An Optimality Theoretic Approach to Accent Insertion*

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This paper explores the accentuation in the words consisting of inherently unaccented morphemes in the languages which distinguish between inherently accented and unaccented morphemes. In this paper, a variety of accent insertion in non-Indo-European languages (Turkish, Tokyo Japanese, Cupeno, and Thompson River Salish) is presented and compared with the word-initial accent insertion in Vedic Sanskrit, which is an Indo-European language. Then, from the viewpoint of Optimality Theory (OT) (Prince and Smolensky 1993 and McCarthy and Prince 1993a, b), it is argued that the parametric difference in the ranking relation of ALIGN-R(ACC, PrWd) and ALIGN-L(ACC, PrWd) between Vedic Sanskrit and Turkish causes the difference in accent insertion between these languages. Further, the examination of accentual systems of Cupeno and Thompson River Salish shows that Root Faith » Affix Faith as a meta-constraint is too fixed to explain a cross-linguistic variety of places for an inserted accent. This examination also shows that the difference in accent insertion among languages should be explained by the different rankings among domain-specific DEP-IO-faithfulness constraints.

Key words: inherent accent, accent insertion, Optimality Theory, MAX-IO, DEP-IO

1. Introduction

A number of languages, including Indo-European languages, distinguish between inherently accented (pre-accenting and post-accenting) and unaccented morphemes. Many phonologists have studied principles and parameters in the output realization of inherent accent in these languages

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from various viewpoints. However, the accentuation in the words consisting of inherently unaccented morphemes in these languages has been treated as trivial. This paper explores the accentuation in these words.

The main goal of this paper is to show from the viewpoint of Optimality Theory (OT) (Prince and Smolensky 1993 and McCarthy and Prince 1993a, b) that the proper analysis of a cross-linguistic variety in accent insertion requires a ROOT and an AFFIX as well as a PROSODIC WORD as a domain for Input-Output (IO) Faithfulness and that different rankings among domain-specific DEP-IO-faithfulness constraints explain different places for an inserted accent among languages.

Kiparsky and Halle (1977) have proposed that the accentuation of words in Indo-European languages is determined by the Basic Accentuation Principle (BAP):

(1) Basic Accentuation Principle (Kiparsky and Halle 1977: 209)
If a word has more than one accented vowel, the first of these gets the word accent. If a word has no accented vowel, the first vowel gets the word accent.

The first sentence of BAP tells us that the leftmost inherent accent survives and other ones disappear in the output. According to the second sentence of BAP, accent should be inserted word-initially in the words consisting of inherently unaccented morphemes.

The main concern of this paper is how to treat the non-Indo-European cases where the word-initial insertion of accent does not happen and thus the BAP takes no effect on accent insertion. In section 2, a variety of accent insertion in non-Indo-European languages is presented and compared with the word-initial accent insertion in Vedic Sanskrit.

In OT, accent insertion correlates with the role of IO-faithfulness, which enforces the correspondence between the input and the output. Emphasizing the distinction between roots and affixes in the IO-faithfulness, McCarthy and Prince (1995) have introduced distinct Root (IO) and Affix (IO) Faithfulness constraints and have proposed a meta-constraint (2) on Constraint Rankings.

(2) Meta-Constraint on Constraint Rankings (McCarthy and Prince 1995)
Root Faith » Affix Faith

In section 3, however, it is shown that Root Faith » Affix Faith as a

meta-constraint is too fixed to explain a cross-linguistic variety of places for an inserted accent. Further, it is argued that the difference in accent insertion among languages should be explained by the different rankings among domain-specific DEP-IO-faithfulness constraints. The conclusion of this paper is summarized in section 4.

2. A Variety of Accent Insertion

2.1. Vedic Sanskrit

Vedic Sanskrit, which is an Indo-European language, is one of the typical languages to which the BAP applies.[1] In Vedic Sanskrit, the leftmost inherent accent survives in the output and all other inherent accents are eliminated (e.g., /marút+é/→[marúte] 'wind (dat. sg.)').[2]

In the words consisting of inherently unaccented morphemes, accent is inserted on the first syllable, as shown in (3) (Kiparsky and Halle 1977, Kiparsky 1982, and Halle and Mohanan 1985). In this paper, roots are indicated with underlining in the input (Accent is realized as stress in the output in the languages discussed in this paper, except for in Tokyo Japanese).

(3) Accent Insertion in Vedic Sanskrit

a.	dúhitar	/duhitar/	'daughter (voc. sg.)'
	pád	/pād/	'foot (voc. sg.)'
b.	sárasvatīvant	/sar-as-vat-ī-vant/	'accompanied by Sarasvati'
	práticyavīyasi	/prati-cyav-īyas-i/	(unglossed)

1) Russian is quite like Vedic Sanskrit in that the BAP also applies to Russian. In other words, in Russian, the leftmost inherent accent survives in the output and all other inherent accents are eliminated, and accent is inserted word-initially in the words consisting of inherently unaccented morphemes; e.g., /koróv-á/→[koróva] 'cow (nom. sg.),' /borod-á/→[borodá] 'beard (nom. sg.),' /koróv-y/→[koróvy] 'cow (nom. pl.),' and /borod-y/→[bórody] 'beard (nom. pl.)' (see Halle 1973, 1996 and Idsardi 1992 for more details).

2) In previous studies there are no data which show where is the accentual place in the form [Inherently Accented Prefix + Inherently Accented Root]$_{PrWd}$ in Vedic Sanskrit. However, according to Kiparsky and Halle (1977), Kiparsky (1982), and Halle and Mohanan (1985), if this form would exist in Vedic Sanskrit, the inherent accent in the prefix should survive in the output and the inherent accent in the root should be eliminated. This assumption also applies to Russian, Turkish, and Tokyo Japanese.

Further evidence for the word-initial insertion in Vedic Sanskrit is also provided from dominance effects, which refer to the effects of morphologically conditioned deletion of accent from the bases where a random set of suffixes (called *dominant* suffixes) attach. For instance, the noun-forming suffix *-in*, which is dominant and inherently accented, always surfaces with accent regardless of whether the bases to which it attaches are inherently accented, as illustrated in (4), where 'dominance' is indicated with boldface.

(4) Words with a Dominant Suffix *-ín*
a. rathíne /ráth-**ín**-é/ 'charioteer (dat. sg.)'
b. mitríne /mitr-**ín**-é/ 'befriended (dat. sg.)'

As demonstrated in (4), in Vedic Sanskrit the bases to which dominant suffixes attach are quite like inherently unaccented morphemes regardless of whether they are inherently accented.

What is noted here is the accentuation in the words with inherently unaccented dominant suffixes. When inherently unaccented suffixes are dominant and their bases include inherently accented syllables, accent is inserted on the word-initial syllable and inherent accent in the bases is eliminated, as shown in (5) (Inher. = inherently, Unacc. = unaccented, Dom. = dominant).

(5) Words with Inher. Unacc. Dom. Suffixes
a. kárayitum /kār-áy-**itum**/ 'in order to cause to make'
b. cíkārayiṣati /ci-kār-áy-**iṣa**-ti/ 'wants to cause to make'

Important is that the words in (5) are quite like the words consisting of inherently unaccented morphemes even though they include an inherently accented morpheme *-áy-*. Therefore, the examples in (3) and (5) show that accent is inserted word-initially in Vedic Sanskrit when no inherent accent exists or when inherent accent is suppressed by dominant suffixes.

2.2. Turkish

Word-initial insertion of accent, which is predicted by the BAP, is not a cross-linguistic phenomenon. In Turkish, the leftmost inherent accent survives in the output and all other inherent accents are eliminated (e.g.,

/África-li-laš-ɨyor/→[Áfricalilašɨyor] 'being ones from Africa'). However, Turkish exhibits the word-final insertion of accent in the words of inherently unaccented morphemes, as illustrated in (6).

(6) Word-final Insertion in Turkish (Inkelas 1999)

a. arabá	/araba/	'car'
b. arabadá	/araba-da/	'car (loc.)'
c. arabalardán	/araba-lar-dan/	'car (abl. pl.)'
b. elmalardán	/elma-lar-dan/	'apple (abl. pl.)'

This is exactly opposite to the accentuation in accent insertion observed in Vedic Sanskrit.

2.3. Tokyo Japanese

Tokyo Japanese is similar to Vedic Sanskrit in that the leftmost inherent accent survives in the output and all other inherent accents are eliminated (e.g., /kokóro-máde/→[kokóromade] 'even heart'). In Tokyo Japanese, however, no accent is inserted in the words consisting of inherently unaccented morphemes, as shown in (7).

(7) No Insertion in Tokyo Japanese (Haraguchi 1977)

a. sakanaga	/sakana-ga/	'fish (subj.)'
b. gamabokoga	/gamaboko-ga/	'fish patty (subj.)'

Further evidence for no insertion of accent in Tokyo Japanese is also provided from dominance effects. For instance, the inherently unaccented dominant suffix *-kko* eliminates the inherent accent of its base *kóobe* 'Kobe' in the example of */kóobe-kko/→ [koobe-kko]* 'Native of Kobe' in (8a). No accent is inserted in this process, whereas accent is inserted word-initially in the similar case of Vedic Sanskrit. When *-kko* attaches to the inherently unaccented base *oosaka* 'Osaka' in (8b), the entire word *oosaka-kko* 'Native of Osaka' is left unaccented without any insertion of accent.

(8) Words with Inher. Unacc. Dom. Suffix *-kko*

a. koobe-kko	/kóobe-**kko**/	'Native of Kobe'
b. oosaka-kko	/oosaka-**kko**/	'Native of Osaka'

2.4. Thompson River Salish

Finally, let us examine the case where the place for an inserted accent is not fixed; neither word-initially nor word-finally. This is observed in Thompson River Salish (TRS).[3)]

According to Coelho (2002), in the TRS words of inherently unaccented morphemes, accent is inserted on the leftmost one of inherently unaccented suffixes except for the cases of [Prefix + Root]$_{PrWd}$ and [Root]$_{PrWd}$, as illustrated in (9).

(9) Accent Insertion in TRS (Coelho 2002)

a.	ʔeskiyeʔstə́s	/ʔes-kəyeʔ-s-t-es/	'respect s.o.'
b.	c'əq'^{w}xíts	/c'əq'^{w}-xi-t-es/	'write.s.o.'
c.	kɬə́m	/kəɬ-əme/	'subtract'
d.	ʔeskə́ɬ	/ʔes-kəɬ/	'detached, separate'
e.	k'^{w}éʔt	/k'^{w}eʔ-t/	'chewed'

In (9a) accent is inserted neither on the prefix *ʔes-* nor on the root *kəyeʔ*. Instead, it is inserted on the suffix *-es*. In (9b) accent is inserted on the leftmost suffix *-xi* and the vowel of unaccented suffix *-es* is deleted. In (9c) the root vowel *ə* is deleted and the first vowel of the suffix *-əme* is accented. This clearly shows that suffixes are preferred to roots in accent insertion and that accent is inserted on the first syllable of the leftmost suffix in the TRS words consisting of inherently unaccented morphemes.

However, accent is sometimes inserted on roots in TRS. When no suffix exists in a word as in (9d) or when no suffix has a vowel as in (9e), accent is inserted on the root. Accent is not inserted on the prefix *ʔes-* but on the root *kəɬ* in (9d) and it is inserted on the root *k^{w}eʔ* in (9e) because the suffix does not contain any vowels. This shows that roots are preferred to prefixes in accent insertion and that the word accent should always exist in TRS.

The four different cases of accent insertion so far discussed in this

3) As shown in the example of */k^{w}ə́n-nwə́n'-t-íyxs-n-t-em/→[k^{w}ənwen'tíyxsetm]* in TRS (Coelho 2002:3), the rightmost inherent accent survives in the output and the preceding inherent accents are all eliminated in TRS. This accentual pattern is a typical case of dominance effects, whereby accent is deleted from the base where a dominant suffix attaches. This is an important issue to be researched, but is just mentioned without more discussion in this paper and is left for further research because the main focus of this paper is on accent insertion.

section demonstrate a cross-linguistic variety in accent insertion. In section 3, it is shown that these different cases can be generalized by the different rankings among domain-specific DEP-IO-faithfulness constraints.

3. An Optimality Theoretic Approach to Accent Insertion

3.1. Conflicting Positional Faithfulness

The leftmost inherent accent survives and other ones disappear in the output in Vedic Sanskrit and Turkish. Here let us examine the following Turkish examples from the viewpoint of OT.

(10) Inherent Accent in Turkish (Inkelas 1999)[4]

a.	Áfricalilaš̆ɨyor	/África-li-laš-ɨyor/	'Being ones from Africa'
	penǰéreyle	/penǰére-' yle/	'with a window'
b.	arabáyla	/araba-' yla/	'with a car'
	gelíyormu	/gel-íyor-'mu/	'come (prog. interr.)'

As shown in (10), the leftmost inherent accent survives and other ones disappear in the output in Turkish. Within OT, the Input-Output (IO) faithfulness constraints are based on the following notion of correspondence proposed in McCarthy and Prince (1995).

(11) Correspondence (McCarthy and Prince 1995:5)
Given two strings S_1 and S_2, correspondence is a relation *R* from the elements of S_1 to those of S_2. Elements $\alpha \in S_1$ and $\beta \in S_2$ are referred to as correspondents of one another with $\alpha R \beta$.

The following positional faithfulness constraints are required for the survival of the leftmost/rightmost inherent accent.

4) The Turkish suffixes *-yle/a* and *-mu* are pre-accenting suffixes which assign accent to the immediately preceding syllable unless inherently accented syllables precede these suffixes.

(12) Conflicting Positional Faithfulness Constraints

a. MAX-IO$_{leftmost}$
The leftmost accent in the input has a correspondent in the output.

b. MAX-IO$_{rightmost}$
The rightmost accent in the input has a correspondent in the output

The survival of the leftmost inherent accent is triggered by the ranking MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$, which reflects the effect of BAP on the output realization of inherent accent. If an important prosodic well-formedness constraint SINGLE-ACCENT in (13) is undominated in Turkish, a single accent in the output in (10) is easily explained.

(13) SINGLE-ACCENT (SINGLE-ACC)
A prosodic domain contains a single accent.

The examples in (10) are explained by the constraint ranking SINGLE-ACC, MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$. The following tableau in (14) illustrates the example of */gel-íyor-ˈmu/→[gelíyormu]* 'come (prog. interr.).'

(14) /gel-íyor-ˈmu/→[gelíyormu]: MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$

/gel-íyor-ˈmu/	SINGLE-ACC	MAX-IO$_{leftmost}$	MAX-IO$_{rightmost}$
a. gel-íyór-mu	*!		
b. gel-iyór-mu		*!	
c. ☞gel-íyor-mu			*

While the constraint ranking SINGLE-ACC, MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$ explains the effect of BAP on the output realization of inherent accent in Vedic Sanskrit, Russian, and Turkish, this ranking cannot explain the difference in accent insertion between Vedic Sanskrit/Russian (word-initial insertion) and Turkish (word-final insertion). Two opposite positions for an inserted accent (Leftmost vs. Rightmost) imply the different rankings between two conflicting constraints, CONSTRAINT α and CONSTRAINT β.

(15) a. CONSTRAINT α » CONSTRAINT β: Vedic Sanskrit and Russian
b. CONSTRAINT β » CONSTRAINT α: Turkish

The next question is what are CONSTRAINT α and CONSTRAINT β.

McCarthy and Prince (1993a) propose that the morphology/prosody interface is to be defined in terms of edge alignment and formalize the general schema of edge alignment in OT as follows.

(16) General Schema for ALIGN (McCarthy and Prince 1993a:32)
In ALIGN(GCat, GEdge, PCat, PEdge), the GEdge of any GCat must coincide with PEdge of some PCat, where
GCat ≡ Grammatical Category, among which are the morphological categories
MCat ≡ Root, Stem, Morphological Word, Prefix, Suffix, etc.
PCat ≡ Prosodic Category ≡ μ, σ, Ft, PrWd, PhPhrase, etc.
MEdge, PEdge = Left, Right

For the alignment relation between accent (stress) and a prosodic word, the following prosodic well-formedness constraints based on the general schema for ALIGN in (16) are employed.

(17) Alignment Constraints (Alderete 2001a)
a. ALIGN-R(ACC, PrWd)
The right edge of every accent coincides with the right edge of some prosodic word.
b. ALIGN-L(ACC, PrWd)
The left edge of every accent coincides with the left edge of some prosodic word.

The following discussion shows that the constraint rankings in (15) are embodied by the different rankings between ALIGN-R(ACC, PrWd) and ALIGN-L(ACC, PrWd) in (18).

(18) a. Vedic Sanskrit and Russian
ALIGN-L(ACC, PrWd) » ALIGN-R(ACC, PrWd)
b. Turkish
ALIGN-R(ACC, PrWd) » ALIGN-L(ACC, PrWd)

In OT, the IO faithfulness constraint for accent insertion is DEP-IO. DEP-IO evaluates a pair of input-output forms and requires no insertion of elements in the output. Since every prosodic word should contain one

accented syllable in Vedic Sanskrit, accent should be inserted in the words consisting of inherently unaccented words. What this means in OT is that DEP-IO is outranked by SINGLE-ACC in Vedic Sanskrit.

The word-initial insertion of accent in Vedic Sanskrit is correctly predicted by SINGLE-ACC » DEP-IO and ALIGN-L(ACC, PrWd) » ALIGN-R (ACC, PrWd), as illustrated in the example of */sar-as-vat-ī-vant/→ [sárasvatīvant]* 'accompanied by Sarasvati' in (19).

(19) /sar-as-vat-ī-vant/→[sárasvatīvant]

/sar-as-vat-ī-vant/	SINGLE-ACC	DEP-IO	ALIGN-L	ALIGN-R
a. sar-as-vat-ī-vant	*!			
b. sar-as-vat-ī-vánt		*	*!***	
c. ☞sár-as-vat-ī-vant		*		****

As illustrated in (19), the ranking relation between DEP-IO and ALIGN-L(ACC, PrWd) is meaningless in explaining the word-initial insertion of accent in Vedic Sanskrit and it is not necessary to bifurcate DEP-IO into DEP-IO$_{root}$ and DEP-IO$_{affix}$ in Vedic Sanskrit.[5] What is crucial to determining the location for the inserted accent is the ranking ALIGN-L(ACC, PrWd) » ALIGN-R(ACC, PrWd) in Vedic Sanskrit.

It has been shown in 2.2 that Turkish is opposite to Vedic Sanskrit in accent insertion whereas it is quite like Vedic Sanskrit in the output realization of inherent accent. The word-final insertion of accent in Turkish has been demonstrated in (6), which is repeated as (20).

(20) (=(6)) Word-final Insertion in Turkish (Inkelas 1999)

a. arabá	/araba/	'car'
b. arabadá	/araba-da/	'car (loc.)'
c. arabalardán	/araba-lar-dan/	'car (abl. pl.)'
d. elmalardán	/elma-lar-dan/	'apple (abl. pl.)'

The word-final insertion of accent can be captured by ALIGN-R(ACC, PrWd) » ALIGN-L(ACC, PrWd), as illustrated in (21).

5) In order to distinguish roots from affixes in the DEP-IO-faithfulness, DEP-IO may be divided into DEP-IO$_{root}$ and DEP$_{affix}$ as follows.
DEP-IO$_{root}$: every accent in the output of root has a correspondent in its input;
DEP-IO$_{affix}$: every accent in the output of affix has a correspondent in its input.

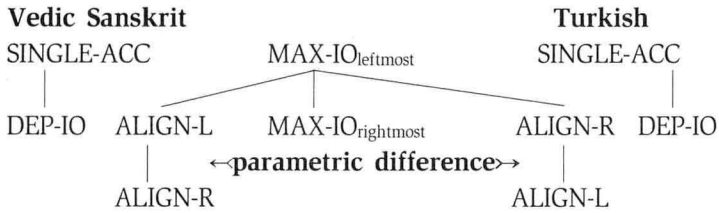
(21) /elma-lar-dan/→[elmalardán]: ALIGN-R » ALIGN-L

/elma-lar-dan/	SINGLE-ACC	DEP-IO	ALIGN-R	ALIGN-L
a elma-lar-dan	*!			
b. élma-lar-dan		*	*!**	
c. ☞elma-lar-dán		*		***

In discussing the constraint ranking in Turkish, it should be noted that ALIGN-R(ACC, PrWd) should be ranked below MAX-IO$_{leftmost}$ because the constraint ranking ALIGN-R(ACC, PrWd) » MAX-IO$_{leftmost}$ incorrectly predicts that the rightmost inherent accent survives and other ones are eliminated.

The constraint rankings argued for thus far are summarized below.

(22) Summary Rankings



The constraint rankings in (22) show that the parametric difference in the ranking relation of ALIGN-R(ACC, PrWd) and ALIGN-L(ACC, PrWd) between Vedic Sanskrit and Turkish causes the difference in the accentual patterns between these languages.

3.2. Accent Insertion in Cupeño: Root Faith and Affix Faith

It has been shown in 3.1 that the constraint ranking MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$ explains the effect of BAP on the output realization of inherent accent in Sanskrit, Russian and Turkish. However, Cupeño exhibits a different type of output realization of inherent accent. In this section, it is first argued that **Root Faith » Affix Faith**, instead of MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$, explains the output realization of inherent accent in Cupeño. Then, it is argued that the opposite ranking **Affix Faith » Root Faith** should exist in terms of DEP-IO faithfulness constraints in Cupeño. While the first argument is based on Alderete (2001b), the second one is against Alderete's (2001b) argument of root-controlled accentuation.

In order to explain the distinction between roots and affixes in the output realization of inherent accent in Cupeño, the following IO faithfulness constraints have been proposed in Alderete (2001b):

(23) IO Faithfulness Constraints: ROOT-AFFIX distinction (Alderete 2001b)
a. MAX-IO$_{root}$
Every accent in the input of root has a correspondent in its output.
b. MAX-IO$_{affix}$
Every accent in the input of affix has a correspondent in its output.

Since MAX-IO is a family of IO-faithfulness constraints evaluating a pair of input-output forms and requiring no deletion of input elements, Root Faith » Affix Faith implies MAX-IO$_{root}$ » MAX-IO$_{affix}$ in the output realization of inherent accent.

Now, let us examine the output realization of inherent accent in Cupeño. In Cupeño, a single accent (realized as *stress*) exists in the output of a prosodic word. Let us look at the Cupeño examples in (24).

(24) Cupeño Stress Pattern (Alderete 2001b)
a. Inher. Acc. Roots with Inher. Acc. Affixes

ʔáyuqa	/ʔáyu-qá/
'He wants'	WANT-PRES.SING
pəŋíypi	/pə́-ŋíy-pi/
'He would go away'	'3sg-GO-FUTURE

b. Inher. Unacc. Root √yax with Inher. Acc. Affixes

nə́yax	/nə́-yax/
'I said'	1sg-SAY
nəʔən yaqáʔ	/nəʔən yax-qá/
'I say'	1sg SAY-PRES.SING

As demonstrated in (24), inherent accent in roots always overrides inherent accent in affixes in Cupeño. Inherent accent in affixes may be realized as stress in the output only when roots are inherently unaccented.

SINGLE-ACC should be inviolable in Cupeño, where the domain refers to the prosodic word. In the Cupeño example of */ʔáyu-qá/→[ʔáyuqa]* 'he wants' in (24a), since the inviolable constraint SINGLE-ACC enforces a single accent in the output, MAX-IO$_{root}$ » MAX-IO$_{affix}$ results in the disappearance of inherent accent in the suffix, as illustrated in (25).

(25) /ʔáyu-qá/→[ʔáyuqa]: MAX-IO$_{root}$ » MAX-IO$_{affix}$

/ʔáyu-qá/	SINGLE-ACC	MAX-IO$_{root}$	MAX-IO$_{affix}$
a. ʔáyu-qá	*!		
b. ʔayu-qá		*!	
b. ☞ʔáyu-qa			*

One might ask whether the survival of root accent in Cupeño, as in Vedic Sanskrit and Turkish, is a result of the ranking between conflicting positional faithfulness constraints (MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$). In fact, the example of */ʔáyu-qá/→[ʔáyuqa]* can also be explained by MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$, as illustrated in (26).

(26) /ʔáyu-qá/→[ʔáyuqa]: MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$

/ʔáyu-qá/	SINGLE-ACC	MAX-IO$_{leftmost}$	MAX-IO$_{rightmost}$
a. ʔáyu-qá	*!		
b. ʔayu-qá		*!	
c. ☞ʔáyu-qa			*

However, it should be noted that inherent accent in prefixes cannot be realized in the output when roots are inherently accented in Cupeño. This pattern cannot be predicted by MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$. From the viewpoint of OT, this should be triggered by MAX-IO$_{root}$ » MAX-IO$_{affix}$, as shown in the example */pə́-ŋíy-pi/→[pəŋíypi]* in (27).

(27) /pə́-ŋíy-pi/ → [pəŋíypi]

a. MAX-IO$_{root}$ » MAX-IO$_{affix}$: [pəŋíypi]

/pə́-ŋíy-pi/	SINGLE-ACC	MAX-IO$_{root}$	MAX-IO$_{affix}$
a. pə́-ŋíy-pi	*!		
b. pə́-ŋiy-pi		*!	
b. ☞pə-ŋíy-pi			*

b. MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$: *[pə́ŋiypi]

/pə́-ŋíy-pi/	SINGLE-ACC	MAX-IO$_{leftmost}$	MAX-IO$_{rightmost}$
a. pə́-ŋíy-pi	*!		
b. ☜ pə́-ŋiy-pi			*!
b. ☞ pə-ŋíy-pi		*!	

MAX-IO$_{root}$ » MAX-IO$_{affix}$ also explains the cases in (24b), where inherently accented affixes attach to inherently unaccented roots: MAX-IO$_{root}$ is vacuously satisfied with unaccented roots and the lower ranked constraint MAX-IO$_{affix}$ chooses the forms with accented affixes as optimal.

Another important property of accentuation in Cupeño is observed when an inherently unaccented root occurs with more than one inherently accented affixes, as in the examples in (28), which are taken from Alderete (2001b: 14-15).

(28) Inher. Unacc. Roots with More Than One Inher. Acc. Affixes

a. /Préfix-Root-Súffix/→[Prefix-Root-Súffix]

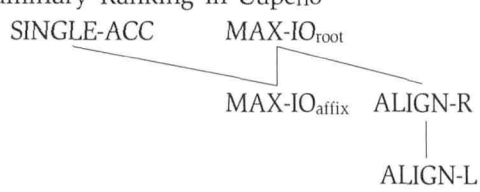
pəyaqál	/pə́-yax-qál/	'He was saying'
nəwənqál	/nə́-wən-qál/	'I was putting'

b. /(Préfix)-Root-Súffix-Súffix/→[(Prefix)-Root-Suffix-Súffix]

yaxqalí	/yax-qál-í/	'While ...was saying'
ʔəyaqalí	/ʔə́-yax-qál-í/	'...what you said'

The examples in (28) clearly show that when an inherently unaccented root occurs with more than one inherently accented affixes, it is the rightmost accent that survives in the output in Cupeño. This pattern holds between a prefix and a suffix as well as between two suffixes. These examples provide evidence against MAX-IO$_{leftmost}$ » MAX-IO$_{rightmost}$. Further, they also show that ALIGN-R(ACC, PrWd) outranks ALIGN-L(ACC, PrWd) in Cupeño. Of course, both ALIGN-R(ACC, PrWd) and ALIGN-L(ACC, PrWd) should be outranked by MAX-IO$_{root}$ because inherent accent in roots always overrides inherent accent in affixes. Therefore, the constraint ranking in Cupeño so far examined is summarized as follows:

(29) Summary Ranking in Cupeño



The examples of */pə́-yax-qál/→[pəyaqál]* and */ʔə́-yax-qál-í/→[ʔəyaqalí]* are correctly predicted by the constraint ranking in (29), as shown in (30).

(30) /pə́-yax-qál/→[pəyaqál] and /ʔə́-yax-qál-í/→[ʔəyaqalí]

a. /pə́-yax-qál/→[pəyaqál]

/pə́-yax-qál/	SINGLE-ACC	MAX-IO_{root}	MAX-IO_{affix}	ALIGN-R	ALIGN-L
a. pə́-yax-qál	*!			**	**
b. pə́-yax-qal			*	*!*	
c. ☞pə-yax-qál			*		**

b. /ʔə́-yax-qál-í/→[ʔəyaqalí]

/ʔə́-yax-qál-í/	SINGLE-ACC	MAX-IO_{root}	MAX-IO_{affix}	ALIGN-R	ALIGN-L
a. ʔə́-yax-qal-i			**	*!**	
b. ʔə-yax-qál-i			**	*!	**
c. ☞ʔə-yax-qal-í			**		***

In summary, with ALIGN-R(ACC, PrWd) » ALIGN-L(ACC, PrWd), Root Faith » Affix Faith represented as MAX-IO_{root} » MAX-IO_{affix} is effective in explaining the output realization of inherent accent in Cupeño.

In the next discussion, it will be shown that Root Faith » Affix Faith cannot predict the pattern of accent insertion in Cupeño, and further evidence is provided for Affix Faith » Root Faith (DEP-IO_{affix} » DEP-IO_{root}).

Let us compare the accent insertion of Cupeño with that of Vedic Sanskrit. Like in Vedic Sanskrit, in Cupeño accent is inserted word-initially in the words consisting of inherently unaccented morphemes, as shown in (31).

(31) Accent Insertion in Cupeño (Alderete 2001b)

a. yáxəm	/yax-əm/	'(YOU pl.) say!'
b. máxaʔəs	/max-aʔəs/	'Give it to us'
c. wə́na	/wən-a/	'Put it in (sg.)'

In the accent insertion of Cupeño it should first be noted that no inherently unaccented prefixes occur with the words the other part of which consists of inherently unaccented morphemes. In other words, in Cupeño at least one morpheme in the words with an inherently unaccented prefix is inherently accented (see Hill and Hill 1968 and Alderete 2001b for details). This morpho-accentual structure tells us that in the words consisting of inherently unaccented morphemes, the word-initial morpheme is always a

root in Cupeño.

Since every prosodic word should contain one accented syllable in the output in Cupeño, accent should be inserted in the words consisting of inherently unaccented words. Like in Vedic Sanskrit, therefore, DEP-IO should be outranked by SINGLE-ACC in Cupeño. In determining the location for the inserted accent, as shown in Vedic Sanskrit, it is important to capture the ranking relation between ALIGN-R(ACC, PrWd) and ALIGN-L (ACC, PrWd). Important here is that it has already been shown in the constraint ranking of Cupeño in (29) in which ALIGN-R(ACC, PrWd) outranks ALIGN-L(ACC, PrWd). Therefore, we expect that the location for the inserted accent is correctly predicted by SINGLE-ACC » DEP-IO and ALIGN-R(ACC, PrWd) » ALIGN-L(ACC, PrWd). However, the prediction is not correct because it triggers the word-final insertion of accent, as illustrated in (32).

(32) SINGLE-ACC » DEP-IO, ALIGN-R » ALIGN-L: Incorrect Prediction

/yax-əm/	SINGLE-ACC	DEP-IO	ALIGN-R	ALIGN-L
a yax-əm	*!			
b. ☜ yax-ə́m		*		*
c. ☞ yáx-əm		*	*!	

The incorrect form *yax-ə́m*, where accent is inserted on the suffix, satisfies ALIGN-R(ACC, PrWd), which is ranked above ALIGN-L(ACC, PrWd). On the other hand, the actual form *yáx-əm*, where accent is inserted on the root, violates it, though satisfying ALIGN-L(ACC, PrWd). Therefore, *yax-ə́m* is incorrectly predicted as optimal by this constraint ranking.

In spite of this incorrect prediction, the constraint ranking ALIGN-R (ACC, PrWd) » ALIGN-L(ACC, PrWd) cannot be abandoned in the Cupeño accentual system because it clearly explains the survival of the rightmost inherent accent in the words with an inherently unaccented root in Cupeño, as demonstrated in (30).

Without abandoning the constraint ranking ALIGN-R(ACC, PrWd) » ALIGN-L(ACC, PrWd), it is proposed here to bifurcate DEP-IO into DEP-IO$_{root}$ and DEP-IO$_{affix}$ and to rank DEP-IO$_{affix}$ above ALIGN-R(ACC, PrWd) and DEP-IO$_{root}$ in Cupeño. The effect of this ranking on accent insertion is that roots are preferred to affixes in accent insertion even though accent insertion in roots violates ALIGN-R(ACC, PrWd) more seriously than

accent insertion in suffixes, as illustrated in (33).

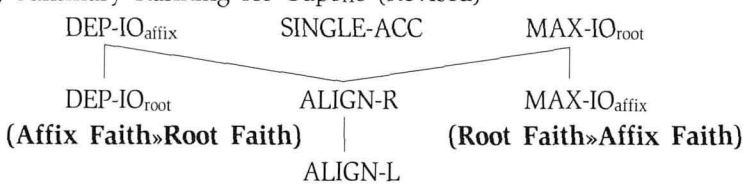
(33) SINGLE-ACC, DEP-IO$_{affix}$ » DEP-IO$_{root}$, ALIGN-R » ALIGN-L

/yax-əm/	SINGLE-ACC	DEP-IO$_{affix}$	DEP-IO$_{root}$	ALIGN-R
a yax-əm	*!			
b. yax-ə́m		*!		
c. ☞ yáx-əm			*	*

The incorrect form *yax-ə́m*, though satisfying ALIGN-R(ACC, PrWd), violates DEP-IO$_{affix}$, which is ranked above DEP-IO$_{root}$ and ALIGN-R(ACC, PrWd). On the other hand, the actual form *yáx-əm*, though violating DEP-IO$_{root}$ and ALIGN-R(ACC, PrWd), satisfies DEP-IO$_{affix}$. Therefore, *yáx-əm* is correctly predicted as optimal by this constraint ranking.

In summary, if DEP-IO$_{affix}$ outranks DEP-IO$_{root}$ and ALIGN-R(ACC, PrWd), the constraint ranking ALIGN-R(ACC, PrWd) » ALIGN-L(ACC, PrWd) can be retained in the Cupeno accentual system. The Cupeno accentual system contains the following constraint ranking.

(34) Summary Ranking for Cupeño (Revised)



The constraint ranking in (34) shows that Root Faith » Affix Faith cannot be retained in accent insertion whereas it is effective in explaining the output realization of inherent accent in Cupeño. In the next section, it will be shown that a cross-linguistic variety in accent insertion is explained by language-particular constraint rankings among DEP-IO (DEP-IO$_{affix}$ and DEP-IO$_{root}$) and other related prosodic constraints.

3.3. A Cross-linguistic Variety in Accent Insertion

It has been shown in 2.3 that no accent in Tokyo Japanese is inserted in the words consisting of inherently unaccented morphemes whereas Tokyo Japanese is similar to Vedic Sanskrit, Russian and Turkish in the output

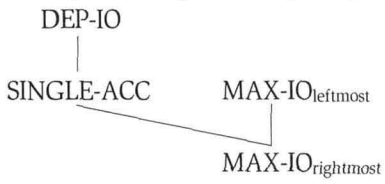
realization of inherent accent. In OT, no insertion of accent is explained by ranking DEP-IO above SINGLE-ACC, as illustrated in the example of */sakana-ga/→[sakanaga]* 'fish (subj.)' in (35).

(35) DEP-IO » SINGLE-ACC: /sakana-ga/→[sakanaga]

/sakana-ga/	DEP-IO	SINGLE-ACC
a sákana-ga	*!	
b. sakana-gá	*!	
c. ☞ sakana-ga		*

In Tokyo Japanese, it is not necessary to bifurcate DEP-IO into DEP-IO$_{affix}$ and DEP-IO$_{root}$, nor to determine the ranking relation between ALIGN-R(ACC, PrWd) and ALIGN-L(ACC, PrWd) because no accent is inserted:

(36) Summary Ranking for Tokyo Japanese



Finally, let us examine the movable insertion of accent in Thompson River Salish (TRS). The examples of (9) are repeated here in (37).

(37) (=(9)) Accent Insertion in TRS (Coelho 2002)

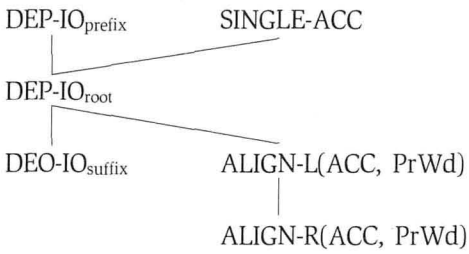
a.	ʔeskiyeʔstə́s	/ʔes-kəyeʔ-s-t-es/	'respect s.o.'
b.	c'əq'^{w}xíts	/c'əq'^{w}-xi-t-es/	'write.s.o.'
c.	kɬə́m	/kəɬ-əme/	'subtract'
d.	ʔeskə́ɬ	/ʔes-kəɬ/	'detached, separate'
e.	k'^{w}éʔt	/k'^{w}eʔ-t/	'chewed'

In TRS suffixes are preferred to roots in accent insertion. If the words of inherently unaccented morphemes contain at least one suffix, accent is always inserted on the first syllable of the leftmost suffix. However, accent is inserted on the root when no suffix exists in a word even though the word contains a prefix as in (37d) or when no suffix has a vowel as in (37e). In other words, roots are preferred to prefixes in accent

insertion and the word accent should always exist in TRS.

Since there is clear distinction between prefixes and suffixes as well as between roots and suffixes in accent insertion in TRS, DEP-IO is divided into three sub-constraints, DEP-IO$_{root}$, DEP-IO$_{suffix}$, and DEP-IO$_{prefix}$. Since suffixes are preferred to roots and roots are preferred to prefixes in accent insertion, the ranking among these three DEP-IO constraints should be DEP-IO$_{prefix}$ » DEP-IO$_{root}$ » DEP-IO$_{suffix}$. Further, since the leftmost suffix is most preferred among suffixes in accent insertion, the ranking relation between ALIGN-R(ACC, PrWd) and ALIGN-L(ACC, PrWd) should be ALIGN-L(ACC, PrWd) » ALIGN-R(ACC, PrWd). However, it should also be noted that ALIGN-L(ACC, PrWd) is ranked below DEP-IO$_{prefix}$ and DEP-IO$_{root}$ in TRS. Therefore, the constraint ranking for accent insertion in TRS is as follows:

(38) Summary Ranking for TRS



Now let us examine how this constraint ranking explains the movable insertion of accent in TRS. First, the following tableau exhibits the case where accent is inserted on the leftmost suffix.

(39) /c'əq'^{w}-xi-t-es/→[c'əq'^{w}xį́ts]: Accent Insertion on the Leftmost Suffix

/c'əq'^{w}-xi-t-es/	SINGLE-ACC	DEP-IO$_{root}$	ALIGN-L	DEP-IO$_{suffix}$	ALIGN-R
a c'əq'^{w}-xi-t-es	*!				
b. c'éq'^{w}-xi-t-es		*!			**
c. c'eq'^{w}-xi-t-és			**!	*	
d.☞c'əq'^{w}-xí-t-es			*	*	*

The unaccented form in (a) violates the inviolable constraint SINGLE-ACC. The root-accented form in (b), though satisfying ALIGN-L(ACC, PrWd),

violates DEP-IO$_{root}$, which outranks ALIGN-L(ACC, PrWd). In choosing an optimal form between the two suffix-accented forms in (c) and (d), *c'eq^{w}-xi-t-és* and *c'əq^{w}-xí-t-es*, ALIGN-L(ACC, PrWd) » ALIGN-R(ACC, PrWd) is crucial. ALIGN-L(ACC, PrWd) » ALIGN-R(ACC, PrWd) selects the leftmost suffix-accented form in (d), which violates ALIGN-L(ACC, PrWd) less fatally than the form in (c).

In the form of [Prefix-Root], accent is inserted on the root in TRS. The root-accent in this form is triggered crucially by DEP-IO$_{prefix}$ » DEP-IO$_{root}$» ALIGN-L(ACC, PrWd), as shown in (40).

(40) /ʔes-kəɬ/→[ʔeskə́ɬ]: Accent Insertion on the Root in [Prefix-Root]

/ʔes-kəɬ/	SINGLE-ACC	DEP-IO$_{prefix}$	DEP-IO$_{root}$	ALIGN-L	ALIGN-R
a ʔes-kəɬ	*!				
b. ʔés-kəɬ		*!			*
c. ☞ ʔes-kə́ɬ			*	*	

Finally, when no suffix has a vowel or when a root is used in isolation, accent is also inserted on the root because SINGLE-ACC is inviolable in TRS. The effect of an inviolable constraint SINGLE-ACC is illustrated in (41).

(41) /k'^{w}eʔ-t/→[k'^{w}éʔt]: Accent Insertion on the Root in [Root-(Suffix$_{voweless}$)]

/k'^{w}eʔ-t/	SINGLE -ACC	DEP-IO$_{prefix}$	DEP-IO$_{root}$
a k'^{w}eʔ-t	*!		
b. ☞ k'^{w}éʔ-t			*

To summarize the accent insertion in TRS, it is necessary to divide DEP-IO into three sub-constraints, DEP-IO$_{root}$, DEP-IO$_{suffix}$, and DEP-IO$_{prefix}$ and the preference order of suffixes » roots » prefixes in accent insertion is determined by the constraint ranking DEP-IO$_{prefix}$ » DEP-IO$_{root}$ » DEP-IO$_{suffix}$. Further, the preference of the leftmost suffix to other suffixes is caused by ALIGN-L(ACC, PrWd) » ALIGN-R(ACC, PrWd).

4. Conclusion

In this paper, we examined various types of accent insertion in some

languages. It has been shown that a variety of accent insertion in non-Indo-European languages is presented and compared with the word-initial accent insertion in Vedic Sanskrit. The examination of Cupeño accentual system has also shown that it is necessary to distinguish roots from affixes in determining a domain for Input-Output (IO) Faithfulness. While Root Faith (MAX-IO_{root}) overrides Affix Faith (MAX-IO_{affix}) in the output realization of inherent accent in Cupeño, accent insertion in Cupeño and TRS has demonstrated that McCarthy and Prince's (1995) proposal (Root Faith » Affix Faith is a meta-constraint on constraint rankings) is too strong to explain a cross-linguistic variety of places for an inserted accent. In other words, Root Faith does not always override Affix Faith. In conclusion, a cross-linguistic variety in accent insertion should be captured by the parametric difference in constraint rankings.

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