and Exceptional Stresses

In our approach, the optionality of the monosyllabic head effect in ESDs containing exactly three syllables (E-3 variation; compare [ne bí zel] with [né bi zel]) is analyzed as a side effect of the ambiguous status of words under three syllables in length. Such forms are stressed correctly using either the default stress parameters or an alternative system assigning initial stress.

In Halle and Kenstowicz 1991 and Kenstowicz 1991, E-3 variation is accounted for using an optional rule of destressing. This approach again requires that ESD formation be a noncyclic phenomenon, with the metrical structure of the first member preserved (and so it is subject to the same problems noted above). In ESDs with a bisyllabic first member and a monosyllabic second member, the noncyclic ESD results in a stress clash at an intermediate level of representation, as illustrated in (34).

(34) *E-3 variation via optional destressing*

1.	x (x)⟨x⟩ pre ku
2.	x (x) x # x pre ku dzid
3.	x x (x)(x)#⟨x⟩ pre ku dzid
4. Optional	x (x) x #⟨x⟩ pre ku dzid
5. Conflation	x (x) x #⟨x⟩ pre ku dzid

In step 1, the final syllable is made extrametrical and a left-headed foot is built immediately to its left. In step 2, the word [dzid] 'wall' is encliticized noncyclically. This deletes any structure that [dzíd] may have possessed, but leaves [préku] intact. In step 3, final extrametricality again applies, and a left-headed foot is again built immediately to its left. The foot so built must be monosyllabic—the syllables to its left have already been metrified. This results in a stress clash on line 1. In step 4, this clash is eliminated using an optional destressing rule, which deletes the second of two clashing elements. This produces the stress variant [préku dzid]. If the rule in step 4 had not applied, the clash would have been resolved during conflation (step 5), where the first stress would have been eliminated. This produces the variant [prekú dzid].

This approach incorrectly predicts variable stress placement for any ESD of exactly three syllables, such as [stár ʧovek] 'old man' or [né reʧe]. According to Koneski (1976:178), variation between penultimate and antepenultimate stress in trisyllabic ESDs is only possible if the final word is monosyllabic. Under our analysis, forms like [star ʧovek] do not show E-3 variation because they cannot trigger the monosyllabic head effect—overall antepenultimate stress is not penultimate with respect to either member. Under Halle and Kenstowicz's (1991) and Kenstowicz's (1991) analyses, incorrect stress placement results if the optional destressing rule does *not* apply, as shown in (35).

(35) *Incorrect prediction*

1.		x (x) star
2.		x (x)# x x star ʧo vek
3.		x x (x)#(x)⟨x⟩ star ʧo vek
4.	Optional	*n/a*
		x x# (x) ⟨x⟩
5.	Conflation	star ʧo vek

Kenstowicz (1991) offers a possible explanation for this data pattern. He points out that ESD formation is optional. For example, [stár ʧovek] and [né reʧe] can both be pronounced with two stresses: [stár ʧóvek], [né rétʃe]. Kenstowicz suggests that in phrases with two stressed words, the rightmost is more prominent. Under this hypothesis, if the predicted pronunciation [ne rétʃe] did occur, it is easy to see how it might be accidentally overlooked by mistaking it for the phonetically similar pronunciation [nè rétʃe]. However, there is no independent evidence that the rightmost stressed word in such constructions bears primary stress. In fact, it seems likely that the leftmost stressed word is the more prominent, at least in ESDs containing the negative particle *ne.* Although both ESD and non-ESD pronunciations can be used, they differ in focus: the non-ESD variant is used to place contrastive emphasis on the negation, whereas the ESD pronunciation is neutral (Koneski 1976:167). Since it is unlikely that a completely unstressed monosyllable could be mistaken for a monosyllable bearing contrastive emphasis, we conclude that the destressing rule makes incorrect predictions concerning this type of ESD.

Idsardi (1992) takes a different approach to E-3 variation, one that is tied to his analysis of exceptional stresses. He uses lexical edge marking to encode exceptional stress. For example, exceptional final stress is lexically encoded using Edge:LLR, which ensures that the final syllable makes up the rightmost constituent: xxxxx(x. Exceptional penultimate stress is encoded by lexically specifying that the word resists all edge marking, a status Idsardi represents as lexical Edge:

Ø. This setting blocks application of the default Edge:RLR parameter that the analysis otherwise employs. When Edge:RLR is blocked, the final syllable is not excluded from metrification, and penultimate stress results.

Idsardi also points out that all bisyllabic words in Macedonian are ambiguous: do they have normal default stress, or are they cases of exceptional penultimate stress? Since this question cannot be resolved, every bisyllabic form is assumed to have dual lexical representations. One representation has no idiosyncratic properties; the other is lexically marked Edge:Ø. Correct stress placement results regardless of which representation is used, as illustrated in (36).

(36) *Use of dual lexical representations for bisyllables*

	Normal stem	Edge: Ø stem
1. Project	x x preku	x x preku
2. Edge:RLR	x)x preku	*lexically* *blocked*
3. ICC		(x x preku
4. Head Line 1	x x) x)x preku	x x) (x x preku

The difference in metrification for the two forms becomes apparent under ESD formation, provided the second member of the ESD is monosyllabic. As shown in (37), the Edge:RLR parameter in step 2 merely closes a preexisting constituent for the representation using lexical Edge:Ø (right column), whereas it builds a new constituent further to the right otherwise (left column).

(37) *Dual lexical representations and ESD formation*

	Normal stem	Edge: Ø stem
1. ESD formation	x)x x preku dzid	(x x x preku dzid
2. Edge:RLR	x)x)x preku dzid	(x x)x preku dzid
3. ICC		
4. Head Line 1	x x) x)x)x preku dzid	x x) (x x)x preku dzid

This analysis of E-3 variation cannot work for two reasons. The first problem is that it relies on

the lexical idiosyncrasies of the first member of an ESD. However, E-3 variation also occurs with ESDs in which the first member is monosyllabic, so long as there is a medial monosyllabic clitic, as in [ne bí dal] '(he) should not have given'. Under Idsardi's analysis, the first member of this ESD must be taken to be [ne bi], which must be stressed as a unit cyclically prior to noncyclic encliticization of the verb [dal]. However, [ne bi] is simply negation followed by the conditional marker [bi]; since it is not a lexical item, it cannot have a variant form that is lexically marked Edge:Ø.

A second problem concerns the possibility of dual lexical representations for monosyllables. Recall that dual lexical representations were assumed for all bisyllables on the basis of the ambiguity argument: bisyllables receive correct stress regardless of whether Edge:RLR applies to them or not. The same argument holds true for monosyllables. Under the same logic, they should also have variant representations marked Edge:Ø. In fact, this would allow us to salvage the analysis of [ne bi dal] from the preceding paragraph: E-3 variation in this form would now be due to the lexical ambiguity of the monosyllabic clitic [bi]. This would provide two differing metrical structures for [ne bi], parallel to those in (36) for [preku]. Unfortunately, this move makes incorrect predictions for other ESDs. For example, in [koga bí dal] 'when should (he) give?', stress is penultimate because of the final monosyllabic verb [dal]. E-3 variation is not possible since the ESD as a whole is longer than three syllables. However, the lexical Edge:Ø analysis incorrectly predicts variation.

(38) *Incorrect predictions using dual representations*

	Normal stem	Edge: Ø stem	Noncyclic block	
1. ESD formation	x x x koga+bi	x x x koga+bi	x x)x x koga bi dal	x(x x x koga bi dal
2. Edge:RLR	x x)x koga+bi	*lexically* *blocked*	x x)x)x koga bi dal	x(x x)x koga bi dal
3. ICC		x(x x koga+bi		
4. Head	x	x	x	x
Line 1	x)	x)	x x)	x)
	x x)x koga+bi	x(x x koga+bi	x x)x)x koga bi dal	x(x x)x *koga bi dal

In contrast, our proposal to encode exceptional stress as lexical constituent boundaries does not make incorrect predictions for ESDs. Under our analysis, whether bisyllables have regular stress or exceptional penultimate stress (encoded as a lexically listed parenthesis) is still ambiguous. Although dual representations are unnecessary to our approach, even if we were to adopt them, both representations would wind up with the same metrical structure at the end of the cyclic block: (xx. The only difference would concern whether a parenthesis is lexical or inserted via LLL edge marking.

4 Crosslinguistic Implications

4.1 Possible Stress Systems

In the preceding section, we proposed a new avoidance constraint that is capable of deriving ternary constituents at word ends. We showed that this constraint is useful in analyzing a wide range of stress facts in Standard Macedonian that cannot be handled by alternative analyses using final nonparsing. In this section, we consider the wider ramifications of this approach. In particular, we review the type of ternary systems that can be derived by enriching the inventory of avoidance constraints along the lines we propose. We begin by considering the possible combinations of nonlocal clash avoidance and edge avoidance constraints, focusing first on right-edge effects. Three combinations are possible:

(39) *Right-edge ternary patterns*

1. Avoid (xx# and Avoid (xx(	(σσσ(σσσ(σσσ
2. Avoid (xx(only	(σσσ(σσσ(σσ
3. Avoid (xx# only	(σσ(σσ(σσ(σσσ

Pattern 1, with both avoidance constraints, generates a purely ternary stress system: stress is antepenultimate at the right edge of the word, with iterating stresses on every third syllable to the left. This pattern is attested in Cayuvava (Key 1961, 1967) and Gilbertese (Blevins and Harrison 1999). Pattern 2, with Avoid (xx(but lacking Avoid (xx#, generates ternary stresses word-internally but penultimate stress at the right edge: (xxx(xxx(xx#. A quantity-sensitive version of this pattern is attested in the dialect of Sentani described by Cowan (1965) and analyzed by Hayes (1995), although it can be interrupted by the occurrence of heavy syllables. Pattern 3, with only Avoid (xx#, is seen in Macedonian. Although Macedonian lacks secondary stresses by which to diagnose the absence of Avoid (xx(, stress placement in five-syllable words also provides a diagnostic: if Avoid (xx(occurred in Macedonian, ICC would not be able to place a boundary to the left of the antepenultimate syllable in such forms, since it would be too close to the parenthesis placed by LLL edge marking: (xx(xxx. As shown in (10), LLL edge marking is necessary in Macedonian. Furthermore, edge marking universally precedes ICC (Idsardi 1992). Therefore, if Macedonian had Avoid (xx(, stress would be expected to fall on the peninitial syllable of five-syllable words, since this would be the only place where ICC would not be blocked by either Avoid (xx(or Avoid (xx#.

Patterns 1–3 can also be derived using an edge-marking type of approach, as in Idsardi 1992. For example, pattern 2 would have the same analysis in both approaches: iterating ternary stresses from right to left as the result of Avoid (xx(, with penultimate stress at the right edge. Pattern 1 would also be analyzed using Avoid (xx(to derive alternating ternary stresses, but antepenultimate stress at the right edge would be due to Edge:RLR leading to final nonparsing. Pattern 3 would lack Avoid (xx(, deriving antepenultimate stress via Edge:RLR. Although both approaches can generate all three of these attested patterns, we think the edge avoidance approach is preferable. Not only does it more adequately account for the version of pattern 3 found in Macedonian; it also gives the word-medial and word-final ternary constituents of pattern 2 a more uniform

analysis: both are derived via avoidance constraints and are built during the same application of ICC. The edge avoidance approach also offers certain analytical advantages for ternary patterns that are calculated with respect to the left edge, to which we now turn.

The existence of the right-edge constraint Avoid (xx# implies the existence of a left-edge variant as well. Putting this together with Idsardi's (1992) constraint Avoid)xx), we predict three possible left-edge ternary systems, parallel to the three right-edge systems discussed above:

(40) *Left-edge ternary patterns*

4. Avoid #xx) and Avoid)xx)	σσσ)σσσ)σσσ)
5. Avoid)xx) only	σσ)σσσ)σσσ)
6. Avoid #xx) only	σσσ)σσ)σσ)σσ)

In pattern 4, the occurrence of both avoidance constraints derives a purely ternary system, calculated from left to right. A surface pattern meeting this description is attested in Tripura Bangla (Das 2002), a dialect of Bangla spoken in the Indian province of Tripura and discussed in more detail below. In pattern 5, ternary rhythm holds word-internally, but a binary constituent occurs at the left edge of the word, owing to the absence of the Avoid #xx) constraint. This pattern is attested in Chugach Alutiiq (Leer 1985). In pattern 6, a ternary constituent is found at the left edge, followed by iterating binary constituents to its right. This pattern is attested in Winnebago (Susman 1943, Miner 1979, 1989, Hale and White Eagle 1980).

The edge-marking type of approach can easily account for patterns 5 and 6. Following Idsardi (1992), pattern 5 (Chugach Alutiiq) can be generated using Avoid)xx), and pattern 6 (Winnebago) can be generated using Edge:LRL followed by application of ICC:L→R with no avoidance constraints. Pattern 4 could also be generated using Edge:LRL, this time followed by application of ICC:L→R subject to Avoid)xx). However, this analysis does not work for Tripura Bangla, to our knowledge the only potential exponent of pattern 4. We address this issue in more detail in the following section.

4.2 Left-Edge Ternarity in Tripura Bangla

The intriguing stress pattern of Tripura Bangla was first described and analyzed in Optimality Theory by Das (2002), a native speaker of Tripura Bangla. Das shows that the ternary stress system of Tripura Bangla is theoretically important within Optimality Theory because it cannot be accounted for with the constraint *LAPSE proposed by Elenbaas and Kager (1999) for use in analyzing ternary systems. Instead, Das proposes the constraint *LAPSE(DE), which allows domain edges to license stray syllables. In this section, we present arguments showing that Tripura Bangla is also an important case in uncovering the best rule-based analysis for ternarity.

In the preceding section, we sketched an edge-marking analysis for the ternary system of Winnebago (pattern 6). To review: the leftmost syllable of a Winnebago word is isolated from the rest of the word using Edge:LRL, as in (41). Binary feet are then built from left to right. Stress falls on the rightmost member of every constituent, giving postpeninitial stress at the left edge and iterating secondaries elsewhere. This analysis of Winnebago is possible because

constituents in Winnebago are right-headed. This means that the three-syllable span at the left edge of a word can be analyzed either as a single ternary constituent, as in our approach, or as a stray syllable followed by a binary constituent, as in Idsardi's (1992) analysis. These two approaches to Winnebago are summarized in (41).

(41) *Approaches to Winnebago ternarity*

	Idsardi's (1992) approach		Proposed approach
1. Project	x x x x x x x	Project	x x x x x x x
2. Edge	x(x x x x x x	Edge	
3. ICC	x(x x)x x)x x)	ICC Avoid #xx)	x x x)x x)x x)
4. Head	x	Head	x
Line 1	(x x x	Line 1	(x x x
	x(x x)x x)x x)		x x x)x x)x x)

Although both approaches work for Winnebago, only the one we propose can be extended to account for Tripura Bangla. The edge-marking approach cannot be used because constituents in Tripura Bangla are left-headed. As illustrated by the forms in (42), the initial syllable in Tripura Bangla is stressed. Since syllable weight in Tripura Bangla interacts with ternarity, the initial data set presented in (42) contains words with light syllables only.

(42) *Stress in Tripura Bangla; light-syllable forms (Das 2002)*

a. σ́σ	ádu	'knee'
	pʰúda	'hole'
b. σ́σσ	pɔ́taka	'flag'
	zírabi	'a kind of sweets'
c. σ́σσσ	álɔsɔna	'discussion'
	bíβɛsɔna	'consideration'
d. σ́σσσ̀σ	ɔ́porinɔ̀tɔ	'immature'
	ʃɔ́malɔsɔ̀na	'criticism'
e. σ́σσσ̀σσ	ɔ́nukɔrɔ̀niyɔ	'imitable'
	pɾɔ́yɔzonìyɔta	'necessity'
f. σ́σσσ̀σσσ	ɔ́nonukɔ̀roniyɔ	'inimitable'
	ɔ́nonuʃɔ̀roniyɔ	'unfollowable'

As shown here, main stress regularly falls on the initial syllable, with secondary stresses falling on every third nonfinal syllable after the main stress. The basic parameter settings we propose for Tripura Bangla are Head:L and ICC:L→R subject to Avoid #xx) and Avoid)xx). This accounts for the basic ternary pattern. In addition, RLR edge marking accounts for secondary stress on the penult in words like [ɔ́porinɔ̀tɔ], a form that would otherwise have two stray syllables at the right edge.

(43) *Sample derivations: light-syllable forms*

1. Project		x x x x x x x	x x x x x
		ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ
2. Edge		x x x x x x) x	x x x x) x
		ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ
3. ICC:L→R	Avoid #xx)	x x x) x x x) x	x x x) x) x
	Avoid)xx)	ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ
4. Head		x	x
Line 1		(x x	(x x
		x x x) x x x) x	x x x) x) x
		ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ

Stress placement is more complex in words with heavy syllables. Examples are provided in (44). Syllables containing a coda count as heavy; there are no long vowels. A heavy syllable attracts stress onto itself, provided this does not result in a stress clash with another heavy syllable. When two heavies are adjacent, the leftmost one emerges with stress, as in (44e). In a string of more than two heavies, every other heavy after the leftmost one emerges with stress, as in (44a). As was the case with light-syllable words, two stray syllables found at the right edge of the word are picked up to form a constituent, as in (44o). The same also happens for two stray syllables found at the left edge of the word, as in (44b,d,l).

(44) *Stress in forms with heavy syllables*

Three syllables	a. **HHH**	ʃɔ́ŋrɔkkɔ̀n	‘reservation’
	b. **LL**H	óβiʃàφ	‘curse’
	c. **HL**H	útʃtʃarɔ̀n	‘pronunciation’
Four syllables	d. **LLH**L	ɔ́nasìʃʈi	‘a strange affair’
	e. **H**HLL	bábzaiʈʈami	‘adamancy’
	f. L**HLH**	obíggaφɔ̀n	‘intimation’
	g. **LLL**H	ɔ́manoʃìk	‘inhuman’
Five syllables	h. L**H**LLL	ɔʃábdanɔta	‘carelessness’
	i. **LLLH**H	ɔ́φoribɔ̀ttɔn	‘changelessness’
	j. L**HLLH**	ɔʃɔ́ŋʃudɔnèr	‘on noncorrection’
	k. **H**LL**H**L	φɔ́kkɔφatìtɔ	‘partisanship’
Six syllables	l. **LLH**LLL	φárɔdòʃʃikɔta	‘expertness’
	m. **LLLH**LL	ɔ́φoribɔ̀ttitɔ	‘unchanged’
Seven syllables	n. **LLLH**LLL	ɔ́φoribɔ̀ttoniyɔ	‘unchangeable’
Eight syllables	o. **LLLH**LL**L**	ɔ́φoribɔ̀ttoniyɔ̀ta	‘unchangeability’

To account for stress placement in (44), we propose that heavy syllables project their left edge. The constraint Avoid (x(prevents stress clash in cases of adjacent heavies. RLR edge marking is blocked in words with penultimate heavy syllables by a universal ban on vacuous constituents

(Idsardi 1992). This allows final heavy syllables to bear stress, provided they are not preceded by another heavy. Additionally, we need to posit LLL edge marking to account for the fact that forms starting out LLH have initial stress. Sample derivations are shown in (45).

(45) *Sample derivations: forms with heavy syllables*

1. Project Avoid (x(	(x x (x	x x (x	x x x (x
		H H H	L L H	L L L H
2. Edge:RLR		*( ) avoided*	*( ) avoided*	*( ) avoided*
3. Edge:LLL			(x x (x	(x x x (x
			L L H	L L L H
4. ICC:L→R Avoid #xx)				(x x x)(x
Avoid)xx)				L L L H
5. Head		x	x	x
Line 1		(x x	x	(x x
		(x x (x	(x x (x	(x x x)(x
		H H H	L L H	L L L H

Addition of LLL edge marking changes the derivation of words with light syllables only, in that the initial constituent is now closed on both sides. Because edge marking introduces a parenthesis between the left word boundary and the leftmost mark, Avoid #xx) must be modified: the string #(xx) does not violate the formal definition of Avoid #xx), but this parse must be ruled out to preserve the correct placement of secondary stresses. We therefore suggest the revised constraint Avoid (xx). Revised derivations for light-syllable words are shown in (46).

(46) *Revised derivations for light-syllable forms*

1. Project	x x x x x x x	x x x x x
	ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ
2. Edge:RLR	x x x x x x) x	x x x x) x
	ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ
3. Edge:LLL	(x x x x x x) x	(x x x x) x
	ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ
4. ICC:L→R Avoid (xx)	(x x x) x x x) x	(x x x) x) x
Avoid)xx)	ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ
5. Head	x	x
Line 1	(x x	(x x
	(x x x) x x x) x	(x x x) x) x
	ɔ́ no nu kɔ̀ ro ni yɔ	ɔ́ φo ri nɔ̀ tɔ

Avoid (xx) also comes into play in the derivation of forms where a stressed heavy is followed by at least three other syllables, provided none of them is also a stressed heavy. The surface stress

patterns for such forms clearly show that the stressed heavy must be parsed as the first member of a ternary constituent, as illustrated in (47).

(47) *Stressed heavies trigger avoidance effects*

1. Project	(x x x x x	(x x x x	x (x x x x	x x x (x x x x x
	H L L L L	H H L L	L H H L L	L L L H L L L L
2. Edge:RLR	(x x x x) x	(x x x) x	x (x x x) x	x x x (x x x x) x
	H L L L L	H H L L	L H H L L	L L L H L L L L
3. Edge:LLL			*(x(avoided*	(x x x (x x x x) x
				L L L H L L L L
4. ICC	(x x x) x) x			(x x x) (x x x) x) x
	H L L L L			L L L H L L L L
5. Head	x	x	x	x
Line 1	(x x	(x	(x	(x x x
	(x x x)(x x	(x x x) x	x (x x x) x	(x x x) (x x x) x) x
	H L L L L	H H L L	L H H L L	L L L H L L L L

In each of these forms, the main-stressed constituent is closed on both sides: (xxx). The left parenthesis is supplied by projection of the left edge of a heavy syllable; the right parenthesis is supplied by ICC for the first and last forms and by edge marking for the second and third forms. The important fact here is that in none of these forms does ICC insert a parenthesis one syllable to the right of the stressed heavy to produce a binary constituent. This is ascertainable in the first and last forms by lack of stress on the antepenult, and for the second and third forms by lack of stress on the penult. This provides additional support for Avoid (xx); this is especially clear for the third and fourth forms, where the stressed heavy is not edge adjacent.

The fact that edge avoidance constraints like Avoid #xx) are not needed in the analysis of Tripura Bangla does produce a gap in the typology of attested edge avoidance patterns discussed earlier since Tripura Bangla can no longer be considered an example of pattern 4. However, the analysis does support our more general hypothesis that the inventory of avoidance constraints needs to be enriched to be able to generate edge-adjacent ternary constituents without using peripheral nonparsing. The fact that Tripura Bangla needs two avoidance constraints, and furthermore that they differ only with respect to the first parenthesis mentioned, suggests that Tripura Bangla may be a case of generalized boundary avoidance, utilizing a constraint along the lines shown in (48).

(48) *Generalized Boundary Avoidance*

Avoid | xx): A right parenthesis may not be preceded by a constituent boundary *of any type* by two marks.

Generalized Boundary Avoidance is potentially useful in that it would avoid establishing Avoid (xx)—which is unattested outside of Tripura Bangla—as a separate and independent constraint.

Whether or not this move is called for depends on whether additional ternary systems requiring Avoid (xx) in isolation come to light. It should be underscored, however, that Generalized Boundary Avoidance cannot replace all instances of edge avoidance. For example, one could not derive antepenultimate stress in Macedonian by instituting Edge:RRR plus Generalized Boundary Avoidance, parallel to the Tripura Bangla analysis. This would make incorrect predictions concerning enclitics because the rightmost constituent would then be closed on both sides, precluding rightward stress shift when two more syllables are added noncyclically (see (11)).

5 Conclusions

In this article, we have argued that antepenultimate stress in Macedonian does not result from final nonparsing. In order to generate the stress pattern of Macedonian in a framework utilizing final nonparsing, we proposed enriching the inventory of avoidance constraints. This move allows antepenultimate stress to be modeled using a ternary constituent rather than a binary one. In making it possible to build ternary constituents at a word edge, this move also draws the formal representations of antepenultimate and ternary stress closer together. We also examined data from Tripura Bangla, where an iterating ternary pattern begins with the leftmost syllable of a form. The Tripura Bangla pattern provides additional evidence for edge-adjacent ternary constituents formed via avoidance constraints, not peripheral nonparsing.

One question raised by our proposal is whether peripheral nonparsing remains a necessary element in this theoretical framework. We feel that it does. Inasmuch as extrametricality in this framework is only the instantiation of certain types of edge marking, we see no way to retain edge marking as a formal mechanism while ruling out the possibility of peripheral nonparsing. Our analyses of both Macedonian and Tripura Bangla make use of edge marking. In fact, the edge-marking setting necessary for Tripura Bangla is RLR—precisely the setting we propose to eliminate from the analysis of Macedonian. This amounts to a situation where both antepenultimate and postpeninitial stress have two available analyses: one using nonlocal avoidance constraints such as the ones we propose, and one using peripheral nonparsing brought about via edge marking. It may be the case, for example, that Macedonian and Latin differ in the mechanisms leading to antepenultimate stress placement. As pointed out by Idsardi (1992), nonlocal avoidance constraints are more complex than local ones and may therefore reasonably be expected to be less frequent crosslinguistically. Since edge marking is also a local phenomenon, it may be that the peripheral nonparsing analysis is always chosen in ambiguous contexts for reasons of analytical economy. The nonlocal avoidance constraints would be used in languages where positive evidence supporting them is available. Such evidence includes stress placement in enlarged stress domains as in Macedonian and headedness effects as in Tripura Bangla. Additional phonological phenomena could also provide a diagnostic. For example, Blevins and Harrison (1999) have argued for ternary constituents in Gilbertese on the basis of a trimoraic minimal word requirement. Maiden (1995) has argued that posttonic syllables in certain Italian dialects all belong to the same constituent, citing evidence from reductive phenomena that strike pretonic unstressed syllables, but not posttonic ones. Finally, certain phonetic implementations of stress may be associated with ternary

constituents: Blevins and Harrison report that the phonetic correlates of stress in Gilbertese are distributed across the leftmost two syllables in a ternary foot. Additional research is needed to determine whether this phonetic pattern is more common in stress systems using large (i.e., nonbinary) metrical constituents. If so, the phonetics of stress could also be used by language learners to help determine constituent boundaries.

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