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*The puzzle of Kashmiri stress: implications for weight theory**

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1 Introduction

There are currently many proposals for analysing cross-linguistic vowel length and consonant weight patterns within an Optimality Theory (OT) framework. The basic claim is that vowel length and consonant weight are determined by the interaction of markedness constraints on moraic content and constraints requiring faithfulness to underlying moraicity.

In this paper, I will show how the constraints used in one such proposal (Morén 1999) provide an analysis of the core syllable weight of Kashmiri, and that the inclusion of several other constraints proposed in the literature allows us to account for the previously puzzling distribution of stress in this language. Besides the empirical importance of both providing an analysis of Kashmiri stress and weight and demonstrating a language type predicted by Morén's weight typology, an added theoretical point is the demonstration that closed syllables may vary in weight depending on surface stress assignment. This is in line with work of Kager (1989), Hayes (1995), Rice (1996) and Broselow *et al.* (1997), but in contrast with many other theories which treat consonant weight for a particular segment in a given syllabic position as static within a given language. Further, the OT analysis presented here provides the necessary tools to allow the expression of weight hierarchies, while maintaining the restrictive theory of weight offered by a single-tiered moraic approach.

Using Optimality Theory (Prince & Smolensky 1993) and Correspondence Theory (McCarthy & Prince 1995), complex distributions of moraic segments are shown to be the result of the interaction of a limited number of general constraints. In addition, it is shown that reranking these constraints does not lead to an unattested and unexpected interaction between stress and weight.

The paper is organised as follows. §1 is a brief introduction to moraic theory. In §2, I describe the Kashmiri weight and stress data. The constraints and typology proposed in Morén (1999) are reviewed and an

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OT analysis of the Kashmiri data is provided in §3, and in §4, some additional theoretical issues are discussed.

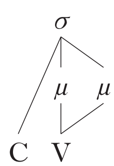
1 Background

The equivalence of syllables containing long vowels (CVV) and closed syllables (CVC), as opposed to open syllables containing short vowels (CV), is found in many languages under a variety of circumstances, including stress assignment. Traditionally, this has been seen as a difference in syllable weight. CVV and CVC are heavy, and CV is light. It has also been shown that in languages with a CV/CVV distinction, CVC syllables do not always pattern with CVV, but may count as light and pattern with CV (e.g. Zec 1988, Broselow *et al*. 1997).

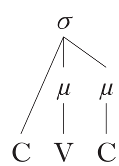
Under Moraic Theory (Prince 1976, 1983, Hyman 1985, Hayes 1989, etc.), the equivalence of CVV and CVC has been captured via bimoraicity. A long vowel has two moraic positions associated with a single vowel root node. A heavy closed syllable has one mora associated with the vowel and another mora associated with the coda consonant. Following McCarthy & Prince (1986) and Hayes (1989), the representations of these two heavy syllables are given in (1).

(1) *Heavy syllables*

a. [CVV]



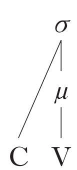
b. [CVC]



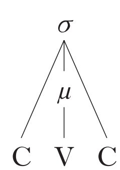
In contrast, in languages where closed syllables pattern with CV, both of these syllables are monomoraic.[1]

(2) *Light syllables*

a. [CV]



b. [CVC]



Further, Zec (1988) demonstrates that not only do CVC syllables pattern as either light or heavy, but CVC can act as light or heavy within

[1] Light syllables which contain short vowels and coda consonants sharing a single mora are not considered in this paper. See Broselow *et al*. (1997) and Morén (1999) for a discussion of the phonetic and phonological implications of this representation.

the same language, depending on the quality of the coda consonant. In some languages, a CVC with a higher-sonority coda patterns with CVV, while a CVC with a lower-sonority coda patterns with CV. For example, Lithuanian CVO (O = obstruent) is light, and CVS (S = sonorant) is heavy (Zec 1988).

In contrast with most previous theories, where consonant weight is constant for a particular segment in a given syllabic position within a language as a whole, I will show that CVC syllables can vary in weight within a language, depending on whether or not they are stressed. I propose that in Kashmiri, CVV and CV are always heavy and light, respectively. However, CVC is heavy only if it is the best potentially stressable syllable in the word, otherwise it is light. The conclusion that consonant weight is variable comes from the surface stress pattern of the language, and this variable weight is shown to result from constraint interactions.

2 Kashmiri data

Kashmiri, a Dardic Indo-Aryan language, shows an interesting relationship between vowel length, consonant weight and stress assignment. In this section, I will provide a description of these phenomena. All data are taken from Kachru (1969, 1973) and Bhatt (1989).

2.1 Length

The examples in (3) show that Kashmiri, like its cousin Hindi, has both long and short vowels. Further, the unpredictability of their distribution, including minimal pairs, leads to the conclusion that Kashmiri vowels have contrastive length (Kachru 1969, Bhatt 1989).

(3) a. *Short vowels only*

[bá.tɨ] 'food/cooked rice' [kú.ni.vi.zi] 'sometime'
[p^hí.ki.ri] 'to understand' [á.ni.ga.tɨ] 'darkness'

b. *Long and short vowels*

[ə́ə.nɨ] 'mirror' [mɔ.kɨ.láa.vun] 'to finish'
[kí.taab] 'book' [báa.laa.dər] 'balcony'
[báa.sun] 'to seem'

c. *Long vowels only*

[áa.raam] 'rest' [dée.vəə.lii] 'the Hindu festival of lights'
[kə́ə.p^hii] 'enough'

d. *Minimal pairs*

[bar] 'door' ~ [baar] 'weight'
[kun] 'all alone' ~ [kuun] 'a corner'
[sɔd] 'a simple person' ~ [sɔɔd] 'one and a quarter'

The status of consonant length is less clear. Although Bhatt (1989) cites one example of a long consonant, (4), Kachru (1969: 66) states 'there are no geminates in Kashmiri'.

(4) [mu.kə́d.di.ma] 'trial'

Since Kashmiri speakers are heavily exposed to neighbouring languages that have geminate consonants, it is possible that Bhatt's citation was mistakenly included from another language.[2] Since the overwhelming evidence available at this time supports a Kashmiri without geminate consonants, that is the assumption made here.

Given that long vowels do not consistently appear in any one syllable in a word, and there are abundant minimal pairs differing only in vowel length, I assume that vowel length is phonologically distinctive. Further, given that geminates are extremely limited in this language, if they exist at all, I assume that consonant weight is non-distinctive. Note that since this is a phonological, not a phonetic, investigation, the terms 'length' and 'weight' are considered roughly equivalent since both are used here to indicate relative moraic content. Following tradition, 'length' will refer to vowel moraicity, and 'weight' will refer to consonant moraicity.

2.2 Stress

As (5) shows, the final syllable is never stressed in disyllabic words, regardless of weight.

(5) [ə́ə.nɨ] 'mirror' [bə́a.sun] 'to seem'
[kí.taab] 'book' [kə́ə.pʰii] 'enough'

However, in words of more than two syllables, stress is determined by syllable weight. In words containing long vowels, the leftmost non-final long vowel is stressed.

(6) [mɔ.kɨ.lə́a.vun] 'to finish' [dée.vəə.lii] 'the Hindu festival of lights'
[bə́a.laa.dər] 'balcony' [vah.rə́a.vun] 'to spread'

In the absence of a non-final long vowel, the leftmost non-final closed syllable is stressed.

(7) [ʃo.kɨ́r.vaar] 'Friday' [jə́m.bɨr.zal] 'narcissus'

Note that the attraction of stress to closed syllables parallels the pattern seen with long vowels. Thus, we can conclude that stressed closed syllables are heavy.

Finally, stress is assigned to the initial syllable if all non-final syllables are light.

(8) [pʰí.ki.ri] 'to understand' [á.ni.ga.tɨ] 'darkness'
[kú.ni.vi.zi] 'sometime' [ná.kɨ.voor] 'nostril'

[2] An informant verified that the word for 'trial' is not pronounced with a geminate in her dialect of Kashmiri.

The conclusion to be drawn from these data is that main stress in Kashmiri is as far left in a word as possible. However, it is weight-sensitive, and is attracted to the leftmost heaviest syllable of the word (excluding final syllables).

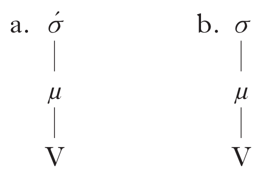
The most puzzling aspect of the interaction between stress and syllable weight in this language is that given the choice of stressing a non-final long vowel or non-final closed syllable within a single word, the long vowel is always stressed – even if it is to the right of a closed syllable.

(9) [vah.ráa.vun]	'to spread'	[pʰam.váa.rɨ]	'fountains'
[vuʃ.náa.vun]	'to warm'	[dar.váa.zɨ]	'door'

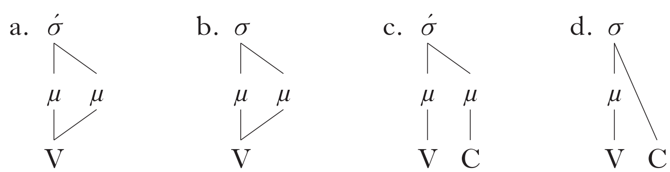
This is a puzzle, given standard assumptions about syllable weight. Under the standard version of moraic theory assumed here, heavy syllables are bimoraic, and light syllables are monomoraic. Since it is obvious that both long vowels and closed syllables are heavy (they both attract stress), why are long vowels preferentially stressed?

The answer proposed here is that despite surface appearances, weight is responsible for all cases of non-initial stress in Kashmiri. The intuition is that the inherent bimoraicity of long vowels (compare (1a) and (2a)) is the driving force behind stress attraction, but the ability of closed syllable weight to be variable (compare (1b) and (2b)) allows for heavy closed syllables only when they are stressed on the surface. In contrast with many languages that treat syllables closed by particular segment types as always heavy or always light, Kashmiri closed syllable weight is variable and dependent on surface stress. §3.3.6 will show that this variability is the result of constraint interaction.

The surface representations proposed here for Kashmiri light and heavy stressed and unstressed syllable rhymes are given in (10) and (11). In (10), both stressed and unstressed syllables containing simple rhymes are monomoraic.

(10)


In (11a) and (11b), both stressed and unstressed long vowels are bimoraic. In (11c), a stressed closed syllable is bimoraic. However, in (11d), an unstressed closed syllable is monomoraic.

(11)


3 Analysis

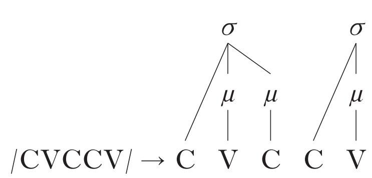
One of the purposes of this paper is to show that a particular set of constraints proposed in the OT literature to account for cross-linguistic segment weight can be used to account for weight in Kashmiri. In §§3.1 and 3.2, I will review the moraic constraints developed in Morén (1999), as well as the typological predictions that result from the interaction of those constraints. The conclusion will be that factorial ranking of three types of constraints on moraicity predicts an accurate cross-linguistic weight typology. In §3.3, I will show that Kashmiri can be analysed using these moraic constraints in combination with other established constraints on prosody. This analysis has the advantage of placing the Kashmiri weight system within a larger typology of weight.

3.1 A descriptive typology of weight

Following the basic principles of OT, phonological weight patterns must be the result of the relative ranking of faithfulness constraints on underlying moraic content and markedness constraints on segment moraicity. Morén (1999) shows that interactions of moraic markedness and faithfulness constraints result in two sources of weight: coerced and distinctive. Coerced weight is due to a restriction on minimal or maximal surface moraicity, and distinctive weight is an underlying moraic distinction reflected in a surface contrast. Although the literature does not explicitly make reference to these two sources as such, the dichotomy is implicitly present. Further, it is claimed that not only are both sources of weight relevant to the full spectrum of segment types (e.g. vowels and consonants), but the generalisations and patterns relevant to each are quite different – coerced weight is subject to sonority restrictions but distinctive weight is not. The next few sections will discuss cross-linguistic coerced and distinctive weight patterns, and provide an OT analysis to account for those patterns. The result will be a unified analysis of weight across languages and segments.

3.1.1 *Description of coerced weight.* Coerced weight results from a restriction on surface moraicity in some phonological context. Well-known examples of coerced weight are: weight by position (coda consonants must be moraic), minimal word (prosodic words must be minimally bimoraic) and stress to weight (stressed syllables must be minimally bimoraic). (12) illustrates the concept of coerced weight by showing that an input without moras surfaces with three moras in a language that requires both nuclei and codas to be moraic.

(12)



Expanding on the work of Zec (1988, 1995), Morén (1999) shows that coerced weight is subject to restrictions based on segment sonority. If a segment of one sonority is forced to be moraic in a given environment, then a segment of higher sonority will also be moraic in that environment. This is shown in (13), where moraic segments are a more sonorous set of the segment inventory for each language.

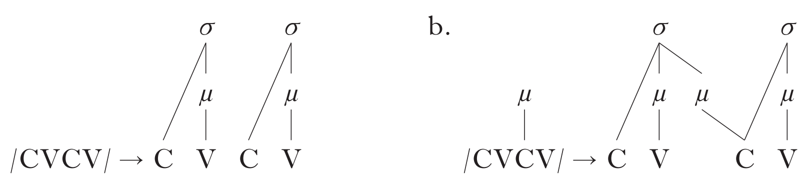
(13)	*Sets of moraic segments*	*Languages*
a.	vowels	Khalkha Mongolian (Zec 1995)
b.	vowels + non-glottal sonorants	Kwakwala (Zec 1998)
c.	vowels + all sonorants	Lithuanian, Tiv (Zec 1995)
d.	vowels + all consonants except aspirated stops	Icelandic (Morén 1999, Morén & Miglio 2000)
e.	all segments	Latin, Arabic dialects, Aklan, Berber (Zec 1988, 1995)

Morén (1999) also shows that this relationship between coerced moraicity and sonority holds for vowels. If lower-sonority vowels are forced to lengthen in some environment, then higher-sonority vowels will lengthen in that environment.[3]

(14)	*Sets of coerced bimoraic vowels*	*Languages*
a.	none	Cayuvava, Chaha, Hua
b.	low	English and Russian dialects
c.	low + mid	Russian dialects
d.	all	Hawaiian, Italian

3.1.2 *Description of distinctive weight.* In contrast to coerced weight, distinctive weight results from an underlying moraic specification that is reflected in a surface contrast (e.g. geminate *vs.* non-geminate intervocalic consonants, or phonemic long *vs.* short vowels). (15a) and (b) illustrate this concept by showing contrastive consonant weight in a language with geminate consonants. An underlyingly non-moraic intervocalic consonant surfaces as non-moraic, while an underlyingly moraic intervocalic consonant surfaces as moraic.

(15) a.



As Morén (1999) discusses, a careful review of the literature leads to the conclusion that distinctive moraicity does not follow sonority. Table I illustrates that there are languages with: (i) no distinctive consonant

[3] Principled exceptions to this generalisation (e.g. Hungarian final vowels) are discussed and shown to be the result of fairly complex interactions among moraic markedness and faithfulness constraints.

weight (e.g. Hawaiian), (ii) distinctive weight for more sonorous consonants only (e.g. Hausa), (iii) distinctive weight for less sonorous consonants only (e.g. Chechen) and (iv) distinctive weight for all consonants (e.g. Standard Italian).

Obstruent	*Sonorant*	*Language*	*Reference*
yes	yes	Balochi	Elfenbein (1997)
		Gujarati	Mistry (1997)
		Hungarian	Nádasdy (1985), Morén (1999)
		Standard Italian	Vogel (1982), Morén (1999)
no	yes	Hausa	Newman (1997)
yes	no	Chechen	Nichols (1997)
		Lak	Anderson (1997)
no	no	Chaha	Leslau (1997)
		Hawaiian	Elbert & Pukui (1979), Morén (1999)
		Khalkha Mongolian	Bosson (1964)

[Table I. Languages, consonant classes and distinctive weight (simplified).]

Similarly, Table II illustrates that distinctive vowel length is also not restricted by sonority.

High	*Low*	*Language*	*Reference*
yes	yes	Hawaiian	Elbert & Pukui (1979), Morén (1999)
		Hungarian	Nádasdy (1985), Morén (1999)
		Khalkha Mongolian	Bosson (1964)
no	yes	Khasi	Maddieson (1984)
yes	no	Atayal	Crothers (1978), Maddieson (1984)
no	no	Icelandic	Einarsson (1945), Morén (1999)
		Standard Italian	Vogel (1982), Morén (1999)
		Spanish	Harris (1983)

[Table II. Languages, vowel classes and distinctive weight (simplified).]

3.2 An OT analysis of the typology of weight

To capture the coerced and distinctive weight patterns outlined in §3.1, Morén (1999) proposes interactions of three basic types of constraints within the OT framework, as shown in (16):

(16) a. *General moraic markedness constraints*
Structural markedness constraints against moraic segments.

b. *Coercive moraic markedness constraints*
Require minimal or maximal moraicity within a given context.

c. *Moraic faithfulness constraints*
Require corresponding segments to be affiliated with the same number of moras.

As will be shown below, coerced weight results from interactions among general and coercive moraic markedness constraints, and distinctive weight results from interactions among moraic markedness and moraic faithfulness constraints.

3.2.1 *Coerced weight*. The general moraic markedness constraint is given in (17).

(17) *MORA[seg]
Do not associate a mora with a particular type of segment.

This is actually a family of constraints relative to different sonority classes and ranked in a universal moraic markedness hierarchy based on sonority (Sherer 1994, Zec 1995, Holt 1997, Morén 1996, 1997, 1999). A simplified hierarchy is given in (18).

(18) *Simplified universal moraic markedness hierarchy*[4]
*MORA[plainstop] ≫ *MORA[vdstop] ≫ *MORA[plaincont] ≫ *MORA[vdcont] ≫ *MORA[nas] ≫ *MORA[liq] ≫ *MORA[high] ≫ *MORA[mid] ≫ *MORA[low]

This hierarchy states that it is worse to be a moraic low-sonority segment than a moraic high-sonority segment.[5]

There are a variety of coercive moraic markedness constraints found in the literature, for example:

(19) a. WEIGHTBYPOSITION (WBYP)
Coda consonants must surface as moraic (based on Hayes 1989).
b. FOOTBINARITY (FTBIN)
Prosodic feet must be binary under syllabic or moraic analysis (McCarthy & Prince 1993).
c. STRESSTOWEIGHT (STOW)
Prominent syllables must be heavy – i.e. 'stressed syllables must be heavy' (based on Prince 1990).

Morén (1999) claims that coerced weight patterns are captured by ranking coercive moraic markedness constraints with respect to the universal moraic markedness hierarchy. This derives the implicational relationship between moraicity and sonority, as shown in (20) and (21). (20) gives a simplified schematisation of the options regarding the interaction between WBYP and the consonantal end of the hierarchy.

[4] This simplified sonority scale roughly follows the sonority indices of Selkirk (1984).

[5] Constraints against moraic vowels help account for a variety of phenomena. Vowel/onset glide alternations are explained via prosodic constraints requiring nuclear/rhyme segments to be moraic. The tendency for lower vowels to lengthen is explained because it is better to add a mora to a low vowel than to a non-low vowel. Likewise, the tendency for broken vowels to gain a non-high component is explained because it is better to add a mora to a low vowel than to a non-low vowel (Miglio & Morén 1999).

(20) ≫ *Mora[obs] ≫ ≫ *Mora[son] ≫

WbyP

(21) provides simplified constraint rankings that correspond to different languages with and without moraic codas of varying sonorities. Khalkha Mongolian does not allow moraic coda consonants of any sonority, Lithuanian allows only sonorant moraic codas and Cairene Arabic allows both obstruent and sonorant moraic codas.

(21) a. *Mora[obs] ≫ *Mora[son] ≫ WbyP (e.g. Khalkha Mongolian)
b. *Mora[obs] ≫ WbyP ≫ *Mora[son] (e.g. Lithuanian)
c. WbyP ≫ *Mora[obs] ≫ *Mora[son] (e.g. Cairene Arabic)

To summarise, it is a combination of the universal moraic markedness hierarchy, strict constraint dominance and transitivity that results in the coerced weight implicational relationship between sonority and moraicity.

3.2.2 *Distinctive weight*. To account for the cross-linguistic patterns of distinctive weight, Morén (1999) proposes the two moraic faithfulness constraints in (22). These constraints are similar in nature to the No-Flop and No-Spread constraints of McCarthy (1995), but formalised to differentiate among segments. As will be discussed below, this differentiation is necessary to ensure that distinctive weight is independent of sonority. Constraint (22a) basically says 'do not delink an underlying mora from a segment', and (22b) says 'do not link a mora with a segment that it did not have underlyingly'.

(22) a. MaxLink-μ[seg]
Let ζ_j be segments, S_k phonological representations,
$S_1 \Re S_2$, ζ_1 is an element of S_1, ζ_2 is an element of S_2, $\zeta_1 \Re \zeta_2$, and ζ_2 belongs to a specific sonority class of segments,
if ζ_1 is associated with a mora, then ζ_2 is associated with a mora.

b. DepLink-μ[seg]
Let ζ_j be segments, S_k phonological representations,
$S_1 \Re S_2$, ζ_1 is an element of S_1, ζ_2 is an element of S_2, $\zeta_1 \Re \zeta_2$, and ζ_1 belongs to a specific sonority class of segments,
if ζ_2 is associated with a mora, then ζ_1 is associated with a mora.

Distinctive weight patterns are captured via relative ranking of the moraic faithfulness constraints with the universal moraic markedness hierarchy. Since the faithfulness constraints are relative to different sonority classes, and they are not universally ranked with respect to one another, there is no implicational relationship between moraicity and sonority for distinctive weight. For example, (23) shows that if a simplified hierarchy is interleaved with different faithfulness constraints against losing underlying moras, there are four possible distinctive consonant weight patterns.

(23) ≫ *Mora[obs] ≫ ≫ *Mora[son] ≫

MaxLink-μ[obs] MaxLink-μ[son]

These are illustrated in (24):

(24) a. *No distinctive consonant weight* (e.g. Mongolian)
*Mora[obs] ≫ MaxLink-μ[obs]
*Mora[son] ≫ MaxLink-μ[son]

b. *Distinctive weight for both obstruents and sonorants* (e.g. Italian)
MaxLink-μ[obs] ≫ *Mora[obs]
MaxLink-μ[son] ≫ *Mora[son]

c. *Distinctive weight for obstruents*, *but not sonorants* (e.g. Chechen)
MaxLink-μ[obs] ≫ *Mora[obs]
*Mora[son] ≫ MaxLink-μ[son]

d. *Distinctive weight for sonorants*, *but not obstruents* (e.g. Hausa)
*Mora[obs] ≫ MaxLink-μ[obs]
MaxLink-μ[son] ≫ *Mora[son]

To summarise, although the universal moraic markedness hierarchy predicts an implicational relationship between sonority and moraicity, freely rerankable moraic faithfulness constraints relative to different types of segments can contravene that implication in the realm of distinctive weight.

3.2.3 *Summary of Morén* (*1999*). The major contribution of Morén (1999) is to develop a cross-linguistic typology of weight via the factorial ranking of a limited number of general constraints. There are two sources of weight: coerced and distinctive, each of which is relevant to all segment types and each of which is subject to different generalisations. Ranking moraic markedness constraints requiring minimal or maximal moraicity with respect to a universal moraic markedness hierarchy results in coerced weight that is dependent on sonority. In contrast, ranking freely rerankable moraic faithfulness constraints with respect to the same universal hierarchy results in distinctive weight patterns that are not dependent on sonority.

3.3 The analysis of Kashmiri

In this section, I will provide a complete analysis of the Kashmiri weight and stress systems. Within the context of Morén (1999), Kashmiri can be described as is a language with distinctive vowel length for all vowels, non-distinctive consonant weight, vowels that are not subject to coerced weight, and consonants that are subject to coerced weight only in the coda of a stressed closed syllable.

Since Kashmiri does not differentiate within the natural classes of vowels and consonants with respect to weight, the moraic constraints can be relativised to these natural classes. Note that this is only an expositional convenience and does not imply that the full range of constraints is not present in the grammar. It simply means that all the constraints relative to vowels will be ranked similarly and all the constraints relative to consonants will be ranked similarly. The moraic faithfulness constraints used in the following analysis are given in shorthand form in (25):

(25) a. MaxLink-μ[cons]
Do not delete an underlying mora from a consonant.
b. DepLink-μ[cons]
Do not add a mora to a consonant that it did not have underlyingly.
c. MaxLink-μ[voc]
Do not delete an underlying mora from a vowel.
d. DepLink-μ[voc]
Do not add a mora to a vowel that it did not have underlyingly.

In addition to faithfulness constraints, a set of markedness constraints is needed. As with the faithfulness constraints, the basic moraic markedness constraints must be relativised to the natural classes of consonants and vowels, as shown in (26).

(26) a. *Mora[cons]
Do not associate a mora with a consonant.
b. *Mora[voc]
Do not associate a mora with a vowel.

Finally, to capture the generalisations of Zec (1988) regarding the implicational relationship between sonority and moraicity, these markedness constraints are universally ranked as in (27).

(27) *Mora[cons] $\gg$ *Mora[voc]

The following sections will show that the distribution of Kashmiri vowel and consonant moraicity, as well as the complex stress pattern, results quite naturally from the interaction of the general moraic markedness constraints, the moraic faithfulness constraints, coercive moraic markedness constraints (to be introduced) and established prosodic constraints.

3.3.1 *Distinctive vowel length.* Recall from §2 that vowel length is distinctive in Kashmiri. Using the constraints proposed in Morén (1999) and reviewed above, distinctive moraicity is analysed as the ranking of a faithfulness constraint on underlying moraic content over a markedness constraint against moraic segments. To account for distinctive vowel length, faithfulness to underlying vowel length must outrank markedness, as shown in (28) and (29). In (28), an underlyingly long vowel in the initial syllable surfaces as long.[6]

(28) [ə́ənɨ] 'mirror'

μ μ μ / ə n ɨ	MaxLink-μ[voc]	*Mora[voc]
a. σ σ / μ μ / ə n ɨ	*!	**
☞ b. σ σ / μ μ μ / ə n ɨ		***

Despite the fact that the initial syllable of candidate (b) violates the markedness constraint twice (once per mora), as opposed to the one violation of candidate (a), it is still optimal. Candidate (a) violates the higher-ranked faithfulness constraint by shortening an underlyingly long vowel.

With an input containing a short vowel in the initial syllable, that vowel will straightforwardly surface as short, as shown in (29). Without some higher-ranked coercive moraic markedness constraint to force a vowel to lengthen, either the general moraic markedness constraint or the faithfulness constraint against adding a mora that was not there underlyingly will ensure that underlyingly short vowels remain short.

(29) [bátɨ] 'food'

μ μ / b a t ɨ	DepLink-μ[voc]	*Mora[voc]
☞ a. σ σ / μ μ / b a t ɨ		**
b. σ σ / μ μ μ / b a t ɨ	*!	***!

Tableau (30) shows that by ranking the faithfulness constraint against deleting underlying moras associated with consonants below the consonant moraic markedness constraint, underlyingly moraic intervocalic con-

[6] I am assuming an undominated prosodic constraint that requires syllables to be minimally monomoraic – thereby forcing at least one violation of the markedness constraint. This constraint is not discussed here.

sonants surface as non-moraic onsets. This means that consonant weight is not distinctive.

(30) [bátɨ] 'food'

μ μ μ b a t ɨ	*MORA[cons]	MAXLINK-μ[cons]
☞ a. σ σ μ μ b a t ɨ		*
b. σ σ μ μ μ b a t ɨ	*!	

Distinctive vowel length and non-distinctive consonant weight are thus captured by the rankings in (31a) and (b). Since the ranking of the DEPLINK-μ constraints is indeterminate, they are not shown.

(31) a. MAXLINK-μ[voc] ≫ *MORA[voc]
b. *MORA[cons] ≫ MAXLINK-μ[cons]

3.3.2 *Stress*. Recall that in the absence of a non-final long vowel or closed syllable, stress is invariably initial in this language. This can be explained by ranking a constraint aligning the head syllable of a prosodic word to the left edge of the prosodic word above a constraint aligning the head syllable to the right edge of the prosodic word.

(32) ALIGNHEAD-EDGE (ALIGNHD-L/R)
Align the head syllable of a prosodic word to an edge of that prosodic word (McCarthy & Prince 1993; an alignment translation of the Prince & Smolensky 1993 EDGEMOST(pk; L/R; word) constraint).

As (33) shows, with ALIGNHD-L ranked above ALIGNHD-R, given a choice between stressing the initial or a non-initial syllable, stress falls on the initial.

(33) [pʰíkiri] 'to understand'

pʰikiri	ALIGNHD-L	ALIGNHD-R
☞ a. pʰí.ki.ri		**
b. pʰi.kí.ri	*!	*
c. pʰi.ki.rí	*!*	

Candidate (b) violates both of these constraints, because neither the leftmost nor the rightmost syllable is stressed. Candidate (c) violates only the higher-ranked constraint, and candidate (a) violates only the lower-ranked constraint. Therefore, candidate (a) is optimal.

3.3.3 *Weight-sensitivity*. Recall that a non-final long vowel attracts stress away from the initial syllable. This was shown in (6), and is due to the ranking of the constraint in (34) requiring heavy syllables to be stressed above the alignment constraint, as demonstrated in (35).

(34) Weight-to-Stress Principle (WSP)

Heavy syllables are prominent – i.e. 'bimoraic syllables must be stressed' (Prince & Smolensky 1993, based on Prince 1990).

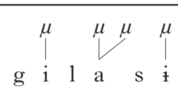
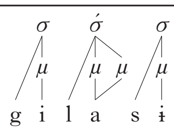
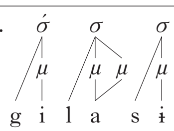
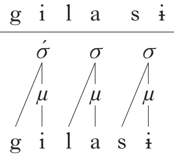
(35) [giláasɨ] 'cherries'

gilaasɨ	WSP	AlignHd-L
☞ a. gi.láa.sɨ		*
b. gí.laa.sɨ	*!	

The tableau in (35) shows that although candidate (b) has initial stress, thus satisfying alignment, it violates WSP, because the heavy syllable is not stressed. Since WSP is higher ranked, candidate (b) loses to candidate (a).

We must also account for the fact that underlyingly long vowels do not shorten to satisfy both WSP and left alignment. By surfacing as short, an underlyingly long vowel could circumvent WSP, and a candidate consisting of only short vowels would surface with initial stress. To prevent this from happening, the constraint aligning stress at the left edge of the word must be ranked lower than both of the other constraints. In (36), vowels maintain distinctive length and the leftmost long vowel is stressed. There is no argument yet to rank MaxLink-μ[voc] with respect to WSP.

(36) [giláasɨ] 'cherries'

	MaxLink-μ[voc]	WSP	AlignHd-L
☞ a. 			*
b. 		*!	
c. 	*!		

However, (37) shows that not only must faithfulness to underlying vowel moraicity be higher ranked than alignment, it must also dominate

WSP. In cases where there is more than one non-final long vowel, the leftmost long vowel is stressed, and the others remain long.

(37) [sáamaani] 'luggage'

μ μ μ μ μ / s a m a n i	MaxLink-μ[voc]	WSP	AlignHd-L
☞ a. σ́ σ σ / μ μ μ μ μ / s a m a n i		*	
b. σ σ́ σ / μ μ μ μ μ / s a m a n i		*	*!
c. σ́ σ σ / μ μ μ μ / s a m a n i	*!		
d. σ σ́ σ / μ μ μ μ / s a m a n i	*!		*

Candidates (c) and (d) both shorten the unstressed long vowel, thus violating the highest-ranked faithfulness constraint. Candidate (b) violates alignment in addition to WSP. Candidate (a) violates only WSP, therefore is optimal. Note that it is the lower-ranked alignment constraint that, although dominated, is still active, and forces the leftmost of the long vowels to be stressed.[7] Also note that if the faithfulness constraint did not dominate WSP, candidate (c) would win.

3.3.4 *Non-finality*. The fact that the final syllable of a polysyllabic word is never stressed follows from an undominated constraint. Recall that although long vowels typically attract stress away from short vowels, final long vowels are never stressed – even if they are preceded by only light syllables. To account for this, WSP must be dominated by a constraint against stressed final syllables, as shown in (39).

(38) Non-Finality (Non-Fin)

No head of a prosodic word is final in the prosodic word (Prince & Smolensky 1993).

[7] I am assuming that there is an undominated constraint (not shown) that allows only one main stress per prosodic word. Therefore, only one of the long vowels can bear stress.

(39) [átʧʰaa] 'all right'

μ μ μ / a ʧʰ a	Non-Fin	WSP
a. σ σ́ / μ μ μ / a ʧʰ a	*!	
☞ b. σ́ σ / μ μ μ / a ʧʰ a		*

The partial constraint ranking motivated to account for stress thus far is:

(40) Non-Fin, MaxLink-μ[voc] ≫ WSP ≫ AlignHd-L ≫ AlignHd-R

a. AlignHd-L ranked above AlignHd-R results in leftward-aligned stress.

b. Undominated Non-Fin results in an absolute prohibition on final stress in polysyllabic forms.

c. WSP ranked above AlignHd-L results in the attraction of stress from initial position to heavy syllables.

d. MaxLink-μ[voc] ranked above WSP results in distinctive vowel length in both stressed and unstressed positions.

3.3.5 *Closed syllables*. As shown in (7), if there are no non-final long vowels, but there are closed syllables, then the leftmost non-final closed syllable is stressed. Since the closed syllables attract stress from the initial syllable the same way that long vowels do, we can hypothesise that stressed closed syllables are bimoraic. The placement of stress on a non-initial syllable is then captured with the constraint ranking already established, as shown in (41). The non-moraic status of the final consonant is not addressed here, but will be addressed in §3.3.7.

(41) [ʃokɨ́rvaar] 'Friday'

μ μ μ μ μ / ʃ o k ɨ r v a r	WSP	AlignHd-L
a. σ́ σ σ / μ μ μ μμ / ʃ o k ɨ r v a r	**!	
☞ b. σ σ́ σ / μ μ μ μμ / ʃ o k ɨ r v a r	*	*

However, since consonant weight is non-distinctive, there must be some way to ensure that closed syllables can attract stress away from the initial syllable regardless of the underlying moraicity of the consonant.[8] To force coda consonants to surface as moraic, there must be an active coercive moraic markedness constraint, WBYP (19a), requiring codas to be heavy.

Since the coda consonant surfaces with a mora that it may not have had underlyingly, WBYP must outrank both the faithfulness constraint against adding moras to consonants and the general moraic markedness constraint against moraic consonants, as shown in (42).

(42) [ʃokɨ́rvaar] 'Friday'

μ μ μ μ ʃ o k ɨ r v a r	WBYP	*MORA[cons]	DEPLINK-μ[cons]
a. σ́ σ σ μ μ μμ ʃ o k ɨ r v a r	**!		
☞ b. σ σ́ σ μ μ μ μμ ʃ o k ɨ r v a r	*	*	*

Finally, to ensure that the coda surfaces as heavy, despite the imperative to have initial stress, WBYP must also be ranked higher than the alignment constraint. (43) shows that with WBYP ranked above ALIGNHD-L, underlyingly non-moraic codas become moraic to bear stress. Recall that WSP ≫ ALIGNHD-L (see (41)) ensures that heavy syllables attract stress from the initial position.

(43) [ʃokɨ́rvaar] 'Friday'

μ μ μ μ ʃ o k ɨ r v a r	WBYP	ALIGNHD-L
a. σ́ σ σ μ μ μμ ʃ o k ɨ r v a r	**!	
☞ b. σ σ́ σ μ μ μ μμ ʃ o k ɨ r v a r	*	*

[8] This is consistent with Richness of the Base (Prince & Smolensky 1993).

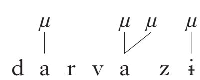
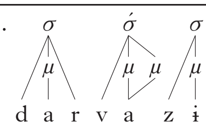
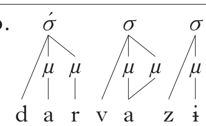
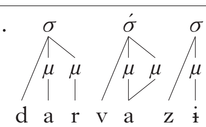
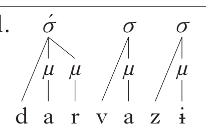
To summarise, (i) WbyP ≫ *Mora[cons], DepLink-μ[cons] and AlignHd-L results in codas surfacing as moraic, and (ii) WSP and WbyP ≫ AlignHd-L results in closed syllables receiving stress.

3.3.6 *Long vowel and closed syllable interactions*. Recall that the interesting aspect of the Kashmiri stress pattern is that a non-final long vowel positioned to the right of a closed syllable will be stressed. This is unexpected, since one would expect the leftmost heavy syllable to be stressed regardless of the segmental content of that syllable. I will show that with the correct constraint ranking, we get the effect that a closed syllable is only heavy and stressed if it is the best potential stressable syllable in a word.

In the absence of a non-final long vowel, a single closed syllable is forced to be heavy by WbyP ranked higher than three constraints: the constraint against moraic consonants, the faithfulness constraint prohibiting adding moras to consonants and the constraint requiring initial stress. If WbyP were undominated, all closed syllables would be heavy, and there would be no weight difference between closed syllables and syllables containing long vowels. In such a situation, the leftmost long vowel or closed syllable would be stressed. However, in Kashmiri, long vowels are stressed over closed syllables, therefore some constraint must dominate WbyP. With WSP ranked above WbyP, we achieve the correct result.

As (44) shows, an input with an underlyingly non-moraic coda consonant surfaces as non-moraic in a word containing a non-final long vowel because surfacing as moraic would cause a violation of WSP.

(44) [darváazɨ] 'door'

	MaxLink-μ[voc]	WSP	WbyP	AlignHd-L
☞ a. 			*	*
b. 		*!		
c. 		*!		*
d. 	*!			

In candidate (b), the long vowel violates WSP, and in candidate (c), the closed syllable violates WSP. To avoid a violation of WSP, either the long vowel could shorten or the coda consonant could be non-moraic. However, shortening the vowel is prevented by MaxLink-μ[voc] ≫ WSP (see (37)), as shown in candidate (d). Since candidate (a) satisfies both higher-ranked constraints, it wins at the expense of violating WbyP. Since consonant moraicity is non-distinctive, the same candidate surfaces even if the input contains an underlyingly moraic consonant (not shown).

The preference for stressing long vowels over closed syllables is now revealed to be the result of a constraint interaction that forces coda consonants to surface as non-moraic in words containing non-final long vowels.

To summarise, it is better to have a non-moraic coda consonant than it is to shorten a vowel. WSP ranked above WbyP prevents a coda from surfacing as moraic if there is a non-final long vowel in the word. WSP and WbyP are functionally similar in that they are both coercive moraic markedness constraints that can coerce consonant moraicity, but they are different in that WSP forces consonant non-moraicity in some environments, and WbyP forces consonant moraicity in some environments.

3.3.7 *Multiple closed syllables.* A prediction of the constraint rankings argued for thus far is that not only do unstressed closed syllables surface as light in the proximity of a non-final long vowel, but if more than one closed syllable is found in a single word, only the leftmost will be heavy. All others will be light. To demonstrate this, tableau (45) evaluates a set of likely candidates, given an input with no underlyingly moraic consonants. The constraint ranking predicts that the leftmost closed syllable surfaces as bimoraic and stressed, while the second closed syllable surfaces as monomoraic. To keep the following large tableau as small as possible, full syllable representations are not given. Instead, syllable boundaries are indicated using '.', and moraic associations are indicated using superscript moras. In addition, since final syllables are never stressed, and moraic codas in final syllables will always incur additional violations of WSP, final codas are always non-moraic. Therefore, only candidates with non-moraic final codas are considered viable in the following tableau.

(45) [jə́mbɨrzal] 'narcissus'

jəmbɨrzal	WSP	WbyP	*Mora[cons]	AlignHd-L
a. jə́$^{\mu}$m.bɨ$^{\mu}$r.za$^{\mu}$l		***!		
b. jə$^{\mu}$m.bɨ́$^{\mu}$r.za$^{\mu}$l		***!		*
c. jə$^{\mu}$m.bɨ́$^{\mu}$r$^{\mu}$.za$^{\mu}$l		**	*	*!
☞ d. jə́$^{\mu}$m$^{\mu}$.bɨ$^{\mu}$r.za$^{\mu}$l		**	*	
e. jə́$^{\mu}$m.bɨ$^{\mu}$r$^{\mu}$.za$^{\mu}$l	*!	**	*	
f. jə$^{\mu}$m$^{\mu}$.bɨ́$^{\mu}$r.za$^{\mu}$l	*!	**	*	*
g. jə$^{\mu}$m$^{\mu}$.bɨ́$^{\mu}$r$^{\mu}$.za$^{\mu}$l	*!	*	**	*
h. jə́$^{\mu}$m$^{\mu}$.bɨ$^{\mu}$r$^{\mu}$.za$^{\mu}$l	*!	*	**	

Candidates (e)–(h) violate the highest-ranked WSP, because each has an unstressed heavy syllable. The remaining candidates all violate WbyP, but (a) and (b) incur one more violation than (c) and (d). Of these two remaining candidates, (c) violates the imperative to have stress as far left in the word as possible. Therefore, (d) is the winning candidate.

3.3.8 *Summary of the analysis of Kashmiri*. We have seen a straightforward account of Kashmiri, in which stressed closed syllables containing short vowels are bimoraic and unstressed closed syllables containing short vowels are monomoraic. This results from an interaction of constraints that not only yields the overall stress pattern of the language, but also accounts for general vowel length and consonant weight distributions.

Following Morén (1999), the general distinctiveness of vowel length and non-distinctiveness of consonant weight is captured by appropriately ranking the moraic faithfulness constraints with respect to the moraic markedness constraints. Distinctive vowel length is captured by the ranking in (46a), and the non-existence of geminates by the ranking in (46b).

(46) a. MaxLink-μ[voc] ≫ *Mora[voc]
b. *Mora[cons] ≫ MaxLink-μ[cons]

The weight-sensitive leftward alignment of stress with a proviso that stress not be on the final syllable is captured by ranking constraints proposed by Prince & Smolensky (1993) and McCarthy & Prince (1993).

(47) Non-Fin ≫ WSP ≫ AlignHd-L ≫ AlignHd-R

Finally, the preference for stressed long vowels over stressed closed syllables is the logical result of constraint interaction. The constraint ranking in (48) allows unstressed long vowels to remain long, but forces unstressed closed syllables containing short vowels to be light. The result of this constraint ranking is the illusion of a prominence scale of the type CV < CVC < CVV. In fact, there is only a monomoraic *vs*. bimoraic dichotomy, where coda moraicity is dependent on surface stress.

(48) MaxLink-μ[voc] ≫ WSP ≫ WbyP ≫ *Mora[cons], DepLink-μ[cons]

4 Theoretical issues

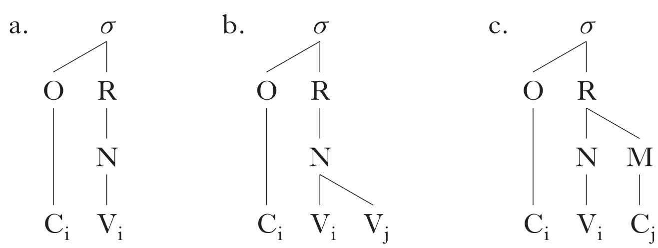
There are three theoretical issues addressed in this section. The first is a discussion of different theories of syllable geometry and how the Kashmiri stress system can be explained without either rhyme constituent branching (McCarthy 1979, Halle & Vergnaud 1980, Hayes 1981, etc.) or multiple moraic tiers (Hayes 1995). The second is a discussion of the similarities and differences between two constraints proposed by Prince & Smolensky (1993) to ensure that heavy syllables are preferred as stressed syllables.

The third is a discussion of how the constraints used in the analysis of Kashmiri to preferentially stress long vowels over closed syllables cannot be reranked to yield the typologically undesirable result of closed syllables preferentially stressed over long vowels.

4.1 Syllable geometry and gradient weight

There have been a number of pre-OT proposals to account for variation in weight by syllables of differing shapes. Recall from §§1 and 3 that the weight of syllables varies from language to language and from structure to structure – whereas CV is consistently light and CVV is consistently heavy, CVC is either light or heavy depending on both the language and the quality of the coda consonant. In addition, it has been argued given data from languages like Klamath, Yupik and Creek (Blevins 1995, Hayes 1995) that there is a gradient weight scale such that CV < CVC < CVV. In this section, I will briefly discuss two alternative representational approaches that might be used to account for the Kashmiri stress system. One approach uses subsyllabic constituent branching and the other uses multiple moraic levels. As will be seen, the advantage of the OT analysis of Kashmiri weight presented here is that the nature of the OT grammar is exploited to capture the economical nature of standard single-tiered moraic theory while also accounting for the apparent weight gradiency seen in Kashmiri.

4.1.1 *Branching rhymes.* There is a large body of work dedicated to the internal structure of the syllable. Within one class of proposals, the syllable is represented as a combination of an optional onset constituent and a mandatory rhyme constituent (Pike & Pike 1947, Fudge 1969, 1987, Halle & Vergnaud 1978, 1980, Selkirk 1978, 1982, etc.). Further, some versions of syllable theory claim that the rhyme consists of a mandatory nucleus and an optional coda (e.g. Selkirk 1978). Three common representations associated with this type of proposal are given in (49) (Hyman 1985: 6).

(49)


(49a) represents a light syllable that consists only of an onset (O) and a rhyme (R) consisting of a nucleus (N) dominating a single vowel (V). (49b) represents a heavy syllable containing a branching nucleus. (49c) represents a syllable with a rhyme that branches into a nucleus and a margin (M). To account for the cross-linguistic variation in the treatment of closed syllables, 'heaviness' is defined on a language-particular basis over the branching of some part of the rhyme constituent. In some languages, all rhyme-internal branching signals a heavy syllable. In languages that treat only CVV as heavy, nuclear branching is the key factor.

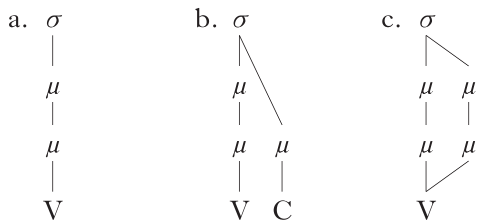
Given that the structures in (49) seem to correlate nicely with the fact that CV, CVV and CVC syllables are treated differently by the phonology of Kashmiri, it is tempting to propose a representational explanation for the seemingly gradient weight found in this language. In other words, one could claim that a syllable with a non-branching rhyme/nucleus is light, a branching rhyme is heavy and a branching nucleus is somehow even heavier.

(50)	*Light*	*Heavy*	*Heaviest*
	non-branching	branching rhyme	branching nucleus

However, there are several complications inherent in this hypothesis that are not faced by the moraic analysis espoused in §3.3. For instance, the necessity for a rhyme constituent as a grammatical element has been vigorously challenged by a number of linguists, including Hyman (1985), Davis (1988) and Hayes (1995). Opponents of the branching rhyme hypothesis argue that many weight phenomena are more adequately and less stipulatively explained using relative moraic content. For example, the common light/heavy weight dichotomy is easily handled via a contrast between monomoraic and bimoraic structures. One advantage of this is that it captures the implicational relationship between CVV and CVC weight. That is, since long vowels are always bimoraic, but coda consonants are not necessarily moraic, a language can have heavy CVV and light CVC, but not heavy CVC and light CVV. Under a branching rhyme analysis, it must simply be stipulated that if a branching rhyme indicates heaviness then a branching nucleus must also indicate heaviness.

4.1.2 *Multiple moraic levels.* It must be noted that despite several advantages of a moraic analysis over an articulated rhyme constituent analysis of weight, there is at least one argument in favour of the latter in a pre-OT framework. That is, one of the strongest arguments against moraic theory and in favour of an articulated rhyme representation of the syllable is the very fact that languages like Klamath, Creek and Kashmiri have stress systems that seem gradiently sensitive (e.g. CV < CVC < CVV). This was difficult to reconcile in pre-OT moraic theory, because if monomoraic structures are light and bimoraic structures are heavy, how can CVC be heavier than CV but lighter than CVV?

To answer criticisms that moraic theory could not account for gradiency effects, Hayes (1995) developed a version of moraic theory with more than one moraic level. He proposed that vocalic elements project a mora at two levels and consonantal elements project a mora at only one level in some languages. Under this hypothesis, open and closed syllables of the relevant types are given in (51).

(51)


Within this framework, CV is always the lightest syllable, because both moraic tiers are monomoraic. CVC weight is variable, depending on which moraic level is important in determining weight in a given language. In those contexts where CVC is light, the upper monomoraic level is relevant. In those contexts where CVC is heavy, the lower bimoraic level is relevant. CVV is always heavy, because both moraic levels are bimoraic.

However, given that the OT analysis presented in this paper successfully makes use of the original single-tiered version of moraic theory, there is no need to propose multiple moraic tiers to account for gradient weight effects.

4.1.3 *Constraint interaction and the illusion of gradient weight*. Given the assumption that segments are mapped to the same abstract syllable structures consistently throughout a language, branching rhyme theories have the advantage of capturing the seemingly gradient nature of weight, albeit with several unexplained stipulations. In contrast, standard moraic theory (non-multilevelled) has the advantage of minimal structure and fewer stipulations in languages where CVC patterns either with CV or with CVV. However, traditional moraic theory has difficulty accounting for seemingly gradient weight.

The advantage of the OT analysis of Kashmiri weight presented here is that the nature of the OT grammar is exploited to capture the economical nature of standard moraic theory, while also accounting for the preference in Kashmiri to stress CVV over CVC over CV.

4.2 Peak prominence

The second theoretical issue to be addressed has to do with the fact that until §3.3.6, the constraint in (52) could have been substituted for WSP. This constraint says that there is a preference for stressing syllables such that stressed superheavy syllables are better than stressed heavy syllables, which in turn are better than stressed light syllables.

(52) PEAKPROMINENCE (PKPROM)
Peak (x) is more harmonic than Peak (y) if |x| > |y|, where |$\mu\mu\mu$| > |$\mu\mu$| > |μ| (Prince & Smolensky 1993, based on McCarthy & Prince 1986, and using the prominence scale of Hayes 1995).[9]

For example, the tableau in (36) could be replaced with (53).

(53) [giláasɨ] 'cherries'

μ μμ μ / g i l a s ɨ	MAXLINK-μ[voc]	PKPROM	ALIGNHD-L
☞ a. σ σ́ σ (g i l a s ɨ)			*
b. σ́ σ σ (g i l a s ɨ)		*!	
c. σ́ σ σ (g i l a s ɨ)	*!		

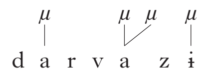
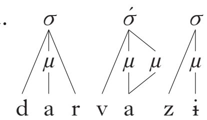
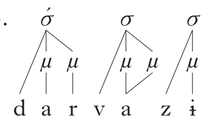
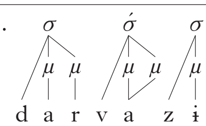
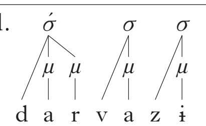
Here candidate (b) violates PKPROM because a short vowel is assigned the peak position instead of an available long vowel.

However, in comparing (44) with (54), it is clear that PKPROM by itself makes the wrong predictions if comparing two syllables of equal prominence. Since PKPROM is satisfied as long as one of the heaviest syllables is stressed, the non-peak status of the other syllables in unimportant. This leaves the lower-ranked ALIGNHD-L to choose between candidates (b) and (c). The result is that the leftmost heavy syllable is stressed regardless of

[9] The issue of the quality of onsets in determining stress placement is not resolved in this paper. One of the basic assumptions of this analysis is that there is a difference between stress placement conditioned by relative moraic content and stress placement conditioned by some notion of an optimal sonority cline from syllable onset to peak (e.g. Pirahã; Everett & Everett 1984, Hayes 1995). At present there is no satisfactory analysis in the literature to capture the effects of onsets on stress placement seen in some languages. However, see Hironymous (1999) for interesting work on using onset sonority in selecting optimal syllables.

segmental content. In (54), a closed syllable is incorrectly stressed when there is an available non-final long vowel.

(54) [darváazɨ] 'door'

	MaxLink-μ[voc]	PkProm	WbyP	AlignHd-L
				
☞ a. 			*!	*
👎 b. 				
c. 				*!
d. 	*!			

This is important because it shows that although PkProm and WSP functionally overlap in some ways, they are functionally distinct in others. They are similar in preferring that stressed syllables be of a particular structural description. However, they are different in that PkProm is violated only by a complete lack of the desired structure, whereas WSP is violated once for every token that does not meet the desired configuration.

Although WSP is necessary for explaining the data presented thus far, this is not to say that PkProm plays no role in the phonology of Kashmiri. On the contrary, there is evidence from the preferential stressing of superheavy syllables over heavy syllables that Kashmiri needs PkProm in addition to WSP.

(55) [boo.dées.var] 'Lord'

WSP is not sufficient for this case because it does not distinguish between bimoraic and trimoraic syllables. Therefore, the constraint ranking argued for thus far will incorrectly yield an output with initial stress if a heavy syllable containing a long vowel is to the left of a superheavy syllable, as shown in (56).

(56) [boodéesvar] 'Lord'

bo$^{\mu\mu}$de$^{\mu\mu}$sva$^{\mu}$r	WSP	WbyP	*Mora[cons]	AlignHd-L
a. bo$^{\mu\mu}$.dé$^{\mu\mu}$s.va$^{\mu}$r	*	*!		*
b. bó$^{\mu\mu}$.de$^{\mu\mu}$s.va$^{\mu}$r	*	*!		
☜ c. bo$^{\mu\mu}$.dé$^{\mu\mu}$s$^{\mu}$.va$^{\mu}$r	*		*	*!
👎 d. bó$^{\mu\mu}$.de$^{\mu\mu}$s$^{\mu}$.va$^{\mu}$r	*		*	

Candidates (a) and (b) are not optimal because they both violate the constraint requiring coda consonants to be moraic. It is the low-ranking constraint requiring that stress be aligned with the left edge of the prosodic word that rules out candidate (c). This incorrectly leaves candidate (d) as optimal.

However, if we include PkProm in the constraint hierarchy, and rank it above AlignHd-L, then the superheavy syllable will receive stress, as shown in (57).

(57) [boodéesvar] 'Lord'

bo$^{\mu\mu}$de$^{\mu\mu}$sva$^{\mu}$r	WSP	WbyP	*Mora[cons]	PkProm	AlignHd-L
a. bo$^{\mu\mu}$.dé$^{\mu\mu}$s.va$^{\mu}$r	*	*!			*
b. bó$^{\mu\mu}$.de$^{\mu\mu}$s.va$^{\mu}$r	*	*!			
☞ c. bo$^{\mu\mu}$.dé$^{\mu\mu}$s$^{\mu}$.va$^{\mu}$r	*		*		*
d. bó$^{\mu\mu}$.de$^{\mu\mu}$s$^{\mu}$.va$^{\mu}$r	*		*	*!	

Candidate (d) is now ruled out because the heaviest syllable is not most prominent. Candidate (c) is optimal.

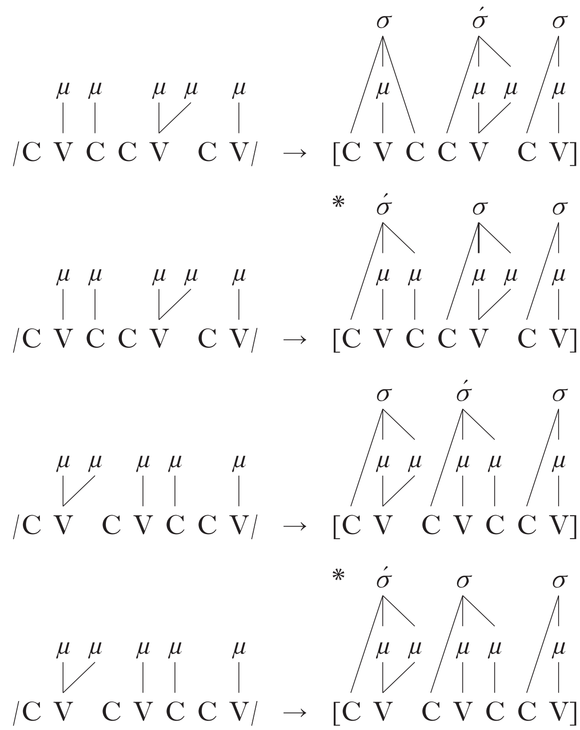
This demonstrates that WSP and PkProm are separate constraints that perform different functions, both of which are necessary to explain the distribution of stress in Kashmiri. While WSP ensures that all heavy syllables are stressed when possible, PkProm ensures that at least one of the heaviest syllables is stressed.

4.3 Unattested stress patterns

In the analysis of Kashmiri presented above, the assignment of stress preferentially to long vowels rather than closed syllables was shown to stem from a constraint ranking that forces unstressed coda consonants to be non-moraic. Is it not possible, then, to rerank these same constraints for the opposite result? That is, can closed syllables be preferentially stressed over long vowels, while maintaining the vowel length on the surface? The answer is that they cannot, because of a subset relation between the constraint violations incurred by the relevant competing candidates.

To be more concrete, (58a) and (58b) illustrate the pattern seen in Kashmiri, and (58c) and (58d) illustrate the hypothetical pattern. Recall that crucial to this comparison is that stress is attracted away from canonical initial position.

(58) a. b. c. d.



In Kashmiri, stress is able to move from the initial syllable to the long vowel because the constraint ranking allows the initial syllable to surface as light, yet still remain closed, as in (58a). However, it is impossible for the constraints to be reranked such that stress moves from canonically left-aligned position to a closed syllable while maintaining a long vowel on the surface, as in (58c). This is because the long vowel is necessarily bimoraic, therefore it is always heavy, and always available to be the leftmost stressed syllable.

The key to the absolute prohibition of the unattested pattern is in examining the subset relationship of constraint violations incurred by the competing output candidates. (59) and (60) show that while maintaining the left-alignment of stress and distinctive vowel length, there is no constraint ranking which will result in candidate (a) or (b) being optimal. Candidates with stressed closed syllables always have one more mark than candidates with stressed long vowels, therefore long vowels are always preferentially stressed. In tableau (59), WSP takes precedence over WbyP, and candidate (d) surfaces (as is the case for Kashmiri).

(59)

$CV^{\mu\mu}CV^{\mu}C^{\mu}CV^{\mu}$	WSP	WbyP	AlignHd-L
a. $CV^{\mu\mu}.C\acute{V}^{\mu}C^{\mu}.CV^{\mu}$	*!		*
b. $CV^{\mu\mu}.C\acute{V}^{\mu}C.CV^{\mu}$	*!	*	*
c. $C\acute{V}^{\mu\mu}.CV^{\mu}C^{\mu}.CV^{\mu}$	*!		
☞ d. $C\acute{V}^{\mu\mu}.CV^{\mu}C.CV^{\mu}$		*	

Tableau (60) shows that if WbyP takes precedence over WSP, candidate (c) will surface. Candidates (b) and (d) violate the highest-ranked constraint by not having moraic coda consonants. Although both candidates (a) and (c) violate WSP, candidate (a) also violates the alignment constraint. Therefore, candidate (c) has a subset of the violations of candidate (a) and is always more harmonic.

(60)

$CV^{\mu\mu}CV^{\mu}C^{\mu}CV^{\mu}$	WbyP	WSP	AlignHd-L
a. $CV^{\mu\mu}.C\acute{V}^{\mu}C^{\mu}.CV^{\mu}$		*	*!
b. $CV^{\mu\mu}.C\acute{V}^{\mu}C.CV^{\mu}$	*!	*	*
☞ c. $C\acute{V}^{\mu\mu}.CV^{\mu}C^{\mu}.CV^{\mu}$		*	
d. $C\acute{V}^{\mu\mu}.CV^{\mu}C.CV^{\mu}$	*!		

In tableaux (59) and (60), candidate (d) occults candidate (b) and candidate (c) occults candidate (a). Both of the occulting candidates have stressed long vowels, and both of the occulted candidates have stressed closed syllables. Therefore, the candidates with the stressed long vowels are always better outputs than the candidates with the stressed closed syllables.

Given that the hypothesised weight/stress pattern is unattested, it is a welcome result that the constraints proposed for the odd weight/stress pattern of Kashmiri will not yield such a system.

5 Conclusion

This paper makes both empirical and theoretical contributions while providing a description and an analysis of weight and stress in Kashmiri. It offers an analysis of Kashmiri vowel length, consonant weight and stress assignment; shows that seemingly complex distributions of moraic segments can be handled by the interaction of a limited number of general constraints; and places the analysis of a particular language in a larger typological context predicted by factorial constraint ranking.

There are several key results. First, just because there is evidence in a language that some closed syllables are heavy, this does not necessitate all closed syllables being heavy. Counter to many theories where consonant weight is constant or a particular segment in a given syllabic position within a language as a whole, CVC syllables in Kashmiri vary in weight, depending on surface stress.

Second, using the system developed in Morén (1999), vowel length and consonant weight in Kashmiri are analysed as resulting from interactions of general and coercive moraic markedness constraints and faithfulness constraints on underlying moraic content. This analysis not only demonstrates some of the typological predictions of factorial constraint ranking, but also that a previously puzzling weight/stress pattern can be accounted for quite simply within OT.

Third, three common approaches to syllable geometry were compared, in the hope of explaining the preference for stressed CVV > CVC > CV. While an articulated rhyme representation, the standard moraic representation and multi-tiered moraic representation each has advantages and disadvantages in a pre-OT framework, standard moraic theory is better suited to explain the distribution of Kashmiri weight and stress within the OT framework. It is less stipulative and it is more economical in that it requires less abstract structure.

Fourth, two constraints proposed by Prince & Smolensky (1993) to ensure that heavy syllables are preferentially stressed over light syllables were compared. Although the constraints are functionally similar in some contexts, they have different effects in other environments and are both necessary to account for the Kashmiri data.

Finally, the constraints needed to explain the somewhat odd distribution of weight and stress in Kashmiri cannot be reranked to result in an unattested and unexpected weight-sensitive stress pattern. That is, the strong prediction is made that CVC can never be preferentially stressed over CVV while maintaining the long vowel on the surface.

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