# Stress and Suffixation in Isbukun Bunun

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## 1. Introduction

This study investigates word stress in Isbukun Bunun from the perspective of Optimality Theory. In particular, the stress patterns of suffixed words are described, and two types of extrametricality are discussed: *morphological extrametricality* that applies to inflectional suffixation, and *initial extrametricality* that emerges in derivational suffixation. This paper is organized as follows. In the remainder of §1, the background and phoneme inventory of Isbukun Bunun are introduced. §2 presents the stress patterns for different types of suffixed and non-suffixed words. In §3, I propose a constraint hierarchy that accounts for the stress patterns, with a morpheme-specific markedness constraint and an anti-alignment constraint. §4 concludes this paper.

Isbukun, a dialect of Bunun, is an Austronesian language spoken in the Hualien, Kaohsiung, Nantou, and Taitung areas in Taiwan. Data presented in this paper was produced by speakers from all the four areas. The Kaohsiung variant is used when there is discrepancy with respect to word stress.

Based on existing work (e.g. Lin 1996) and our field work, Isbukun Bunun has fourteen consonants /p t k (ʔ) b d g m n ŋ v ð s h l/ and three short vowels /i a u/. Among the consonants, /g/ only appears in newly borrowed words, /l/ is pronounced [ɬ] by old people, and /ʔ/ has been lost in young generations. Before a tautosyllabic high front vowel /i/, /t/ becomes [tɕ] for some speakers and [ts] for the others; similarly, /s/ is produced as [ɕ] before a tautosyllabic /i/ by some speakers. As to the vowels, /i/ is a front non-low vowel that varies between [i] and [e], and /u/ is a back non-low vowel that varies between [u] and [o]. In addition, there are three long vowels /iː aː uː/ and six diphthongs /ia iu ai au ua ui/. Long vowels only emerge in stressed syllables, while short vowels and diphthongs appear in all contexts. There has been discussion on whether or not one of the elements in a diphthong is a glide in Isbukun Bunun (Huang 2005, Wu 2002). Since the issue is irrelevant to the focus of this paper, I leave the question open and only use vowel symbols in transcriptions for simplicity.

## 2. Stress patterns

Beginning with general footing principles, this section presents two types of quantitative change – vowel shortening and fusion, and two types of extrametricality – morphological and positional.

### *2.1. Basic footing*

In Isbukun Bunun, coda consonants do not contribute to syllable weight. Syllables with a long vowel (CVːC) or diphthong (CVVC) are heavy, and syllables with a short vowel (CVC) are light. A single quantity-sensitive trochee is formed at the right edge of a word (Huang 2008), as shown in (1).

(1) a. *Stress falls on the final syllable if it is heavy.*

| | | |
|---|---|---|
| L(ˈH)# | si.la.(ˈlaː) | ‘provoke; challenge’ |
| H(ˈH)# | ma.aun.(ˈvai) | ‘win in arm wrestling’ |

b. *If the final syllable is light, stress falls on the penultimate syllable.*

| | | |
|---|---|---|
| (ˈLL)# | pi.(ˈnas.kal) | ‘make happy’ |
| (ˈH)L# | i.(ˈais).ku | ‘near to’ |

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## *2.2. Vowel shortening*

Stress interacts with vowel length and syllable position in Isbukun Bunun. Long vowels only appear in the last syllable of a stem and always co-occur with stress. As illustrated in (2), long vowels are shortened when they become non-final for morphological purposes.

| | | | | | |
|---|---|---|---|---|---|
| (2) a. | u.(ˈva:ð) | ‘child’ | b. | u.vað.(ˈikit) | ‘kid’ |
| | taŋ.(ˈŋa:) | ‘hoe’ | | taŋ.ŋa.(ˈaus) | ‘big hoe’ |

One might argue that long vowels do not exist underlyingly. Examples in (2) might actually exhibit length alternation in order to satisfy some markedness requirement. That is to say, final stress is specified in the lexicon for words like (2a), where the final syllable become heavy in the surface to realize the lexical stress in situ, because otherwise stress would fall on the penultimate syllable according to the footing principles (see §2.1).[1] Indeed, similar metrical adjustment seems to occur in monosyllabic content words as well. As shown in (3), monosyllabic content words must be heavy.

(3) (ˈðu:) ‘elephant’ (ˈvu:s) ‘juice; milk’

However, it has been attested across languages that content words are preferably prosodic words. Prosodic structure is typically binary, and hence the minimum size of content words is one foot that consists of two moras (See Prince 1980, McCarthy & Prince 1986 for Prosodic Hierarchy, Foot Binarity, and Minimal Word). Vowel lengthening in monosyllabic content words conforms to the universal prohibition of degenerate feet, although it is capable of retaining underlying stress if there is any. Since there is no evidence for lexical stress in Isbukun Bunun, I consider the alternation in (2) as vowel shortening which is triggered by a prosodic constraint that prefers unstressed syllables to be light (see §3 for an OT analysis), rather than vowel lengthening which would result from lexical stress.

It is worth mentioning that falling diphthongs are monophthongized by some speakers,[2] as illustrated in (4). The monophthongized vowel is short when unstressed in (4a) and long when stressed in (4b), which further provides evidence that unstressed syllables tend to lose weight in Isbukun Bunun.

| | | |
|---|---|---|
| (4) a. | ma.aun.(ˈvai) ~ ma.ɔn.(ˈvai) | ‘win in arm wrestling’ |
| b. | pi.(ˈsauk) ~ pi.(ˈsɔ:k) | ‘bow (cau.)’ |

Vowel shortening appears not only in unstressed syllables, but also in stressed syllables that contain a derivational suffix. As illustrated in (5), underlying long vowels in stems are realized faithfully in (5a) but shortened in (5b), where suffixation integrates two vowels with different length and quality into a diphthong. The alternation keeps the number of syllables the least possible (see Selkirk’s (1981) Syllable Minimization Principle). Vowel shortening is not required in (5a), since the number of syllables would remain the same either way. Whereas in (5b), because this language strictly prohibits trimoraic syllables (e.g. *pan.du:an), the long vowel loses a mora to prevent forming additional syllables.

| | | | | | |
|---|---|---|---|---|---|
| (5) a. | V: => ˈV: | /pandu:/ | pan.(ˈdu:) | *(ˈpan.du) | ‘perch; stop’ |
| b. | V1: + V2 => ˈV1V2 | /pandu: + an/ | *pan.(ˈdu:).an | pan.(ˈduan) | ‘stopped (loc.)’ |

## *2.3. Vowel fusion*

With the same apparent motivation as vowel shortening, vowel fusion happens when derivational suffixation integrates two vowels with identical quality, as shown in (6). There are three cases: First, both vowels are short monophthongs such as (6a), where they merge into a long vowel without

[1] In Huang (2008), whose data was based on the variant spoken in Nantou, there is no long vowel in the Isbukun transcriptions. Final stress on a light syllable in non-affixed words (e.g. [taˈpa] ‘blanket’, which is [taˈpa:] in our data) was considered lexical.

[2] /au/ appears to be the only diphthong that has been consistently monophthongized. It seems the dialects in Hualien and Taitung have shown a stronger tendency to monophthongize.

reducing weight (*hai.pun). Second, two vowels have different length such as (6b), where they merge into a long vowel by losing a mora. Third, when the vowel in the stem is part of a diphthong, such as (6c), the diphthong and the vowel in the suffix merge into a diphthong by losing a mora. Vowel fusion, accompanied by weight reducing when necessary, minimizes the number of syllables in all three cases.

| | | | | | |
|---|---|---|---|---|---|
| (6) | a. V + V => ˈV: | /haipu + un/ | *hai.(ˈpu.un) | hai.(ˈpu:n) | ‘looked after (pat.)’ |
| | b. V: + V => ˈV: | /pandu: + un/ | *pan.(ˈdu:).un | pan(ˈdu:n) | ‘stopped (loc.)’ |
| | c. V1V2 + V2 => ˈV1V2 | /tanhaiiu + un/ | *tan.hai.i.(ˈu:n) | tan.hai.(ˈiun) | ‘stolen (pat.)’ |

Another possible analysis for the examples in (6b-c) is vowel deletion which deletes a short vowel when adjacent vowels have the same quality. However, the notion “vowel fusion” enables us to account for (6b-c) with the same mechanism as involved in (6a) and (5b), which is, vowels are merged into long vowels or diphthongs under the force of suffixation, and their length is reduced if otherwise the number of syllables in a word would increase.

### *2.4. Morphological extrametricality - Stress shift*

The stress pattern described above is not always the case. Stress also interacts with suffixation in Isbukun Bunun (Huang 2008).[3] If we roughly divide suffixation into derivation and inflection[4], derivational suffixation, as illustrated in (7b) and §2.2-2.3, obeys the general stress pattern as non-affixed words do, which shifts stress rightwards from the position in a non-suffixed stem. Whereas inflectional suffixation, as illustrated in (7c), exhibits extrametricality (Liberman & Prince 1977) that keeps stress on the same syllable as in the non-suffixed stem.

| (7) | a. Non-suffixed stem | | b. Derivational suffixation | | c. Inflectional suffixation | |
|---|---|---|---|---|---|---|
| | ma.(ˈsa.bah) | ‘sleep’ | ma.sa.(ˈba.h-a) | ‘sleep (imp.)’ | ma.(ˈsa.ba).h-in | ‘have slept (perf.)’ |
| | (ˈi.vut) | ‘snake’ | i.(ˈvu.t-að) | ‘worm’ | (ˈi.vu).ta | ‘that snake’ |

Furthermore, compounds such as (2) follow the stress pattern of monomorphemic and derivationally suffixed words, while clitics behave like inflectional suffixes, such as in (8). Since the inflectional suffixes that we have found in Isbukun Bunun do not co-occur in a word, suffixed words with clitics might be the only context that helps determine the range of extrametricality. As shown in (9), inflectional suffixes and clitics are never stressed, whether they are the final morpheme of a word (9b) or not (9c).

| | | | | |
|---|---|---|---|---|
| (8) | ma.(ˈdai.dað) | ‘adore’ | ma.(ˈdai.da).ð-ik | ‘I adore’ |
| | pa.li.han.(ˈsiap) | ‘discuss’ | pa.li.han.(ˈsiap).-ta | ‘we (incl.) discuss’ |

| | | | | |
|---|---|---|---|---|
| (9) | a. an.ta.(ˈlaun) | ‘accepted (pat.)’ | in.da.(ˈŋa.ðan) | ‘helped (loc.)’ |
| | b. an.ta.(ˈlau).n-in | ‘has been accepted (perf.)’ | in.da.(ˈŋa.ðan).-ku | ‘be helped by me’ |
| | c. an.ta.(ˈlau).n-in.-su | ‘has been accepted by you’ | in.da.(ˈŋa.ðan).-ku-as | ‘you’re helped by me’ |

### *2.5. Positional extrametricality - Non-initiality*

Besides morphological extrametricality which is sensitive to the distinction between derivational and inflectional suffixation, there is positional extrametricality in Isbukun Bunun which avoids generating feet at the left edge of a root. Recall that vowels are shortened and fused to minimize the number of syllables in this language (see §2.2-2.3); such quantitative adjustments do not happen, however, if otherwise the stress would fall at the beginning of a root. As illustrated in (10) where a derivational suffix attaches to a monosyllabic, bimoraic root, the long vowel or diphthong in the root is

[3] Huang (2008) attributes stress shift to non-morphological properties of suffixes, which cannot account for our data.

[4] Classification of morphological types is beyond the scope of this paper. Solely based on stress patterns, suffixation like (7a) includes: focus markers *-un* and *-an*, imperative markers *-a*, *-av*, and *-aŋ*, and diminutive *-að*; suffixation like (7b) includes: aspect markers *-in* and *-aŋ* and determiners *-a*, *-an*, *-tia*, *-tin*, and *-tan*.

split into two short vowels, which increases the number of syllables so that the initial part of a root will not be stressed.

(10) Monosyllabic, bimoraic root + derivational suffix

| | | | |
|---|---|---|---|
| /mu: + -an/ | *(ˈmuan) | mu.(ˈuan) | 'your place (loc.)' |
| /suis + -un/ | *(ˈsui).sun | su.(ˈi.sun) | 'graved into threads (pat.)' |

In fact, (10) is the only environment where non-initiality emerges. As illustrated in (11a), when an inflectional suffix or clitic attaches to a monosyllabic, bimoraic root (*sia* 'locative marker'), due to morphological extrametricality that avoids footing inflectional suffixes or clitics (see §2.4), the foot is formed with the same boundaries as the root. Also note that non-initiality exclusively targets roots, rather than stems. In (11b), the word /ku-sia-an/ can be analyzed as the derivational suffix /-an/ attaching to the stem /ku-sia/, since /ku-sia/ is able to be combined with other affixes (e.g. *makusia* 'use', *iskusia* 'used for (ins.)') while /sia-an/ is not. If non-initiality applied to stems, the diphthong in the root /sia/ would not be split into different syllables, because the foot is not formed at the beginning of a stem anyway. However, the stress placement in (11b) is the same as (10), which suggests that non-initiality only concerns roots.

(11) a. Monosyllabic, bimoraic root + inflectional suffix

| | | | |
|---|---|---|---|
| /masi- + sia + -in/ | ma.(ˈsia).in | *ma.si.(ˈain) | 'have belonged (perf.)' |

b. Monosyllabic, bimoraic root + derivational suffix

| | | | |
|---|---|---|---|
| /ku- + sia + -an/ | *ku.(ˈsian) | ku.si.(ˈa:n) | 'used (loc.)' |

Another environment where non-initiality potentially applies is monosyllabic, monomoraic roots; however, here positional extrametricality is suppressed by the prohibition against quantitative increase. As illustrated in (12), short vowels in a monosyllabic root are not split, even though the foot begins from the same syllable as the root.

(12) Monosyllabic, monomoraic roots

| | | | |
|---|---|---|---|
| /ip + -un/ | (ˈi.pun) | *i.(ˈi.pun) | 'puffed (pat.)' |
| /hud + -an/ | (ˈhu.dan) | *hu.(ˈu.dan) | 'drunk (loc.)' |

### *2.6. Summary*

To sum up, words in Isbukun Bunun have only primary stress, which is represented by a quantity-sensitive trochee built at the right edge of a word. Across morphological categories, syllable weight is reduced when underlyingly long vowels appear in unstressed syllables. Except for basic footing and vowel shortening rules, all the stress patterns in this language more or less depend on morphological structure. There are two types of extrametricality: One is sensitive to morphological categories – inflectional suffixes and clitics are never stressed; the other is positional – feet are preferably not formed at the left edge of a root. Since feet are constructed at the end of a word and derivational suffixes are allowed to be footed, quantitative changes take place in derivational suffixation: adjacent vowels with the same quality merge into one when two vowels come from different morphemes (i.e. the final segment of the stem and the initial segment of the suffix), in which case, moras are discarded when necessary, in order to minimize the number of syllables.

## 3. An OT analysis

With corresponding subsections, this section presents OT constraints and constraint hierarchies that yield the stress patterns described in §2.

### *3.1. Basic footing*

The foot type in Isbukun Bunun is the moraic trochee, which can be captured by the set of constraints listed in (13): FT-BIN, FT-TYPE=T, RH-CONTOUR, and WSP. FT-BIN generates feet composed of two syllables or moras. FT-TYPE=T guarantees trochees by excluding iambs and unstressed feet from all binary feet that fulfill FT-BIN. RH-CONTOUR and WSP together penalize syllabic trochees: RH-CONTOUR rules out feet of the type (HL), while WSP rules out feet of the type (LH) or (HH). Thus, only feet of the type (H) or (LL), namely moraic trochee, are legal.

(13) FT-BIN: Feet are binary under moraic or syllabic analysis. (Prince & Smolensky 1993)
FT-TYPE=T: Feet have initial prominence. (Prince & Smolensky 1993)
RH-CONTOUR: Every foot ends in a strong-weak contour at the moraic level. (Prince & Smolensky 1993)
WSP: Heavy syllables are stressed. (Prince & Smolensky 1993)

For foot construction, PARSE-σ, ALL-FT-R, and DEP-μ as listed in (14), are used to interact with WSP. PARSE-σ assigns as many syllables into feet as possible while ALL-FT-R arranges feet as close to the right edge as possible, and DEP-μ makes sure syllable weight does not increase during footing. Since primary stress falls toward the end of a word, and secondary stress is not found, ALL-FT-R must dominate PARSE-σ and WSP in Isbukun Bunun. As shown in (15), this language will leave two moras unfooted and a heavy syllable unstressed, rather than have a foot far from the right edge of a word.

(14) PARSE-σ: Syllables are parsed by feet. (Prince & Smolensky 1993)
ALL-FT-R: Every foot stands at the right edge of a PrWd. (McCarthy and Prince 1993)
DEP-μ: Output moras have input correspondents. (Kager 1999)

(15) **ALL-FT-R >> WSP, PARSE-σ**

| /aunbiskav/ 'upset' | ALL-FT-R | WSP | PARSE-σ |
|---|---|---|---|
| ☞ a. aun.(ˈbis.kav) | | * | * |
| b. (ˌaun).(ˈbis.kav) | *!* | | |

Along with the set of constraints for foot type, ALL-FT-R has to be dominated by RH-CONTOUR and DEP-μ, and PARSE-σ by FT-TYPE=T and WSP. As shown in (16), the winner (16a) violates ALL-FT-R but not RH-CONTOUR or DEP-μ, while candidate (16b) and (16c) do the reverse. In (17), the winner (17a) violates PARSE-σ but not FT-TYPE=T or WSP, while the loser (17b) violates only FT-TYPE=T and (17c) only WSP.

(16) **RH-CONTOUR, DEP-μ >> ALL-FT-R >> PARSE-σ**

| /HL/ | RH-CONTOUR | DEP-μ | ALL-FT-R | PARSE-σ |
|---|---|---|---|---|
| ☞ a. (ˈH)L | | | * | * |
| b. (ˈHL) | *! | | | |
| c. H(ˈH) | | *! | | * |

(17) **FT-TYPE=T, WSP >> PARSE-σ**

| /LH/ | FT-TYPE=T | WSP | PARSE-σ |
|---|---|---|---|
| ☞ a. L(ˈH) | | | * |
| b. (LˈH) | *! | | |
| c. (ˈLH) | | *! | |

### *3.2. Vowel shortening*

There are five constraints involved in vowel shortening: *STRUC-σ and MAX-μ as listed in (18) interacts with ALL-FT-R, WSP, and PARSE-σ.

(18) *STRUC-σ: No syllables. (Zoll 1994)
MAX-μ: Input moras have output correspondents. (Kager 1999)

Since long vowels only emerge in the last syllable of a word, ALL-FT-R and WSP must dominate MAX-μ. In (19) where an underlyingly long vowel appears non-final and unstressed in the output, the faithful candidate (19b) loses because unstressed syllables are not permitted to be heavy, and (19a) wins by giving up a mora. In (20) where an underlyingly long vowel appears non-final but stressed in the output, the faithful candidate (20b) still loses because the foot is farther from the right edge, and (20a) again wins by giving up a mora.

(19) **WSP >> MAX-μ**

| /uva:ð + ikit/ 'kid' | WSP | MAX-μ |
|---|---|---|
| ☞ a. u.vað.(ˈi.kit) | | * |
| b. u.va:ð.(ˈi.kit) | *! | |

(20) **ALL-FT-R >> MAX-μ, PARSE-σ**

| /masmu:l+a/ 'soak (imp.)' | ALL-FT-R | MAX-μ | PARSE-σ |
|---|---|---|---|
| ☞ a. mas.(ˈmu.la) | | * | * |
| b. mas.(ˈmu:).la | *! | | ** |

When an underlyingly long vowel becomes stressed and word-final in the output, vowel shortening occurs only in suffixed words, as illustrated in (21) and (22). For non-suffixed words of which the last syllable contains a long vowel, such as in (21), the faithful candidate (21a) survives even though the loser (21b) parses more syllables. That suggests MAX-μ must dominate PARSE-σ. For suffixed words of which the last syllable contains a long vowel, such as in (22), candidate (22b) loses because it contains more syllables than (22a), despite its faithfulness to the number of moras. That means STRUC-σ must dominate MAX-μ.

(21) **MAX-μ >> PARSE-σ**

| /masmu:l/ 'soak' | MAX-μ | PARSE-σ |
|---|---|---|
| ☞ a. mas.(ˈmu:l) | | * |
| b. (ˈmas.mul) | *! | |

(22) ***STRUC-σ >> MAX-μ >> PARSE-σ**

| /sisasa: + un/ 'tolerated (pat.) | *STRUC-σ | MAX-μ | PARSE-σ |
|---|---|---|---|
| ☞ a. si.sa.(ˈsaun) | *** | * | ** |
| b. si.sa.sa.(ˈaun) | ****! | | *** |

## *3.3. Vowel fusion*

The constraints used for vowel shortening account for vowel fusion as well. As illustrated in (23)-(25), the constraint hierarchy *STRUC-σ, ALL-FT-R >> WSP >> MAX-μ >> PARSE-σ produces all three cases of vowel fusion that are summarized in (6).[5] Note that the competition between (25a) and (25c) reveals that *STRUC-σ outranks WSP, for which we have not found an example in the data of vowel shortening. In (25), candidate (25a) with fewer syllables beats (25c), although (25c) fulfills WSP while (25a) does not.

(23) V + V => ˈV: MAX-μ >> PARSE-σ

| /inba + an/ 'scalded (loc.)' | MAX-μ | PARSE-σ |
|---|---|---|
| ☞ a. in.(ˈba:n) | | * |
| b. (ˈin.ban) | *! | |

[5] Faithfulness constraints on segments (e.g. MAX-seg) are not necessarily relevant here. Examples like (24) and (25) can be seen as different vowels in the input being mapped to the same vowel in the output (e.g. /sisasa:1 + a2n/ → [si.sa.(ˈsa:12 n)]).

(24) V: + V => ˈV: *STRUC-σ, ALL-FT-R >> MAX-μ >> PARSE-σ

| /sisasa: + an/ ‘tolerated (loc.)’ | *STRUC-σ | ALL-FT-R | MAX-μ | PARSE-σ |
|---|---|---|---|---|
| ☞ a. si.sa.(ˈsa:n) | *** | | * | ** |
| b. si.sa.(ˈsa:).an | ****(!) | *(!) | | *** |

(25) V1V2 + V2 => V1ˈV2: ***STRUC-σ >> WSP >> MAX-μ >> PARSE-σ**

| /tanhaiiu + un/ ‘stolen (pat.)’ | *STRUC-σ | WSP | MAX-μ | PARSE-σ |
|---|---|---|---|---|
| ☞ a. tan.hai.(ˈiun) | *** | * | * | ** |
| b. tan.hai.i.(ˈu:n) | ****! | * | | *** |
| c. tan.ha.i.(ˈiun) | ****! | | * | *** |

### *3.4. Morphological extrametricality* **-** *Stress shift*

Stress shift distinguishes derivation from inflection and clitics. Morphologically, there are at least two major differences between the two categories: One is that inflectional affixes and clitics can attach to derivational words, but not vice versa; the other is that inflectional affixes and clitics must attach to free morphemes, while derivational affixes may attach to bound morphemes. Following the output-output correspondence theories (e.g. McCarthy and Prince 1995), OO-ID(stress) is used to require polymorphemic words to copy the output prosodic structures of their morphological constituents, as defined in (26). Inflectional words and words with clitics strictly obey OO-ID(stress), which prevents inflectional suffixes and clitics from being footed, since free morphemes to which they attach have prosodic specifications in the output. In contrast, derivational words and compounds prefer the general footing rules that apply to monomorphemic words, whether or not they contain free morphemes, as analyzed in §3.1-3. Since words with inflectional affixes or clitics cannot undergo derivation, inflectional suffixes and clitics are never rid of OO-ID(stress) and hence always unstressed. Based on indexed constraint theories (e.g. McCarthy and Prince 1995), I propose a pair of morpheme-specific constraints to account for the morphology-driven stress assignment: a higher ranked OO-ID(stress) with index INF that refers to inflectional suffixes and clitics, and a lower ranked clone with no index.

(26) OO-ID(stress): Correspondent elements are identical in stress. (Pater 2000)

Compare (27a) with (27b). When a inflectional suffix attaches to a stem, as shown in (27a), OO-ID(stress)$_{INF}$ penalizes candidate (27a.I) where the stress falls on a syllable different from the base; therefore, (27a.II) wins even though the foot does not stand at the end of a word. In contrast, when a derivational suffix attaches to the same stem, as shown in (27b), since OO-ID(stress)$_{INF}$ is not relevant, ALL-FT-R rules out candidate (27bII) where the foot does not align with the right edge of a word; thus, (27bI) wins despite the violation against OO-ID(stress). Through the same mechanism, when clitics attach to a stem such as in (28) and (29), stress stays in the same syllable regardless of the size of attachments.

(27) Stem + suffix

| Base: (ˈi.vut) ‘snake’ | | OO-ID(stress)$_{INF}$ | ALL-FT-R | OO-ID(stress) |
|---|---|---|---|---|
| a. /ivut + an$_{INF}$/ ‘this/these snakes(s)’ | I. i.(ˈvu.t-an) | *! | | * |
| | ☞ II. (ˈi.vu).t-an | | * | |
| b. /ivut + að/ ‘worm’ | ☞ I. i.(ˈvu.t-að) | | | * |
| | II. (ˈi.vu).t-að | | *! | |

(28) Stem + 1 clitic

| Base: in.da.(ˈŋa.ðan) ‘helped (loc.)’ /indaŋaðan + ku$_{INF}$/ ‘be helped by me’ | OO-ID (stress)$_{INF}$ | ALL-FT-R | OO-ID (stress) |
|---|---|---|---|
| a. in.da.ŋa.(ˈðan.-ku) | *! | | * |
| ☞ b. in.da.(ˈŋa.ðan).-ku | | * | |

(29) Stem + 2 clitics

| Base: in.da.(ˈŋa.ðan).-ku 'be helped by me' /indaŋaðan + $ku_{INF}$ + $as_{INF}$/ 'you are helped by me' | OO-ID $(stress)_{INF}$ | ALL-FT-R | WSP | OO-ID (stress) |
|---|---|---|---|---|
| a. in.da.ŋa.ðan.(ˈ-ku-as) | *! | | | * |
| ☞ b. in.da.(ˈŋa.ðan).-ku-as | | * | * | |

### *3.5. Positional extrametricality - Non-initiality*

Initial extrametricality has been attested in a variety of American Indian languages as well as some Altaic, Bantu, Finno-Uralic, and Irish languages (Buckley 2009). In Isbukun Bunun, non-initiality emerges when derivational suffixes attach to monosyllabic, bimoraic stems. I adopt the anti-alignment constraint *ALIGN-L and confine its scope to roots, as defined in (30). It interacts with the faithfulness constraint DEP-μ, the markedness constraint *STRUC-σ that causes quantitative reduction and OO-ID$(stress)_{INF}$ that causes morphological extrametricality.

(30) *ALIGN-L(Root, FT): No foot stands at the left edge of a root. (Adapted from Buckley 2009)

As shown in (31), where a derivational suffix is attached to a monosyllabic, bimoraic root, candidate (31b) loses because the foot is formed at the beginning of the root, while candidate (31a) survives although it has more syllables than (31b), which suggests *ALIGN-L(Root, FT) outranks *STRUC-σ. In (32), however, when an inflectional suffix attaches to a monosyllabic, bimoraic root, candidate (32a) with a foot formed at the beginning of the root wins, while candidate (32b) is ruled out because the stressed syllable is different from the base, which means *ALIGN-L(Root, FT) is ranked lower than OO-ID$(stress)_{INF}$.

(31) Monosyllabic, bimoraic root + derivational suffix

| /mu: + an/ 'your place (loc.)' | *ALIGN-L(Root, FT) | *STRUC-σ | MAX-μ | PARSE-σ |
|---|---|---|---|---|
| ☞ a. mu.(ˈuan) | | ** | | * |
| b. (ˈmuan) | *! | * | * | |

(32) Monosyllabic, bimoraic root + inflectional suffix

| Base: ma.si.(ˈsia) 'belong' /masi- + sia + $-in_{INF}$/ 'have belonged (perf.)' | OO-ID $(stress)_{INF}$ | *ALIGN-L (Root, FT) | ALL-FT-R | PARSE-σ | OO-ID (stress) |
|---|---|---|---|---|---|
| ☞ a. ma.(ˈsia).in | | * | * | * | |
| b. ma.si.(ˈain) | *! | | | ** | * |

For monosyllabic, monomoraic roots such as in (33), similar to the monosyllabic, bimoraic roots with inflectional suffixes, candidate (33a) with a foot formed at the left edge of the root wins. However, OO-ID$(stress)_{INF}$ cannot be the cause, since the suffixation occurring here is derivational. The candidate (33b) is excluded by DEP-μ, which outranks *ALIGN-L(Root, FT) and penalizes the epenthesized mora.

(33) Monosyllabic, monomoraic root

| /ip + un/ 'puffed (pat.)' | DEP-μ | *ALIGN-L (Root, FT) | *STRUC-σ | MAX-μ | PARSE-σ |
|---|---|---|---|---|---|
| ☞ a. (ˈi.pun) | | * | ** | | |
| b. i.(ˈi.pun) | *! | | *** | | * |

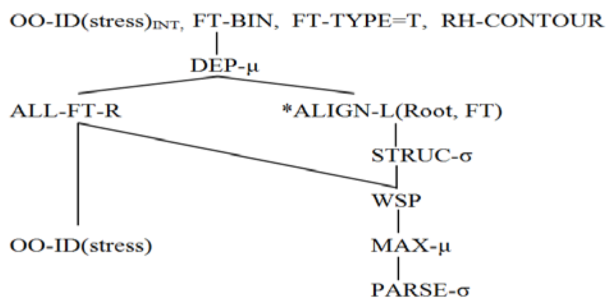
### *3.6. Summary*

To sum up, the crucial constraint rankings illustrated in this section are listed below:
1) Basic footing: FT-BIN, FT-TYPE=T, RH-CONTOUR, DEP-σ >>ALL-FT-R >>WSP >>PARSE-σ;
2) Quantitative adjustment: *STRUC-σ, ALL-FT-R >>WSP >>MAX-μ >>PARSE-σ;

3) Morphological extrametricality: OO-ID(stress)$_{INF}$ >>ALL-FT-R >>OO-ID(stress);
4) Positional extrametricality: OO-ID(stress)$_{INF}$ >>*ALIGN-L(Root, FT) >>*STRUC-σ.

## 4. Conclusion

This paper explores the interaction between stress and suffixation in Isbukun Bunun. The diagram in (34) gives an overview of the constraint hierarchies responsible for stress patterns in monomorphemic and compound words, derivational and inflectional suffixation, and words with clitics. Among all the constraints, FT-BIN, FT-TYPE=T, RH-CONTOUR, and OO-ID(stress)$_{INT}$ are inviolate in this language and hence undominated. DEP-μ is not violated in suffixation but should be dominated by FT-BIN, FT-TYPE=T, RH-CONTOUR, and OO-ID(stress)$_{INT}$, according to some stress patterns that are not explored in this paper (e.g. minimal word effect and prefixation). The morpheme-specific constraint OO-ID(stress)$_{INT}$ and the anti-alignment constraint *ALIGN-L(Root, FT) trigger morphological and positional extrametricality respectively. Undominated OO-ID(stress)$_{INT}$ draws a clear distinction between derivational and inflectional words, of which the former behave like monomorphemic words while the latter do not. *ALIGN-L(Root, FT) being ranked lower than OO-ID(stress)$_{INT}$ and DEP-μ confines the emergence of non-initiality in derivational words with roots not smaller than two moras. Finally, the constraints triggering weight reduction, *STRUC-σ and ALL-FT-R, are ranked around the middle of the hierarchies, which ensures weight reduction to occur only when both types of extrametricality are achieved.

(34)
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