1 A Typology of Stress Systems

1.1. Introduction

This chapter offers a typology of stress systems and locates lexical accent systems on the ‘stress map’. The typological patterns discussed here offer a number of criteria for treating lexical accent systems as members of a broader family of accentual systems.

One of the oldest notions in stress typology is that of *fixed* versus *free* stress languages. Fixed stress is predictable in its location, and usually derived by an algorithm, while free stress is unpredictable and must be lexically listed.

In fixed systems, stress is primarily determined by phonological factors that build prosodic structure based on syllable weight and prominence, limitations on the distance between stresses, and between stress and word boundaries. On the other hand, in free systems, stress can practically occur anywhere in the word because morphological constituency interferes with prosodic factors in stress assignment. Lexical accent systems are considered to be a subgroup of free systems (Hayes 1995:32).

In this chapter I claim that it is not quite accurate to refer to languages whose stress is not entirely the byproduct of phonological principles as free-stress languages. Instead, I propose that such systems must be viewed from the perspective of a prosody-morphology interaction. Therefore, I suggest the term *interface systems* which, as I show, is both theoretically and empirically justified.

The first part of this chapter aims at establishing the exact status of interface systems in general, and lexical accent systems in particular, in the stress typology. The second part of this chapter familiarizes the reader with the basic characteristics of interface systems and formalizes the stress typology by means of constraint rankings based on the theoretical model of Optimality Theory (Prince and Smolensky 1993).

1.1.1. Fixed-stress systems

A first variety of fixed accentuation is documented in languages which have primary stress very close to a word edge. For instance, stress in Turkish is predominantly on the final syllable (Lees 1961, Sezer 1981, Inkelas 1994), as shown in (1a), whereas stress in Finnish is on the initial syllable of the word (Sovijärvi 1956, Anttila 1995), as shown in (1b). Syllable structure or weight distinctions do not play any role in determining stress location. This means that both languages have a quantity insensitive system, which is only concerned with the assignment of prominence to a vocalic peak at the right and left edge of the prosodic word, respectively. It is natural, therefore, to use the expression *edge-oriented quantity insensitive systems* to refer to systems with the characteristics just described. In such systems, stress is a parsing cue for (the beginning and the end of) word boundaries.

(1) *edge-oriented quantity insensitive systems*

a.	Turkish:	σσσ́	araba-dá	‘car-LOC’
b.	Finnish:	σ́σσσ	lémmikki	‘pet’

Murik, on the other hand, a lower Sepik language of New Guinea, stresses the leftmost heavy (2a-c); otherwise the leftmost syllable (2d) (Abbott 1985, Walker 1996). Heavy syllables are those with long (CVV) vowels. All unstressed long vowels are phonetically shortened. As a result, two long vowels never surface in a single word.

(2) *edge-oriented quantity sensitive system: Murik*

a.	H˝H	sáːkʰo	‘wait’
b.	LLLH˝	anəpʰarɛ́ːtʰ	‘lightning’
c.	LLH˝H	numaɾóːgo	‘woman’
d.	LĽL	dákʰanimp	‘post’

In Murik, it seems that both weight and word edge are of importance for the location of stress. Theoretically, the combination of word edge with syllable quantity generates four logical possibilities, all of which are attested. Aguacatec stresses the rightmost heavy or the rightmost light, in the absence of a heavy (McArthur and McArthur 1956, Walker 1996). Komi has prominence to the leftmost heavy, otherwise to the rightmost light syllable (Itkonen 1955, Lytkin 1961, Hayes 1995), whereas Chuvash (Krueger 1961) is the exact mirror image

of Komi (Hayes 1995:296). Such languages are called *edge-oriented quantity sensitive systems* or *prominence-driven* stress systems.

To sum up, what is relevant for stress in these systems is word edge, vocalic peaks and, occasionally, quantity. Often edge-oriented systems are called *unbounded* because no scope limitations are imposed on stress. Although accentuation is based on an algorithm, stress can practically occur anywhere in the word. For instance, stress in Murik can be on the first syllable as in (2a) and (2d), the final one as in (2b), or the penultimate one as in (2c). One may wonder how we can tell with confidence that languages like Turkish, for example, are unbounded. In such cases words with an exceptional stress pattern can prove illuminating. For Turkish, specifically, there is a handful of words that display stress in the non-final position, e.g. *gít-me-meli* 'go-NEG-NEC' (Inkelas 1994). The unboundedness of the system is suggested by the fact that stress in the aforementioned word does not occur on one of the last two or three syllables of the word. However, for many languages there is no sufficient empirical evidence to decide whether a system with fixed initial or final stress is unbounded or not.

Next to edge-oriented systems, there are also languages with another form of fixed stress. In such systems, word edges anchor a foot. To illustrate with an example, most Polish words have fixed stress on the penultimate syllable (Rubach and Booij 1985, Hammond 1989). This is because a trochaic foot is built at the right edge of the word. As shown in (3a), the two last (rightmost) syllables of the word are parsed into binary groupings with left-headed prominence, (σ́σ). Slavic Macedonian (Hammond 1989) has a similar pattern with the important difference that in this case the last syllable must be left unfooted. The language has final syllable extrametricality symbolized as <σ>. An example is given in (3b). Languages like Polish and Slavic Macedonian are called *foot-based quantity insensitive* because syllable quantity is irrelevant for footing.

(3) *foot-based quantity insensitive systems*

a.	Polish	σσ(σ́σ)	hipopótam	'hippopotamus'
b.	SlavMac	σ(σ́σ)<σ>	vodéničar	'miller'

When footing is exhaustive, that is, when all syllables of the word are parsed into feet, a *rhythmic (foot-based) system* is created. Cavineña (Key 1968, Van de Vijver 1998) is an example of a rhythmic system with completely predictable stress. Primary stress is on the penultimate syllable and secondary stress on every other syllable preceding main stress, as shown in (4a). Badimaya (Dunn

1988, Van de Vijver 1998) has a similar stress algorithm but with the difference that primary stress here is on the first syllable and every other syllable thereafter, as illustrated in (4b).

(4) *rhythmic quantity insensitive systems*

Cavineña (Van de Vijver 1998:15)

a. kiríka ‘paper, book’
atàtawáha ‘a kind of bee’

Badimaya (Van de Vijver 1998:16)

b. wánara ‘long, thin’
ŋángaŋùwa ‘to choke on something’

In many languages, footing can be sensitive to weight distinctions. Cahuilla (Seiler 1957, Hayes 1995:134) is such a case. In this language, heavy syllables (CVV) constitute a foot by themselves and often carry primary stress, e.g. *qáːnkìčem* ‘palo verde (pl)’.

Often foot-based systems are called *bounded*. This is because primary stress falls within a particular distance of the word edge or another stress. We have seen that the majority of the vocabulary in Polish has stress on the penultimate syllable. A small set of primarily foreign words, though, has stress on other syllables than the penultimate one. Interestingly, the exceptional patterns are limited to the antepenultimate as in *univérsitet* ‘university’ and final syllable as in *rezím* ‘regime’ adducing solid proof that the system is bounded or, more casually, has a three-syllable window.

To summarize so far, fixed stress is the byproduct of edgemost rules or rules that parse syllables into feet. More varieties arise when these two prosodic factors interact with syllable structure, quantity distinctions, extrametricality, exhaustivity of footing, and so on. As any typological distinction, also the one presented here is rarely manifested in a clear form. Many languages have characteristics from different varieties of accentual systems.

Having established a basic classification for fixed systems, let us proceed to the most important category of stress languages for this study, the so-called free-stress systems.

1.1.2. Free-stress systems or rather, *interface systems*

The typology of stress distinguishes a category of languages with *free* stress (Hayes 1995, Van der Hulst 1996, among others). The main reason for calling these systems ‘free’ is that stress often occurs in random positions within the

word, mainly because it is to the greatest extent determined in the lexicon. However, this thesis in general, and this section in particular, aims at clarifying the somewhat misconceived picture main stream phonology has about these systems. More specifically, I argue that the idiosyncrasy of free stress systems relies on their deeply morphological character. Stress is the result of a sophisticated system of interactions between morphology and prosody. This is the reason that, from now on, I use the term *interface systems* to refer to what other studies call free-stress languages. Let us have a closer look at what exactly the interface systems are.

As shown in the previous section, prosodic constituency in fixed systems is constructed on the basis of purely phonological principles (e.g. edgemost rules, feet, syllabic structure, vocalic peaks, etc.). Generally speaking, these phonological constituents and principles are at the disposal of phonology which, depending on the language, combines them in a particular modus in order to derive stress. However, what happens when the morphological mode of combination in a language intervenes and, moreover, moderates the prosodic mode of combination? Or, when prosodic constituency is part of the lexical specification of a morpheme and not the result of prosodic constraints? In this case an interface system is created.

In some languages the morphological domain in which stress is performed, the type of suffixation, or the status a morpheme has in the morphological structure, play an important role in accentuation. In those cases, being prosodically prominent is not dependent on whether you are heavy or close to the right edge of the word, but on whether you are a suffix of a particular class, a nominalizing or an aspectual morpheme, or a root that has a lexically prespecified metrical structure. The latter remark hints at a very important property that many interface systems have, namely *lexical marking*.

Often, being a foot-head (or, similarly, a foot-tail) does not flow from phonological principles, but is an inherent characteristic of a morpheme, part of its subcategorization matrix. In this case we say that the morpheme is marked with a 'lexical accent'.[1] Marking is an identifying feature for many interface systems, and especially for the lexical accent systems that are the subject of this thesis.[2]

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[1] I follow Van der Hulst (1996) in assuming that *accent* is an abstract property of a unit such as a word that does not provide any information about phonetic cues. It can be phonetically manifested as stress or pitch (Lehiste 1970, Van Heuven and Sluijter 1996). I come back to this issue in Chapter 2.

[2] In this thesis the terms 'mark', 'marking', 'markedness' have a strict reading. They refer to the property of a morpheme to have a lexically prespecified accent.

Another shared attribute of all interface systems is that prosody is a parsing cue for morphological structure and not for word boundaries. Stress pinpoints the hierarchical relations between morphemes such as the subordination or domination of one morpheme to another, or highlights the morpheme that controls the syntactic or grammatical identity of the form.

Let us start our presentation with a system that represents a transitional stage between the fixed and the interface variety. I choose Spanish as the language of exemplification. In Spanish, regular (fixed) stress falls on the penult:

(5) *penultimate stress in Spanish*

a.	monéda	‘coin’	c.	termíno	‘finish-PRES.1sg’
b.	trabájo	‘work’	d.	Tolédo	‘Toledo’

However, the language displays two deviant accentual patterns. First, there are nouns with invariant antepenultimate and final stress (6a-b), whereas, in a number of verbal paradigms, stress occurs on the first vowel after the root i.e., the thematic vowel, producing final or antepenultimate stress, depending on the size of the following suffix (6c-d) (Roca 1988, 1992, 1996, Harris 1983, 1995, Hammond 1995). The only restriction that limits stress both in verbs and nouns is the ‘three-syllable window’: stress is bound to the last three syllables from the right edge of the word.

(6) *antepenultimate and ultimate stress in Spanish*

	nouns			verbs	
a.	pájaro	‘bird’	c.	termin-é	‘finish-PAST.1sg’
b.	sofá	‘sofa’	d.	termin-áb-amos	‘finish-IMPERF-1pl’

The Spanish facts lead to the following two observations: First, stress can occur in more than one position. The only limitation is imposed by the highly respected requirement of boundedness to the last three positions. Second, different word classes are subject to different stress rules. In nouns, regular stress is on the penultimate syllable, whereas deviant stress patterns, exhibited mostly, but not exclusively, by loan words, have to be listed in the lexicon. In verbs, penultimate stress is also the norm, but in a handful of verbal classes the accent of the thematic vowel decides on the position of stress (Roca 1992). It is evident that a fixed-stress algorithm which assigns penultimate stress cannot adequately account for the Spanish stress facts. Reference to the internal structure of words, and, especially, to the accentual properties of morphological elements is also required.

In sum, trochaic footing, edgemost rules and class-specific marking derive Spanish stress. I propose the name *morphology-dependent* (interface) system to describe the stress pattern of a language like Spanish. It is not so much the stress dichotomy between verbs and nouns that classifies Spanish into this stress group as the genuinely morphological nature of verbal stress. Grammatical markers, and not just arbitrary morphemes, are lexically prespecified to prevail over other constituents in the word.

Pashto, an Indo-Iranian language spoken in Afganistan, is also a morphology-dependent system. Several oblique and direct grammatical cases, as well as past and present tense verbal suffixes, are marked. Unlike Spanish, Pashto reveals marking in roots as well. Consider the examples in (7) taken from Penzl (1955) and Shafeev (1964):

(7) *morphology-dependent system: Pashto*

a.	saṛ-í	'man-DR.pl'	class III masculine nouns
b.	saṛ-éyu	'man-OBL.pl'	
c.	melgér-u	'friend-OBL.pl'	class IV masculine nouns
d.	ṭek-ú	'point-OBL.pl'	
e.	ǰoṛéž-əm	'to convalesce-PRES.1sg'	
f.	ǰoṛed-ə́m	'to convalesce-PAST.1sg'	
g.	ǰoṛed-ə-láːy[3]	'to convalesce-POTEN.PRES.1sg'	

Class III masculine nouns are always stressed on the suffix; if the suffix is monosyllabic, stress is final (7a), but with disyllabic suffixes stress is on the penultimate syllable (the first syllable of the suffix), (7b). Class IV nouns have members with final stress on the root such as (7c) and also members with final stress such as (7d).

These facts are interpreted as follows: first, accented suffixes are prosodically prominent; this explains why there are no nouns with stress on the root in class III masculine nouns (7a-b). Second, the accent of the root prevails when there is no other marked element following (7c). Third, in the absence of marked morphemes, default stress is on the final syllable (7d).[4] The verbal examples in (7e-g) lead to the same conclusion. The root is accented, but every time an accented suffix is added, stress is on the suffix.

[3] Vowel length is irrelevant for stress, e.g. *shpaːné* 'shepherd-OBL.sg', *meːlmaːné* 'guest-DR.pl'.

[4] One could argue that final stress in (7d) is triggered by the root /ṭek-/, which is accented but chooses to place its inherent accent on the suffix. However, the marked-unmarked opposition in this case is neutralized by the default, which also assigns final stress in Pashto.

To sum up, both in Spanish and Pashto prosodic structure is built on a par with morphological structure. On the one hand, morphemes of a particular class or grammatical category influence accentuation by having an inherent accent. On the other hand, prosodic principles are at play determining which 'special' morpheme will win or, otherwise, which syllable will bear stress. Often the prosodic principles that decide on the conflict between lexical accents as well as default prominence blur accentual contrasts. In Pashto, for example, final stress can originate either from a marked suffix, or a root that assigns an accent on a following morpheme or, finally, by an edgemost rule which assigns stress on the final peak of the word.

There is variation within morphology-dependent systems. Hayes (1995) gives English as an example of a morphology dependent system in which stress serves to elucidate the morphological structure of the word. Often, a particular syllable of the root bears main stress and affixes are subordinated to the root by being stressless or bearing secondary stress. Thus, antepenultimate stress in *un-bound-ed-ness* has nothing to do with rhythmic principles, but reflects the fact that the stressed root is preceded by two stress-neutral suffixes.

Lexical accent systems form another group of interface systems. Greek, Russian and some languages of the Salish family, namely Thompson, Spokane, Moses-Columbia and Lillooet Salish are all lexical accent systems[5] whose analysis constitutes the core of the present study. From these languages, Greek, Russian and Lillooet Salish are metrically organized in trochees,[6] whereas Thompson, Spokane and Moses-Columbia are unbounded systems. Here I present a general description of lexical accent systems, postponing a more detailed presentation of their properties and characteristics till the next section.

In lexical accent systems, primary stress shows a high degree of dependence on morphological structure. A first indication of the morphological orientation of stress is the pervasive presence of marking. The vast majority of morphemes (i.e. roots, inflectional suffixes, derivational suffixes) in these languages have a prespecified metrical structure in the lexicon. A morpheme can bear an accent or assign an accent to neighboring morphemes. Check the examples in (8) from Greek. The lexical specification of morphemes is given between slashes.

[5] Other lexical accent systems are: Sanskrit (Kiparsky 1982), Ancient Greek (Oikonomou 1984), Japanese (Haraguchi 1977, 1991, McCawley 1968, Poser 1984, Beckman and Pierrehumbert 1986), Byelorussian (Mayo 1976, 1993), the Basque dialect of Gernika (Hualde and Bilbao 1993, Hualde 1996).

[6] I have not encountered any lexical accent system with an iambic rhythm. Although the existence of iamb as a foot type has been challenged (Van de Vijver 1996, 1998), I cannot exclude the possibility that there are lexical accent systems organized in an iambic fashion, given that our knowledge of these systems is very limited.

Marked morphemes are represented as 'σ́' when the accent is located on some syllabic position, or as '´σ, σ´' when the accent is directed to a following or preceding morpheme. Accents with conflicting directionality as in (8j) are indicated with the sign '≒'.

(8) *lexical accent system: Greek*

a.	stafíða	/stafíð-a/	'raisin-NOM.sg'
b.	stafíðon	/stafíð-ón/	'raisin-GEN.pl'
c.	θálasa	/θalas-a/	'sea-NOM.sg'
d.	θalasón	/θalas-ón/	'sea-GEN.pl'
e.	γónðola	/γónðol-a/	'gondola-NOM.sg'
f.	γónðolon	/γónðol-ón/	'gondola-GEN.pl'
g.	aγorá	/aγor´-a/	'market-NOM.sg'
h.	aγorón	/aγor´-ón/	'market-GEN.pl'
i.	uranós	/uran -os/	'sky-NOM.sg'
j.	uranú	/urán≒ú/	'sky-GEN.sg'
k.	ánθropos	/anθrop-os/	'man-NOM.sg'
l.	anθrópu	/anθrop-´u/	'man-GEN.sg'

The root in (8a) is lexically accented on the last syllable. We reach this conclusion by comparing this root with the root /θalas-/ in (8c). The latter shifts stress to the ending in genitive plural (8d), whereas the former preserves its stress on the penultimate syllable. If the root in (8a) is accented, then /θalas-/ must be unmarked (8c). Unmarked roots are stressed by default[7] on the antepenultimate syllable when they combine with unmarked suffixes. However, when they are escorted by a marked suffix, the latter morpheme wins over the default (8d).

The root in *γónðol-a* (8e) also has an inherent accent on the initial syllable because it preserves its stress in genitive plural. On the other hand, the word *aγorá* in (8g) is stressed on the suffix. The discussion above suggested that the suffix /-a/ cannot be accented; otherwise we would expect final stress when it combines with unmarked roots as in *θálas-a*. We assert, therefore, that the final stress of *aγorá* must be triggered by the root. Indeed, there are many roots in Greek and other languages that impose their inherent accent on the following

[7] Default here is used as a cover term to express the fixed subsystem that takes charge of accentuation only in the absence of marked morphemes.

morpheme. Such roots are known as 'post-stressing' or 'post-accenting'[8] (Kiparsky 1982, Halle and Vergnaud 1987). In (8j), the root /uran-/ is also post-stressing, but here it is combined with a pre-stressing suffix, a suffix that requires the preceding syllable to be stressed (8l).

The second mode in which morphology interferes with accentuation is when accents compete for stress. Primary stress results from the interplay of the inherent marks of roots and the accentual properties of suffixes. The examples in (8) make clear that there are two underlying accents, but in each case only one survives and bears stress. It is evident from the facts above that, unlike Spanish and Pashto, an edgemost rule cannot derive the correct results because in (8b) and (8f) the leftmost accent wins, whereas in (8j) the rightmost accent wins. The generalization is that the accent imposed by the root prevails in both cases. The accent of the suffix (8d) and the default pattern (8c) have a chance to emerge when there is no conflict, and more specifically, when the root is unmarked.

One of the most important proposals in this study is that stress in systems like Greek (and Russian) is sensitive to morphological headedness. The accent that prevails belongs to the 'head of the word'. In other words, a morphological head becomes a prosodic head, provided that it is marked. In languages with fusional morphology like Greek and Russian, the notion 'head of the word' must be read as the element that determines the categorial status of the word. Derivational suffixes are almost always heads because they define the lexical category, class or gender of the derived form, e.g. *agel-os* (noun) 'angel' > *agel-ik-os* (adjective) 'of angels'. In polysynthetic languages like Salish, the notion 'head' refers to the (functional) head in the syntactic tree. The head in aspectual and modal phrases is the aspectual and modal marker, respectively. In incorporated constructions, the root is the head and the suffix, which serves as the argument of the root and incorporates to it, is the complement of the head.

According to this proposal, it is also expected marked derivational suffixes to override root-accent and inflectional suffix-accent. This expectation is indeed fulfilled; marked roots prevail over marked inflectional suffixes in (8b) and (8f) but in the derived word *γονδoliéris* 'gondolier' < /γónðol-a/, the accent of the derivational suffix /-iér-/ outweighs the accent of the root.

It is important to keep in mind for the moment that the notion 'head of the word' is important for the accentuation of such languages. Elements other than heads can influence accentuation only when the head lacks inherent accentual

[8] In this thesis I adopt a different view on post-accentuation. Post-accenting morphemes are just morphemes with an unlinked (floating) lexical accent. Cf. Chapter 2 for a detailed discussion of this proposal.

properties. Since stress is mainly, but not exclusively, dependent on the lexical accent of the morphological head of the word, I name these systems *head-dependent systems with lexical accents*.

Thompson Salish operates like Greek within the lexical stem domain. Roots are often conjoined with lexical suffixes (suffixes with lexical referents) into an incorporated construction (Gerdts 1998). In such formations, the incorporated lexical suffix satisfies the argument structure of the verb (root). With respect to stress, the accent of the root prevails over the accent of the lexical suffix which, in turn̄, prevails over the default leftmost stress. This stress pattern is shown in (9a) through (9c). The examples are taken from Thompson and Thompson (1992, 1996). I use '=' to indicate a morpheme belonging to the lexical suffix category and '/' to symbolize a prefix directly before the root.

(9) *head-dependent system with lexical accents: Thompson* (stem level)

a.	ʔes/x̌'áq'^{w}=yeq^{w}	/ʔes/x̌'áq'^{w}=éyeq^{w}/	'a nail nailed into the tree'
		STAT/ROOT=LEXS	*stress on accented root*
b.	ɬac=úʔs-m	/ɬac=úʔs-əm/	'to poultice one's back'
		ROOT= LEXS-MDL	*stress on accented LexS*
c.	ɬác=kst-m	/ɬac=akst-əm/	'to poultice the hand'
		ROOT=LEXS-MDL	*stress on leftmost V*

The dominance of root-accent over lexical suffix-accent can be easily accounted for if we take into consideration the morphosyntactic structure of the above constructions. The root is the head of the VP to which the lexical suffix incorporates. Lexical suffixes in Salish serve as arguments within the context of the sentence in which the Root=LexS predicate occurs. They are semantically interpreted as themes, instruments or locatives (cf. Chapter 5). We assert that, as in Greek, marked heads prevail over other marked constituents. Default constraints apply to assign prosodic structure to accentless strings.

Interestingly, Salish languages have polysynthetic morphology. This means that word formation takes place in the syntax. When aspectual and modal suffixes are added to the verbal base to form intransitive words, they are always stressed. This is shown in (10).

(10) *head-stress system with lexical accents: Thompson* (word level)

a.	ʔuq^{w}eʔ-nwéɬn	/ʔuq^{w}eʔ-nweɬn/	'manage to get a drink'
		ROOT-NON-CTL	
b.	ʔuq^{w}eʔ-úɬ	/ʔuq^{w}eʔ-uɬ/	's.o. who always drinks'
		ROOT-HBT	

c.	ʔuqʷeʔ-úluɬ	/ʔuqʷeʔ-uluɬ/	‘go out to drink’
		ROOT-TRANSLOC	
d.	k’ʷenmeh-úɬ	/k’ʷénmeh-uɬ/	‘always criticizing’
		ROOT-HBT	

Aspectual and modal suffixes are functional heads of aspectual and modal phrases, respectively. Seen from this perspective, it is not so surprising that they attract stress. As claimed above, morphemes that are dominant in the morphosyntactic structure are prosodically dominant as well. The difference is that at the word level, heads attract stress even when they are deprived of accents. That heads are lexically marked is shown by aspectual markers like the resultative suffix /-e/, which emphasizes the recent completion of an activity or change of state. This suffix has an inherent accent that is realized on a neighboring morpheme, e.g. *ʔes-t/xə́ɬ-e kn* ‘I feel refreshed’. We understand from this example that preserving the accent of the head is deemed more important than stressing the head. Languages like Thompson are called in this study *head-stress systems with lexical accents*. Such systems allow the lexical contrasts of morphological heads to surface but they assign prominence to morphological heads even when they are accentless.

We conclude that, at the level of the stem, Thompson Salish is a head-dependent system, but at the level of the word it converts to a head-stress system. Head-dependent systems are very close to head-stress systems, which also display a one-to-one correspondence between prosody and morphology. In both varieties prosodic structure serves as a parsing cue about morphological structure and not the beginning or end of word boundaries.

Tahltan, an Athapaskan language spoken in British Columbia and southern Yukon, is also a representative head-stress system with lexical accents. There are no weight sensitivities in the accentual system of Tahltan. In general, the location of the accent cannot be predicted by purely phonological principles. As shown in the examples (11a-d), marking is a necessity for roots in Tahltan. Note that the accent in this language is phonetically manifested as high tone. Affixes usually host rhythmic accents on every other syllable, following the accented syllable of the root, as shown in (11e-f). The rhythmic pattern is disrupted when an affix, which is preeminent in the morphological structure of the word, such as the deictic marker /kiθ-/, attracts stress, (11g). We conclude that morphological constituents that have a specific function in the morphological structure claim accentual prominence. The examples are taken from Cook (1972) and Nater (1989).

(11) *head-stress system with lexical accents: Tahltan*

a.	łédih	‘sweet’	(Nater 1989:30)
b.	keyéh	‘town’	
c.	náːtθ’et	‘it has fallen off’	
d.	taːq’áƛ	‘needle’	
e.	hodéθiː-déːh	‘we talk’	(Cook 1972:231)
f.	hóde-séːh	‘I talk’	
g.	k’íθhédeːs-déːl	‘they three or more run’	

Another example of a head-stress system is Hua, a dialect of Yagaria, a language of the Gorokan family of East New Guinea (Haiman 1980, Hendriks 1996).

An example of a *head-stress system without lexical accents* comes from the Yupik languages. The forms in (12) come from the dialect of Norton Sound (Jakobson 1985, Van de Vijver 1998) and show that the root is always stressed. Without going into the details of accentuation, it is evident that stress is not dependent on marking. Closed (CVC) syllables attract stress (12a), otherwise stress falls on the second light (CV) syllable of the root, (12b). Phonologically long vowels are prohibited in this language. An open syllable in the root is closed in order to guarantee stress on the root, (12c). Suffixation in (12c), for example, causes the final consonant of the root to be syllabified as an onset, *ku.vuq*, triggering stress on the suffix, in violation of the head-stress requirement. To avoid this result, the vowel of the root must become bimoraic and attract stress. Since the vowel may not lengthen, the only way in which the syllable can become bimoraic is by closing it (Van de Vijver 1998:131).

(12) *head-stress system without lexical accents: Norton Sound Yupik*

a.	ang-yamini	[áŋyamíːni]	‘his own boat’
b.	qaya-ni	[qayáːni]	‘his own kayak’
c.	kuvə-uq	[kúvvuq]	‘it spills’

Kobon, a member of the Kalam family of the East New Guinea Highlands Stock (Davies 1980, Hendriks 1996), is another head-stress system without lexical accents. In this language stress is on the penultimate syllable (13a-b) unless this syllable is of a lesser prominence than the final one, then the final syllable is stressed (13c). The following vowel hierarchy applies: a/au/ai > o/e/u/i > ʌ/ɨ. However, suffixes that mark tense, mood and non-coreferential subject (NCS) bear primary stress irrespective of their vowel quality, (13d). The

examples are taken from Hendriks (1996:228-30).

(13) *head-stress system without lexical accents: Kobon*

a.	aláfʌ	'tree species'
b.	kɨjígiɬ	'tattoo'
c.	kɨdolmáŋ	'arrow type'
d.	pakʌ́	'you strike and he ...'
	/pak-ʌ/	strike-NCS.2sg/3sg
	gaibʌ́p	'he will be doing and he...'
	/g-ai-bʌp/	do-DUR-COREF-FUT.3sg

Another head-stress system without lexical accents is Chukchee (Krause 1979).

To summarize, the interaction of prosody with morphology is expressed in different ways. Some languages choose to assign special prosodic status to specific morphemes or grammatical markers, and some others choose to assign important prosodic roles to elements that stand in important morphological positions. More specifically, in morphology-dependent systems, roots, thematic vowels, and other grammatical elements are prosodically distinguished in the word structure. Next to these elements, however, purely prosodic constraints that refer to footing and edgemost prominence have their share in defining the prosodic structure of a word. In head-dependent systems, the prosody-morphology interface is expressed as dominance of the head element. But, when the head is accentless, prosodic principles and inherent accentual properties of other constituents take charge of accentuation and determine stress. In head-stress systems the prosody-morphology interface is expressed in a more direct way: heads are always prominent, even when they lack inherent accentual properties.

The short excursion on accentual systems encountered around the world is completed at this point. The greatest effort of metrical theory has been put into describing rhythmic influences on stress. Interface systems and especially the ones with lexical accents have played a less significant role in the development of stress theory, mainly because they are considered to be devoid of rhythmic principles. In this study, I try to show that the examination and analysis of this class of systems is essential for any theory that aspires at developing a universal grammar for stress. As mentioned earlier, the largest part of the thesis is devoted to the accentuation of head-dependent systems with lexical accents, or in short, lexical accent systems. Head-stress systems with lexical accents will be given some extra attention in Chapter 5 where the Salish languages are discussed.

In the remainder of this chapter I introduce the theoretical framework the analysis will be based on and formalize the stress typology presented in the previous two sections.

1.2. Optimality Theory and Stress Typology

1.2.1. Optimality Theory

The constraint-based framework of *Optimality Theory* (OT) (Prince and Smolensky 1993, McCarthy and Prince 1993a, 1994), has dramatically changed the way linguists view phonology. OT shifts the explanatory burden of linguistic theory from input-based rewrite rules to output-based constraints. Instead of taking an underlying form and transforming it stepwise to its associated output, OT allows for the specification of a large set of candidate outputs. The candidate set is evaluated by the system of constraints, which selects the actual output from the available candidates. Schematically, the grammar is like this:

(14) *an Optimality-based Grammar* (McCarthy and Prince 1993b)
Gen(in_i)= {$cand_1$, $cand_2$, ...}
Eval ({$cand_1$, $cand_2$, ...}) → $cand_k$ (the output, given in_i)

The function Gen (for Generator) associates each input with a (possibly infinite) pool of 'output' candidates. Free generation implies that input forms are provided with all conceivable syllabifications, prosodic constituency, and so on. The function Eval (for Evaluator) is defined by a system of constraints, which assesses the various candidate output forms, ordering the candidates by how well they satisfy the constraint system of the language. Eval selects one candidate as the actual *optimal* output. The evaluation of all candidates is accomplished with the help of a ranked set of *universal constraints* (Con). Individual grammars are constructed by imposing a ranking on the entire universal constraint set. The central proposal of OT is that constraints are ranked in a hierarchy of relevance. Lower-ranked constraints can be violated in an optimal output form when such violation secures success on higher-ranked constraints. The higher ranked a constraint, the more forceful it is.

To illustrate with an abstract example; suppose that a language has the constraints A, B and C ranked in the following order (in an OT notation): A >> B >> C. If the candidate set of outputs generated by Gen is cand 1, cand 2 and cand 3, the evaluation takes the form presented in the following tableau:

(15)

input	A	B	C
cand 1	*!		
cand 2		*	***!
☞ cand 3		*	**

An asterisk in the box means that the candidate in the horizontal row violates the constraint in the vertical column. The optimal candidate, cand 3, the one that occurs in the language, is indicated with the sign '☞'. Fatal violations of a constraint are marked with an exclamation mark '!'. Cand 1 is excluded because it fatally violates the high ranked constraint A, though it respects the other constraints of the string. Cand 2 and cand 3 equally violate constraint B. The decision for the optimal output rests on constraint C which deems cand 3 as the actual output because it incurs less violations of the lower ranked constraint C. To be precise, cand 2 violates the relevant constraint three times whereas cand 3 violates it only two times.

1.2.2. Constraints and stress typology

The brief overview of stress systems revealed that stress is the byproduct of prosodic principles, marking and morphological factors. In fixed systems, stress assignment is almost exclusively controlled by prosodic constraints. In interface systems, on the other hand, morphological structure and lexical marking interact with prosodic principles to derive stress. In Optimality Theory, crosslinguistic variation arises by different constraint rankings. In this section I first show that marking, prosodic principles and morphological conditions are formalized as constraint statements and second, that the variety of stress systems can be derived by different constraint rankings.

Optimality Theory distinguishes, among others, two major families of constraints: faithfulness and structural constraints. Faithfulness constraints demand a tight relation between the input and the output. More specifically, they require the output to be identical to the input and vice versa. Structural constraints, on the other hand, are constraints on output structural configurations, which may favor modification of the input, contravening faithfulness. Domination of structural constraints over faithfulness con-straints results in modification of the input form, whereas domination of faithfulness constraints results in preservation of the underlying structure of the input.

Prosodic principles that determine footing, edgemost-rules and weight sensitivity take the form of structural constraints such as RHYTHMTYPE, EDGEMOST-L/R and WEIGHT-TO-STRESS (Prince and Smolensky 1993). These

constraints are short statements about the way input forms are footed, the inherent prominence of bimoraic rhymes, the directionality of foot-prominence, and so on. Depending on how they are ordered they can derive an assortment of stress patterns.

Lexical marking is a vital apparatus for many interface systems. The inherent accentual properties of morphemes take the form of faithfulness constraints. These constraints demand output forms to adhere to information that is specified in the input and vice versa. McCarthy and Prince (1995) and McCarthy (1997) argue that the set of elements that can be referred to by faithfulness constraints is not limited to segments; those elements may include autosegmental features like moras, tones and, by extension, lexical accents.[9]

(16) FAITH (LA) (McCarthy and Prince 1995)
A lexical accent in the input has a correspondent in the output (MAX(LA)).

A lexical accent in the output has a correspondent in the input (DEP(LA)).

Morphological constituency, and especially the notion of headedness, is crucial for the majority of interface systems. In the Introduction, I presented a brief overview of the theory of interface advanced in this thesis. More specifically, I argued that the mapping of morphological structure to prosodic structure is pursued in a compositional way. This means that prosodic structure is built in parallel with morphological structure. If the morphological mode of combination in a construction is that of a head and a complement, then the prosodic mode of combination can be a function that assigns some sort of prominence to the head-element. The function that performs the prosody-morphology interface is expressed as *head dominance* in lexical accent systems: morphological heads are prosodically prominent. I propose briefly here, and more extensively in the remaining chapters, that head dominance enriches Universal Grammar with the *family of head constraints*.[10] This family constitutes part of a broader family of interface constraints, which allow a direct

[9] Faithfulness constraints are phrased in terms of a correspondence relation (McCarthy and Prince 1995) holding between input-output lexical accents (cf. the discussion surrounding faithfulness constraints in Chapter 2).

[10] One may wonder whether non-head constituents can have a similar role in accentuation. This issue is extensively addressed in Chapter 4. It is enough to mention here that studies on head-dependent asymmetries have established the special status of head constituents (Dresher and Van der Hulst 1997).

relation between prosodic elements and morphological constituents such as, for example, lexical accents and morphological heads. Two types of head constraints are important in this study: *head-faithfulness* and *head-stress* constraints. The former constraint demands input heads to preserve their accent in the output and vice versa; the latter constraint simply states that heads must be stressed.

(17) a. HEADFAITH (LA)
A lexical accent sponsored by a morphological head in the input has a correspondent in the output (HEADMAX(LA)).

A lexical accent hosted by a morphological head in the output has a correspondent in the input (HEADDEP(LA)).

b. HEADSTRESS
Morphological heads are stressed.

Now, we can derive the stress patterns of the languages reviewed in §1.1.1 and §1.1.2 by simply ranking structural constraints (S), faithfulness constraints (F) and head constraints (HF, HS). The rankings in (18) have a certain degree of abstractness. Natural languages are complex and have many idiosyncratic characteristics. So, often other constraints intervene, motivating the ranking between constraints. For instance, FAITH and HEADFAITH in (18bii) do not in principle conflict with each other. Their conflict in Greek, for example, is established by intervening constraints, which are left out of the discussion here (cf. Chapter 3). The factorial typology of stress systems and a list of abstract tableaux that exemplify each type of accentual system are given in the Appendix at the end of this chapter. Note that a comma ',' between constraints denotes that they can be ranked either way (A,B=A >> B and B >>A). Structural constraints mainly comprise default stress, which takes charge when marking is lacking.

(18) *stress typology*
a. <u>fixed-stress systems</u>
Ranking: S >> F, HF, HS (Appendix A)
Pattern: No head dominance effects, no lexical accents.
Examples: Turkish, Finnish, Polish, etc.

b. <u>interface systems</u>
(i) morphology-dependent

Ranking: F>> S >> HF, HS (Appendix Ba)
Pattern: Lexical accents but no head dominance effects.
Examples: Spanish,[11] Pashto, etc.

(ii) head-dependent with lexical accents
Ranking: HF >> F >> S >> HS (Appendix Bb I)
Pattern: Head accent wins; (non-head) accent surfaces; otherwise, default.
Examples: Greek, Russian, Thompson Salish (stem level), Sanskrit

(iii) head-stress with lexical accents

Type I
Ranking: HS >> HF >> S, F (Appendix Bc I)
Pattern: Head accent wins but not if it is post-accenting; (non-head) accent does not surface; otherwise, stress is on the head on a syllable determined by S.
Examples: Tahltan, Hua

Type II
Ranking: HF >> HS, S, F (Appendix Bc II)
Pattern: Head accent wins even if it is post-accenting; (non-head) accent does not surface; otherwise, stress is on a syllable determined by S.
Examples: Thompson Salish (word level)

(iv) head-stress without lexical accents
Ranking: HS >> S >> HF, F (Appendix Bd)
Pattern: The head is always stressed and the position of stress is determined by the default. No lexical accents are present.
Examples: Yupik languages, Chukchee, Kobon

Fixed-stress systems are governed by purely prosodic principles due to high ranking of structural constraints. Intertwined with each other these constraints derive an assortment of fixed stress systems. I abstain from giving a more

[11] We have seen that, in Spanish, the trisyllabic window controls the distribution of lexical accents suggesting that FAITH is in fact dominated by a structural constraint that defines the window (S_1) and that it dominates itself a structural constraint (S_2) that determines default penultimate stress.

specific illustration of such rankings, since they easily can be found in recent studies on rhythmic stress.

In interface systems, structural (default) constraints are ranked low. Morphology-dependent stress emerges due to high ranking of faithfulness constraints (18bi). However, head constraints are ranked lower than the other constraints and, consequently, are inert. Structural constraints determine the winning candidate when conflicts arise. On the contrary, the ranking of HEADFAITH above FAITH is crucial in head-dependent (lexical accent) systems (18bii). Accents belonging to heads prevail over other accents in the word. However, the necessity for obligatory prominence of the head is relaxed because FAITH and STRUCTURAL outrank HEADSTRESS. Reranking of STRUCTURAL and HEADSTRESS derives a system like Tahltan, which displays lexical accent contrasts only in heads (18biii, Type I). Notice that placing FAITH above STRUCTURAL has no effect on stress when HEADSTRESS and HEADFAITH are top-ranked. In this way, the faithfulness requirement of other morphological elements is consistently suppressed by the requirement of having a stressed head. Interestingly, a simple reranking between HEADFAITH and HEADSTRESS derives a second variety of head-stress systems in which post-stressing heads can surface (18biii, Type II). A head that requires its accent on a neighboring constituent would survive the competition because HEADSTRESS is ranked low. Unmarked heads behave as in the previous system. Thompson word level accentuation is an example of a head-stress (with lexical accents) system. Finally, having HEADSTRESS top-ranked and FAITH and HEADFAITH below STRUCTURAL derives systems with obligatory stress on the head (18biv). The exact position of stress is determined by the structural constraint in effect; faithfulness is powerless from the rank it occupies.

Employing Optimality Theory has a number of advantages. Most importantly, the idea of having ranked constraints successfully grasps the fact that there are hierarchically ordered preferences in stress systems. With respect to lexical accent systems in particular, the typology makes explicit why priority is given to marking over the default subsystem and, further, within marking, why accentual properties of heads dominate inherent accentual properties of other elements.

Before bringing this section to an end it is important to mention that the distinction between fixed-stress and interface systems is rarely manifested in pure form; most systems are a mix of the two. The simple stress pattern of Finnish cannot save the language from a number of thorny problems related to secondary stress and allomorphic variation in the inflectional system of nouns (Anttila 1995, 1997). On the other hand, even morphological systems might have rhythmic aspects. For example, Spanish and Lillooet Salish have rhythmic secondary stress (Halle and Kenstowicz 1991, Roca 1992, Roberts 1993)

whereas marking in lexical accent systems like Greek and Russian is governed by prosodic wellformedness principles (cf. Chapter 3).

1.3. Conclusions

In Optimality Theory, a grammar of a language is a particular ranking of the constraints supplied by Universal Grammar. Permutation is therefore a crucial test of any proposed subtheory of constraints: are all the rankings of the constraints attested grammars, or at least possible ones?

In this chapter I showed that a set of four archetypical constraints predicts several attested accentual systems. The factorial typology is presented in the Appendix where it is shown that most rankings are attested grammars. There are few gaps but, given the limited knowledge we have on interface systems, they do not pose any serious problem for the theory advanced here. Moreover, the predicted grammars are close variants of the attested ones and can be possible grammars.

In general, there are two major types of systems. At the one pole are the pure phonological systems where accentuation shows few, if any, signs of morphological dependencies. Prosodic constraints build structure based on syllable weight, word edges, binary groupings with left or right-head prominence, and so on. At the other pole stand the pure interface systems. Here accentuation depends totally upon morphological structure. The prosody-morphology interface is expressed in the most transparent and direct way: by making the dominant morphological element prosodically dominant as well. Only morphological heads are prominent and moreover, if there is no marking, the prominent position is decided by prosodic constraints (i.e. stress the initial/final syllable or the heavy syllable of the head, and so on).

Between the two poles there are many other varieties, two of which are relevant to the discussion in this chapter: morphology-dependent and head-dependent stress systems. Both are close to, and at the same time distant from, each other. They share a fixed (sub)system and, to some extent, marking and dependence on morphological structure but they come apart in head dominance effects.

At this point the presentation of the main characteristics of lexical accent systems is completed. Full argumentation and empirical evidence for many of the claims made here is provided in the rest of this thesis.

Appendix: Factorial Typology of Stress Systems

Archetypical constraints:
S: STRUCTURAL (=EDGEMOST-R)
F: FAITH
HF: HEADFAITH
HS: HEADSTRESS

Note: I assume here that HF and F are violated in post-accenting morphemes when the accent is realized within the vicinity of the morpheme that sponsors it. Post-accenting morphemes are discussed in Chapter 2.

Types of marking:		*Notational conventions*:	
Accented:	σσ́	$\sigma\sigma_H$:	head of the word
Post-accenting:	σσ´	σσ-:	root
Unmarked:	σσ	-σ:	suffix

A. Fixed Stress Systems: Turkish, Finnish, Murik

S >> F >> HF >> HS
S >> F >> HS >> HF
S >> HF >> F >> HS
S >> HF >>HS >> F
S >> HS >> F >> HF
S >> HS >> HF >> F

No head dominance effects, no lexical accents. Stress is in the position determined by S

T1 $\sigma\acute{\sigma}_H$-, -σ́	S(R)	F	HF	HS
a. σσ́-σ	*!	*		
☞ b. σσ-σ́		*	*	*

T2 $\sigma\acute{\sigma}_H$-, -σ	S(R)	F	HF	HS
a. σσ́-σ	*!			
☞ b. σσ-σ́		**	*	*

T3 σσ$_H$-, -σ	S(R)	F	HF	HS
a. σσ́-σ	*!			
☞ b. σσ-σ́				*

B. Interface Systems

a. *morphology-dependent systems*: Spanish, Pashto
F >> S >> HF >> HS Lexical accents but no head dominance effects
F >> S >> HS >> HF

T1 σσ́$_H$-, -σ́	F	S(R)	HF	HS
a. σσ́-σ	*	*!		
☞ b. σσ-σ́	*		*	*

T2 σσ́$_H$-, -σ	F	S(R)	HF	HS
☞ a. σσ́-σ		*		
b. σσ-σ́	*!*		*	*

T3 σσ$_{\acute{H}}$-, -σ	F	S(R)	HF	HS
a. σσ́-σ	*	*!	*	
☞ b. σσ-σ́	*			*

T4 σσ$_H$-, -σ	F	S(R)	HF	HS
a. σσ́-σ		*!		
☞ b. σσ-σ́				*

b. *head-dependent systems with lexical accents*

Type I: Greek, Russian, Sanskrit
F >> HF >> S >> HS Head accent of any type wins (T1-T3);
HF >> F >> S >> HS (non-head) accent surfaces (T4); otherwise, default (T5).

T1 σσ́$_{H}$-, -σ́	HF	F	S(R)	HS
☞ a. σσ́-σ		*	*	
b. σσ-σ́	*!	*		*

T2 σσ́$_{H}$-, -σ	HF	F	S(R)	HS
☞ a. σσ́-σ			*	
b. σσ-σ́	*!	*		*

T3 σσ$_{H}$́-, -σ	HF	F	S(R)	HS
a. σσ́-σ	*!	*	*	
☞ b. σσ-σ́		*		*

T4 σσ$_{H}$-, -σ́	HF	F	S(R)	HS
a. σσ́-σ		*!	*	
☞ b. σσ-σ́				*

T5 σσ$_{H}$-, -σ	HF	F	S(R)	HS
a. σσ́-σ			*!	
☞ b. σσ-σ́				*

Type II

F >> HF >> HS >> S
HF >> F >> HS >> S

Head accent of any type wins (T1-T3); (non-head) accent surfaces (T4); otherwise, stress is on the head on a syllable determined by S (T5).

T1 σσ́$_{H}$-, -σ́	HF	F	HS	S(R)
☞ a. σσ́-σ		*		*
b. σσ-σ́	*!	*	*	

T2 σσ́$_{H}$-, -σ	HF	F	HS	S(R)
☞ a. σσ́-σ			*	*
b. σσ-σ́	*!	*		

T3 σσ$_{H}$́-, -σ	HF	F	HS	S(R)
a. σσ́-σ	*!	*		*
☞ b. σσ-σ́		*	*	

T4 σσ$_{H}$-, -σ́	HF	F	HS	S(R)
a. σσ́-σ		*!		*
☞ b. σσ-σ́			*	

T5 σσ$_{H}$-, -σ	HF	F	HS	S(R)
☞ a. σσ́-σ				*
b. σσ́-σ				**!
c. σσ-σ́			*!	

Type III

F >> HS >> S >> HF
F >> HS >> HF >> S

Head accent wins (T1, T2) but not if it is post-accenting (T3); (non-head) accent surfaces (T4); otherwise, stress is on the head on a syllable determined by S (T5).

T1 σσ́$_{H}$-, -σ́	F	HS	S(R)	HF
☞ a. σσ́-σ	*		*	
b. σσ-σ́	*	*!		*

T2 σσ́$_{H}$-, -σ	F	HS	S(R)	HF
☞ a. σσ́-σ			*	
b. σσ-σ́	*!	*		*

T3 σσ$_{H}$́-, -σ	F	HS	S(R)	HF
☞ a. σσ́-σ	*		*	*
b. σσ-σ́	*	*!		

T4 σσ$_{H}$-, -σ́	F	HS	S(R)	HF
a. σσ́-σ	*!		*	
☞ b. σσ-σ́		*		

T5 σσ$_H$-, -σ	F	HS	S(R)	HF
☞ a. σσ́-σ			*	
b. σσ-σ́		*!		

c. *head-stress systems with lexical accents*

Type I: Tahltan

HS >> HF >> S >> F
HS >> F >> HF >> S
HS >> F >> S >> HF
HS >> HF >> F >> S

Head accent wins (T1, T2) but not if it is post-accenting (T3); (non-head) accent does not surface (T4); otherwise, stress is on the head on a syllable determined by S (T5).

T1 σσ́$_H$-,-σ́	HS	HF	S(R)	F
☞ a. σσ́-σ			*	*
b. σσ-σ́	*!	*		*

T2 σσ́$_H$-,-σ	HS	HF	S(R)	F
☞ a. σσ́-σ			*	
b. σσ-σ́	*!	*		*

T3 σσ$_{\acute{H}}$-, -σ	HS	HF	S(R)	F
☞ a. σσ́-σ		*	*	*
b. σσ-σ́	*!			*

T4 σσ$_H$-, -σ́	HS	HF	S(R)	F
☞ a. σσ́-σ			*	*
b. σσ-σ́	*!			

T5 σσ$_H$-, -σ	HS	HF	S(R)	F
☞ a. σσ́-σ			*	
b. σ́σ-σ			**!	
c. σσ-σ́	*!			

Type II: Thompson Salish (word level)

HF >> HS >> S >> F
HF >> HS >> F >> S

Head accent wins (T1, T2); post-accenting heads win as well (T3); (non-head) accent does not surface (T4); otherwise, stress is on the head on a syllable determined by S (T5).

T1 $\sigma\acute{\sigma}_H$-, -$\acute{\sigma}$	HF	HS	S(R)	F
☞ a. σσ́-σ			*	*
b. σσ-σ́	*!	*		*

T2 $\sigma\acute{\sigma}_H$-,-σ	HF	HS	S(R)	F
☞ a. σσ́-σ			*	
b. σσ-σ́	*!	*		*

T3 $\sigma\sigma\acute{}_H$-, -σ	HF	HS	S(R)	F
a. σσ́-σ	*		*	*
☞ b. σσ-σ́		*!		*

T4 $\sigma\sigma_H$-, -$\acute{\sigma}$	HF	HS	S(R)	F
a. σσ́-σ			*	*
☞ b. σσ-σ́		*!		

T5 $\sigma\sigma_H$-, -σ	HF	HS	S(R)	F
☞ a. σσ́-σ			*	
b. σ́σ-σ			**!	
c. σσ-σ́		*!		

Type III

HF >> S >> HS >> F
HF >> S >> F >> HS

Head accent wins (T1, T2); post-accenting heads win as well (T3); (non-head) accent does not surface (T4);[12] otherwise, default (T5).

[12] A suffix can be stressed only when S is EDGEMOST-R.

T1 σσ́$_H$-,-σ́	HF	S(R)	HS	F
☞ a. σσ́-σ		*		*
b. σσ-σ́	*!		*	*

T2 σσ́$_H$-, -σ	HF	S(R)	HS	F
☞ a. σσ́-σ		*	*	
b. σσ-σ́	*!			*

T3 σσ$_{\acute{H}}$-, -σ	HF	S(R)	HS	F
a. σσ́-σ	*!	*		*
☞ b. σσ-σ́			*	*

T4 σσ$_H$-, -σ́	HF	S(R)	HS	F
a. σσ́-σ		*!		*
☞ b. σσ-σ́			*	

T5 σσ$_H$-, -σ	HF	S(R)	HS	F
a. σσ́-σ		*!		
☞ b. σσ-σ́			*	

d. *head-stress systems without lexical accents*: Yupik, Chukchee
HS >> S >> HF >> F Head is always stressed on a syllable
HS >> S >> F >> HF determined by S (T1-T5).

T1 σσ́$_H$-, -σ́	HS	S(R)	HF	F
☞ a. σσ́-σ		*		*
b. σ́σ-σ		**!		*
c. σσ-σ́	*!		*	*

T2 σσ́$_H$-, -σ	HS	S(R)	HF	F
☞ a. σσ́-σ		*		
b. σσ-σ́	*!		*	*

T3 σσ$_{H}$́-, -σ	HS	S(R)	HF	F
☞ a. σσ́-σ		*	*	*
b. σσ-σ́	*!			*

T4 σσ$_{H}$-, -σ́	HS	S(R)	HF	F
☞ a. σσ́-σ		*		*
b. σσ-σ́	*!			

T5 σσ$_{H}$-, -σ	HS	S(R)	HF	F
☞ a. σσ́-σ		*		
b. σ́σ-σ		**!		
c. σσ-σ́	*!			