Deriving the Compounding Parameter from Phonology[*]

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Abstract

Snyder (2001) proposes the compounding parameter that governs the productivity of compounding and the acceptability of complex predicate constructions in languages. This paper argues that the compounding parameter can be derived from the stress location in a word in the language, together with the prosodic constraint on complement-movement. It is claimed that the compounding parameter does not need to be assumed in the morphosyntax and in the process of languages acquisition.

1. Introduction

The Minimalist Program claims that there are conditions on the interface between syntax and the sensorimotor (SM) system and conceptual-intentional (C-I) system (Chomsky 1995). To pursue this idea, we need to reconsider the status of those syntactic parameters proposed to explain variations in the world's languages, including the head-directionality parameter. One possible goal of research is to show that all the morphosyntactic parameters are due to phonological differences between languages.

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Mazuka (1996) and Nespor et al. (1996) argue that the value of head-directionality parameter is determined by the rhythm in a prosodic category, i.e. intonational phrase or phonological phrase, in the language. Tokizaki (2011) and Tokizaki and Kuwana (to appear) show that the orders in head-complement pairs are derived from the word-stress location in the world's languages. Richards (2010) proposes that the occurrence of wh-movement depends on the prosodic phrasing as well as head-direction parameter. If these studies are on the right track, we can expect to find other morphosyntactic parameters that are derived from phonology.

In this paper, I argue that the compounding parameter proposed by Snyder (2001) can be derived from word-stress location in the language. Based on Stowell's (1981) analysis, Snyder (2001) and Sugisaki and Snyder (2002) argue that it is the compounding parameter that decides productive compounding, complex predicate constructions and pre/post-position stranding. However, they do not discuss the nature of the parameter in detail, and it is not clear how the parameter is set in language acquisition. I show that there is a correlation between word-stress location and the compounding parameter. I argue that we can derive the compounding parameter from the stress location in a word in the language, together with the prosodic constraint on complement-movement. It is claimed that the compounding parameter does not need to be assumed in the morphosyntax and in the process of languages acquisition.

In Section 2, I review the compounding parameter (Snyder 2001) and word-stress typology (Goedemans and van der Hulst 2011a, b). The data show that there is a correlation between word-stress location and the compounding parameter. Section 3 discusses the reason why stress location determines the effects of the compounding parameter. I argue that the correlation stems from the asymmetry between left-branching structures and right-branching structures in the syntax-phonology interface. In Section 4, I compare the productivity of compounding in Germanic and Romance languages by investigating recursive compounds. Section 5 shows that recursive compounds are found in languages with lefthand stress or no stress. Section 6 shows that languages with righthand stress are non-recursive in compounding. Section 7 concludes the discussion.

2. The Compounding Parameter and Word-Stress Typology

2.1. The Compounding Parameter and Complex Predicates

Snyder (2001: 328) proposes the compounding parameter as formulated in (1).

(1) The grammar {disallows*, allows} formation of endocentric compounds during the syntactic derivation. [*unmarked value]

The relevant type of compounding is productive, endocentric root compounding as shown in (2).

(2) a. banana box (for 'a box in which bananas are stored')

b. worm can (for 'a can in which fishing bait is stored')

This type of compounding is allowed in English but not in Spanish, which uses phrases in place of novel compounds as shown in (3) (cf. Snyder 2005: 1).

(3) a. * banana caja/ * caja banana

banana box/ box banana

b. caja de banano

box of banana

Thus, the value of compounding parameter (1) is marked ("allows") in English and unmarked ("disallows") in Spanish.

Snyder (2001) argues that a language allows complex predicate constructions such as resultative constructions and verb-particle constructions only if it has a plus value in the compounding parameter. English has these constructions while Spanish does not, as shown in (4).

(4) a. John painted the house red.

b. Juan golpeó el hierro hasta que estaba plano.
John beat-PST the iron until that be-PST flat
'John beat the iron until it was flat.'

(4b) shows that Spanish requires paraphrases in place of resultatives. Snyder (2001) argues that the connection between productive compounding and complex predicates is semantic in character: the distinctive semantic characteristics that unify the complex-predicate constructions derive from a mode of semantic composition available only within endocentric compounds. He states the restriction as in (5).

(5) Complex Predicate Constraint: Two syntactically independent expressions can jointly characterize the event-type of a single event-argument, only if they constitute a single word (endocentric compound) at the point of semantic interpretation.

Based on Stowell's (1981) analysis, Sugisaki and Snyder (2002) argue that the compounding parameter also governs the possibility of pre/postposition-stranding (P-stranding) in a given language. If these analyses are on the right track, we can derive the parametric variations in a number of constructions from the compounding parameter. However, the nature of the compounding parameter has not been discussed in detail in Snyder (2001) and subsequent work. Below I consider the correlation between the compounding parameter and word-stress location in the world's languages, and argue that the compounding parameter is derived from the stress position in a language.

2.2. Typology of Word-stress Location

I use the classification of word-stress location by Goedemans and van der Hulst (2011a, b), who distinguish two types of stress location: fixed stress and weight-sensitive stress.[1] In fixed stress languages, stress is located on the same syllable in each word. The location is independent of the weight (usually quantity) of the syllables in the word and is determined with reference to a word edge only. In languages with weight-sensitive stress, heavy syllables (CV or CVC) attract stress, while light syllables (CV) only get stress if they are in the right location in the string of syllables. Stress types listed in Goedemans and van der Hulst (2011a, b) are shown in (6) and (7), where the number of languages is in brackets.

(6) Fixed stress location [Total 282]

a. Initial: stress is on the first syllable [92]

b. Second: stress is on the second syllable [16]

c. Third: stress is on the third syllable [1]

d. Antepenultimate: stress is on the antepenultimate (third from the right) syllable [12]

e. Penultimate: stress is on the penultimate (second from the right) syllable [110]

f. Ultimate: stress is on the ultimate (last) syllable [51]

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[1] I use the classification by Goedemans and van der Hulst (2011a, b) because it gives us a simple and clear idea of stress location in languages. There are other databases of stress location such as the University of Delaware Phonology Lab Stress Pattern Database (http://phonology.cogsci.udel.edu/dbs/stress/) and the Cardiff University Stress System Database (http://psych.cf.ac.uk/ssdb/). A more detailed description of stress patterns is given in van der Hulst et al. (2010).

(7) Weight-sensitive stress [Total 219]

a. Left-edge: stress is on the first or second syllable [37]
b. Left-oriented: the third syllable is involved [2]
c. Right-edge: stress on the ultimate or penultimate syllable [65]
d. Right-oriented: the antepenultimate is involved [27]
e. Unbounded: stress can be anywhere in the word [54]
f. Combined: both Right-edge and unbounded [8]
g. Not predictable [26]

Based on this stress typology, I will consider the correlation of stress location and the compounding parameter. The stress locations such as initial (6a), second (6b) and left-edge (7a) are lefthand stress while penultimate (6e), ultimate (6f) and right-edge (7c) are righthand stress. The status of third (6c), antepenultimate (6d), left-oriented (7b) and right-oriented (7d) is not clear: if we consider the average number of syllables in words as less than four, the third position from the right equals the initial position in a word (e.g. *díscipline*, *ínnocent, cínnamon* (van der Hulst et al. 2010: 446)). Thus, I classify right-oriented stress as lefthand stress in the discussion below.

2.3. Correlation between the Compounding Parameter and Stress Location

Snyder (2001: 329) gives a list of languages showing whether or not a language has resultative constructions and productive N-N compounding. Here I show the list with the word-stress location described in Goedemans and van der Hulst (2011a, b) as (8).

(8)	Resultatives	N-N compound	*word-stress*
American Sign Language	yes	yes	*n.d.*
Austroasiatic (Khmer)	yes	yes	*ultimate*

Fin-Ugric (Hungarian)	yes	yes	*initial*
Germanic (English, German)	yes	yes	*right-oriented*
Japanese-Korean (Japanese, Korean)	yes	yes	*n.d.*
Sino-Tibetan (Mandarin)	yes	yes	*n.d.*
Tai (Thai)	yes	yes	*n.d.*
Basque	no	yes	[*dialectal differences*]
Afroasiatic (Egyptian Arabic, Hebrew)	no	no (?)	*right-oriented, ultimate*
Austronesian (Javanese)	no	no	*right-edge*
Bantu (Lingala)	no	no	*n.d.*
Romance (French, Spanish)	no	no	*right-edge*
Slavic (Russian, Serbo-Croatian)	no	no	*unbounded*

The list (8) as it is does not show a clear correlation between the compounding parameter and word-stress location. However, by examining the data, I will argue that languages with lefthand stress (e.g. initial and right-oriented) have productive compounding while languages with righthand stress (e.g. ultimate and right-edge) do not.[2]

3. Phonology of Compounding

3.1. The Strength of Juncture: Asymmetry between Left- and Right-Branching Structures

In order to reveal the mechanism of compounding, let us consider the juncture between words in branching structures. Tokizaki (2008, 2011) and Tokizaki and Kuwana (to appear) argue that the juncture between constituents in left-branching structures is stronger than that in right-branching

[2] As I argued in section 2.2, I classify right-oriented stress as lefthand stress.

structures: this strong juncture in left-branching structures makes the structures compounds.[3] In other words, the boundary between constituents in left-branching structure is weaker than that in right-branching structure. Here, I outline two of the arguments presented in the two articles just cited.

First, sequential voicing in Japanese applies to the constituents in left-branching structures but not to those in right-branching structures, as shown in (9a) and (9b) (cf. Otsu 1980).

(9) a. [[nise tanuki] shiru] → nise danuki jiru
mock badger soup
'mock-badger soup'

b. [nise [tanuki shiru]] → nise tanuki jiru
mock badger soup
'mock badger-soup'

A voiceless consonant *sh* changes into a voiced *j* in the left-branching structure (9a) while *t* does not change into *d* in the right-branching structure (9b). This asymmetry between left-branching and right-branching is also seen in Korean *n*-Insertion (Han 1994). These phonological phenomena show that the juncture between constituents in left-branching structures is stronger than that in right-branching structures: the boundary between constituents in left-branching structure is weaker than that in right-branching structure.

Second, interfixation in Dutch three-word compounds shows the left/right-branching asymmetry. According to Krott et al. (2004), the occurrence of an interfix including *-s-* in tri-constituent compounds matches the major constituent boundary better in right-branching compounds than in left-branching compounds. In (10) and (11), the numbers of compounds with *-s-* and all interfixes are

[3] I use the term 'juncture' to mean the connection between two elements.

shown in parentheses after the examples.

(10) a. [arbeid-s-[vraag stuk]] (-s- 38; all 60)

employment+question-issue

b. [hoofd [verkeer-s-weg]] (-s- 3; all 11)

main+traffic-road

(11) a. [[grond wet]-s-artikel] (-s- 25; all 39)

ground-law+article, constitution

b. [[scheep-s-bouw] maatschappij] (-s- 13; all 50)

ship-building+company

The ratio of the unmarked interfix position (10a) and (11a) to the marked interfix position (10b) and (11b) is higher in right-branching (10) (*-s-* 38÷3=12.7; all 60÷11=5.5) than in left-branching (11) (*-s-* 25÷13=1.9; all 39÷50=0.8). That is, interfixes occur at the constituent break more often in right-branching compounds than in left-branching compounds. This result is expected if we assume that the juncture between constituents in right-branching structures is stronger than that in left-branching structures.

There is also syntactic evidence for the asymmetry between the left-branching structures and the right-branching structures. I refer readers to Tokizaki (2011) and Tokizaki and Kuwana (to appear) for further arguments.

3.2. Stress Location in Words and Compounds

In this section, I argue that the stress location in a word corresponds to that in a compound. We can go back to Bally (1944) who observes that languages with word-initial stress have compound-initial stress while languages with word-final stress have compound-final stress (cf. Plank 1998: 211). More specifically, Giegerich (2004) argues that the stress patterns of noncompound nouns are also accounted for by the compound stress rule (CSR) of Liberman and Prince (1977: 257) shown in (12).

(12) In a configuration [$_C$ A B]: If C is a lexical category, B is strong if and only if it branches.

Stress falls on the right foot in words with branching right feet (*ìntrodúction*, *sensàtionálity*) and the left syllable in words with non-branching right feet (*prótest*, *cónquest*). Similarly, stress falls on the right constituent in compounds with right-branching structure, as in (13a), and the left constituent in compounds with non-right-branching structure, as in (13b, c).

(13) a. [government [wórking party]]

b. [[gréen-house] effect]

c. [wátch maker]

The fact that the same rule (12) applies to words and compounds supports the idea that the stress location of a compound corresponds to that of a word.

3.3. Stress Constraints on Compounding

Now let us go back to the compounding parameter. First, I assume Kayne's (1994) antisymmetry in morphosyntactic structure, which claims that the universal base order is specifier-head-complement. Head-final construction (14c) is derived from head-initial construction (14a) by cyclic complement movement to specifier position, as shown in (14) (Kayne 1994: 52).[4]

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[4] I assume that phonologically null elements are invisible at the PF-interface. Then, YP in (14b) and (14c) and XP in (14c) are left-branching structures at PF.

(14) a. $[_{XP}$ X $[_{YP}$ Y ZP]]

b. $[_{XP}$ X $[_{YP}$ ZP Y t]]

c. $[_{XP}$ $[_{YP}$ ZP Y t_{ZP}] X] t_{YP}

Kayne (1994: 53) speculates that the head-final structure in (14c) underlies pure agglutination. In the analysis presented here, the agglutinative nature of (14c) comes from strong juncture (i.e. a weak boundary) between its constituents, as I argued in section 3.1. I assume that compounding needs complement movement to make left-branching structure.

Now, let us consider principles of stress assignment. Cinque (1993) proposes a null theory of phrasal and compound stress, which assigns stress to the most deeply embedded element in a structure. Let us call this rule Bottom Stress, which is stated as in (15).

(15) Stress is assigned to the element at the bottom of a structure.

Bottom Stress assigns stress to branching complement rather than head in a structure because head is non-branching X^0 by definition; an element in complement Y is lower than the head X^0, as shown in (16).

(16) $[_X X^0 [_Y .. Z ..]]$

Here, Z is lower than X^0 and receives stress by Bottom Stress.

If we assume Kayne's (1994) Linear Correspondence Axiom (LCA), Bottom Stress assigns stress to complement rather than head even when complement is a non-branching category.

(17) $[_X X^0 [_Y Z]]$

Here, X^0 is the head of X, and its complement Y exclusively dominates Z, which is the most deeply embedded element and assigned stress. This guarantees stress on complement in case of compounds consisting of two words, as we will see below.

Note that in (14a-c), ZP receives the main stress by Bottom Stress at PF: ZP is the most deeply embedded element in each structure at PF on the assumption that trace is invisible at the PF-interface. Thus, compounds such as (14c) have lefthand stress while phrases such as (14a) have righthand stress. Assuming the correspondence between the locations of word stress and compound stress as I argued in section 3.2, I propose a phonological constraint on productive compounding formalized in (18).

(18) Complement moves to the specifier position to make a compound if the resulting structure has an acceptable prosody of a word in the language.

This prosodic constraint on compounding explains why compounding is productive in English but not in Spanish as we saw in (2) and (3). Let us look at each language in turn below.

First, English is productive in compounding because the resulting structure has the same stress location as a word, as shown in (19). The stressed syllable is underscored.

(19) a. banana box

b. worm can

English has a right-oriented stress system, which assigns stress on one of the last three syllables in a word. The compounds in (19a, b) have stress on the antepenultimate and the penultimate syllable in the whole strings. The stress pattern in (19) also conforms to Bottom Stress.

In Spanish, compounding is not productive, as shown in (3) and repeated here as (20).

(20) a. * banana caja

banana box

b. * caja banana

box banana

The stress patterns in (20a) and (20b) conform to Bottom Stress. The unacceptability of (20a) is due to its stress falling on the fourth syllable from the right in the whole compound, which is unacceptable in Spanish, a right-edge stress (penultimate or ultimate) language. (20b) has penultimate stress in the whole sequence. However, (20b) is not a compound structure derived by complement movement to the specifier position. The structure in (20b) is potentially right-branching rather than left-branching in the sense that the head is *caja*, which is non-branching by definition of head, while the complement *banana* can be branching if it is expandend into *banana morado* for example. Thus, the head-complement sequence in (20b) can only be phrasal with weak juncture (i.e. a strong boundary) between its constituents. Thus, Spanish uses phrase (21) instead of (20b) in the case of head-initial order.

(21) [$_{NP}$ caja [$_{PP}$ de ba<u>na</u>no]]

box of banana

The stress pattern in (21) conforms to Bottom Stress and is acceptable. Thus, we can derive the difference in productive compounding between English and Spanish from phonology.

4. Recursive Compounds and Stress: Germanic (Right-oriented) vs. Romance (Right-edge)

The productivity of compounding is clearly seen in the recursivity of compounding, as Roeper et al. (2002) argue. The difference in recursive compounding among languages can be explained in the same manner as above. Following Bisetto (2010), I use the term 'recursive compounds' only for compounds with head-addition as in (22a) and not for compounds without head-addition as in (22b), which Bisetto (2010) calls 'iterative compounds' (cf. Tokizaki 2010).

(22) a. [[waste disposal] plan]

b. [American [history teacher]]

In a recursive compound (22a), the head in the inner compound *waste disposal* is *disposal,* and the head in the whole compound *waste disposal plan* is *plan*: another head is added to a compound to make a larger compound. In an iterative compound (22b), the head in the inner compound *history teacher* is *teacher,* and the head in the whole compound *American history teacher* is again *teacher*: another modifier is added to a compound.

Germanic languages contrast with Romance languages in recursivity of compounding. Roeper and Snyder (2004) show the difference between English and French with (23) and (24).

(23) a. [frog man]

b. [[frog man] team]

(24) a. [homme grenouille]

man frog

b.?* [équipe [homme grenouille]]

team man frog

They observe that two-term compounds such as *homme grenouille* are readily stored as frozen forms in the lexicon while compounds of three or more terms are the result of a recursive compounding operation in the vast majority of cases. Although Bisetto (2010: 28) argues that recursive compounding is possible in Italian, she admits that the recursivity in Italian is not so widespread as it is in Germanic languages or Turkish.

Recursive compounding is possible in English because it observes Bottom Stress and right-oriented (antepenult, penultimate or ultimate) stress, as shown in (25).

(25) [[[<u>frog</u>] man] team]

The deepest element *frog* has stress and it is located at the antepenultimate position in the whole compound.

We can explain the unacceptability of French (24b) in a similar way to the two-word compounding in Spanish (20). (24b) is likely to be pronounced with the stress on *grenouille*, the most deeply embedded element. This stress pattern conforms to Bottom Stress, but the juncture between constituents is weak (i.e. the boundary between constituents is strong) because (24b) is a right-branching structure. Thus, (24b) is difficult to accept as a compound. Putting a preposition before the inside compound makes the whole construction a phrase, which is acceptable in French, as shown in (26).

(26) équipe d'homme grenouille

team of man frog

If complement-movement is cyclically applied to (24b), the resulting structure would make a left-branching compound with strong juncture (i.e. weak boundaries) between constituents as shown in (27).

(27) * [[[grenouille] homme] équipe]

frog man team

This structure is expected to have stress on *grenouille* according to Bottom Stress. However, this main stress is on the fourth syllable from the right-end of the whole structure, which is not acceptable in French, a right-edge (penultimate or ultimate) stress language. Thus, (27) is not derived by cyclic complement movement because of the prosodic constraint in (18).

Note that recursive compounding is not impossible in Romance languages. The French example (24b) becomes more acceptable if the head word *équipe* is replaced with *costume*, as shown in (28).

(28) ? [costume [homme grenouille]]

suit man frog

A recursive compound in (28) is acceptable although it is less natural than the corresponding phrasal expression in (29).

(29) costume d'homme grenouille

suit of-man frog

Bisetto (2010: 28) argues that Italian has some recursive compounds that have a slight 'headline flavor,' such as (30).[5]

(30) a. programma riciclo materiali

programme recycling material 'stuff recycling programme'

b. bancone distribuzione libri

counter distribution book 'book distribution counter'

These examples are actually not only formed by root nouns but contain deverbal nominals (*riciclo* and *distribuzione*). They have right-branching structure, [*programma* [*riciclo materiali*]] and [*bancone* [*distribuzione libri*]. The recursive compounds such as (28) and (30) in Romance languages are in fact phrasal compounds with the stress on the rightmost word, *grenouille*, *materiali* and *libri*. The fact that Romance languages allow certain cases of recursive compounds supports our idea that productivity and recursivity of compounding are due to stress location and the junctural asymmetry between left-branching and right-branching structure.

Thus, we can explain the difference in recursive compounding between languages with right-oriented stress such as English and languages with right-edge stress such as French. One might wonder about recursive compounds with more than three syllables in the right-oriented stress system, as shown in (31).

(31) a. [[[<u>kitch</u>en] towel] rack]

[5] My informant does not accept (30a) and (30b) and suggests *programma di riciclo materiali* and *bancone di distribuzione libri*.

b. [[[[kitchen] towel] rack] designer]

In (31a), the stress is on the fifth syllable from the right edge of the whole compound. However, the prosodic pattern in (31a) is acceptable in languages with right-oriented syllable because these languages use reduction of weak vowels. The weak vowels in the last syllable in *kitchen* and *towel* are likely to be more reduced in compounds (31a) than in isolation (kɪtʃn taʊl < kɪtʃən taʊəl). This reduction process makes the whole compound sound like a three-syllable word. Alternatively, we could postulate a higher rhythmic layer such as a foot, which mimics the three-syllable window in words: English compounds allow the strongest stress to fall within three feet of the right-edge. Note that recursivity is not unlimited in English: examples such as (31b) are not very common.[6] This fact shows that prosodic constraints affect the acceptability of compounds in English.

Compared to English, German and Dutch are more productive in recursive compounds. Neef (2009: 386) and Don (2009: 370) give the long compounds shown in (32).

(32) a. Donau-dampf-schiff-fahrt-s-gesellschaft-s-kapitän-s-mütze

Danube-steamboat-ship-journey- LE-company- LE-captain- LE-hat

'cap of the captain of the Danube steam ship company'

b. weer-s-voorspelling-s-deskundingen-congress

weather-LE-forecast-LE-experts-conference

'conference of the weather forecasts experts'

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[6] If another word is added to this sequence, the whole compound still has stress on the initial syllable, *kitchen towel rack designer.* This stress location is far more leftward than the antepenult from the right edge of the compound. Thus, English does not often use long recursive compounds such as this example.

These are problematic for our analysis if examples such as these are found often in data. The fact that these examples are acceptable seems to show that German and Dutch still retain the word-initial stress of Old Germanic (cf. Lahiri et al. 1999: 336). The rhythmic layer above syllables seems to be working in these languages, as well as in English (cf. Wiese 1996: 311).

5. Recursive Compounding in Languages with Lefthand Stress (or No Stress)

5.1. Fin-Ugric (Hungarian): Initial Stress

Now let us look at languages other than the Germanic and Romance listed in (8). First, Hungarian (Fin-Ugric) has word-initial stress. Our theory predicts that it will allow recursive compounds. This prediction is borne out as shown in (33) (Varga 2002: 134, Kenesei et al. 1998: 381).

(33) a. [[pót kerék] csapágy]

spare wheel bearing 'spare-wheel bearing'

b. [[[ház-tartás-i]-gép]-javít-ás]

house-hold-ATTR-machine-repair-NML 'home equipment repair'

In these examples, the main stress falls on the initial syllable of the whole compound, and Bottom Stress is satisfied.

Initial-stress languages other than Fin-Ugric also have recursive compounds. Examples from Icelandic (Germanic) are shown in (34) (cf. Árnason 2011: 272, Harðarson 2013: 7).

(34) a. <u>for</u>ða-búr

storage room 'storage room'

b. [[<u>karl</u> hest-a] vagn]

man horse-GEN carriage 'carriage drawn by male horses'

This fact supports the idea that lefthand stress system allows recursive compounding.

5.2. Languages with No Stress: Japanese-Korean (Japanese, Korean)

Japanese and Korean do not have stress accent. If a language does not have word-stress, the constraint (18) does not prevent complement-movement from making recursive compounds. Thus, we can explain the fact that pitch accent languages such as Japanese and Kyungsan Korean and no-accent languages such as Seoul Korean have recursive compounds (cf. Sohn 1999: 245).

(35) a. [[shira yuki] hime (Japanese)

white snow princess 'Snow White'

b. [[sushi neta] ire]

sushi ingredient case 'sushi ingredient case'

(36) a. [[ssal aki] nwun] (Korean)

husked rice baby snow 'fine snow'

b. [[pam namu] kolc'aki]

chestnut tree valley 'chestnut-tree valley'

These languages have no stress and allow complement-movement to make a left-branching compound.

5.3. Sino-Tibetan (Mandarin)

Mandarin is a tone language, but it also has reduction of tones, which is called neutral tone or light tone. The neutral tone appears on the second element in a word and a two-word compound, as shown in (37) (cf. Henne et al. 1977: 33, Kubozono 2004: 115).

(37) a. bōli

glass

b. mián-hua < mián + huā

cotton-flower

This tone reduction shows that Mandarin Chinese has a kind of lefthand stress in compounds. It may seem that our prediction is borne out because it is reported that Chinese has recursive compounds (Arcodia et al. (2009: 25) and Štekauer et al. (2012: 96)).

(38) a. gōnggòng guǎnlǐ xìnxī fúwù

public-manage-information-service

'Common Management Information Service (CMIS)'

b. shōu yīn jī kāi guān

receive-sound-machine-open-close

'radio knob'

However, the structure of these examples is not clear. Moreover, tone reduction does not occur in these examples. Duanmu (2000: 189) argues that the [YY [X NN]] type is more natural semantically and phonologically than the [[YY X] NN] type in Chinese compounding. This fact suggests that Chinese compounding is not as productive as in Germanic languages. We need to investigate Chinese compounding in more detail.

5.4. Basque: Dialectal Differences

Basque has a number of dialects with different word-stress systems: initial (Sakana), second (Bidasoa Valley, Oñati), left-edge (Basabura and Imoz), penultimate (Lekeitio, Northern High

Navarrese, Roncalese), right-edge (Hondarribia, Souletin), and 'not predictable' (Gernica, Zeberio). Hualde (1991: 139) argues that eastern dialects are stress-languages while some western dialects have pitch accent. We also need to consider the language contact between Basque and Spanish or French, which have a right-edge stress system. It seems possible that lefthand stress such as an initial, second and left-edge stress, or pitch accent system allows the language to have productive compounding. Hualde and Oritz de Urbina (2003: 354) observe that N-N compounding is very productive in Basque, but they did not discuss dialectal differences. Saltarelli (1988: 262) observes that compound nominals in Basque may have compound nominals as a constituent as in (39).

(39) a. albistari-saltzaile bilera

news-vendor conference 'news vendor conference'

b. jan-gela mahai-a

eat-room table-SG 'the dining room table'

These examples show that Basque allows recursive compounding.

6. Non-Recursive Compounding in Languages with Righthand Stress

6.1. Austronesian (Javanese): Right-Edge Stress

Languages with right-edge stress are predicted to be non-recursive in compounding as we have seen in case of Romance languages. Javanese (Austronesian) has a right-edge stress system, and has compounds but not recursive compounds. Tang (2010: 67) gives some examples of two-word compounds, shown in (40).

(40) a. kəmbaŋglɔ < kəmbaŋ + gula

candy flower sugar

b. ɔnd̪ɔwid̪od̪ari < and̪a + wid̪od̪ari

rainbow ladder goddess

In addition to these, Tang discusses another type of construction shown in (41).

(41) t̪ukaŋ + rasa + səga > t̪ukaŋ-rɔsɔ-səgɔ-ne, t̪ukaŋ-rɔsɔ-səga-ne

worker taste rice ‘taster (by profession)’

Tang (2010: 77) points out that the final noun in (41) fails to show the phonological freezing that is expected in a compound: both *səgɔ* and *səga* are possible. This fact seems to show that this example is a noun phrase or a phrasal compound with the structure [N [$_{\mathrm{VP}}$ V N]] rather than a recursive compound. Then, Javanese, a right-edge stress language, does not allow recursive compounding.

6.2. Tai-Kadai (Thai): Righthand Stress

Another language that is considered to have righthand stress is Thai (Tai-Kadai). Goedemans and van der Hulst (2011a, b) do not give any value for the stress location in Thai. However, Iwasaki and Ingkaphirom (2005: 6) observe that a two-syllable word has short duration for the first syllable and longer duration for the second syllable. They also observe that in compounds the first element is short while the second element is long (cf. Kubozono 2004: 114). These facts show that Thai has some kind of phonological strength in the righthand part of a word or a compound. Morphosyntactically, Thai is reported by Snyder (2001) to have productive N-N compounds, as in (8). However, Iwasaki and Ingkaphirom (2005: 42) observe that many of the compounds consisting of more than two elements are the names of dishes, or phrasal noun compounds consisting of a noun as the first constituent and a phrasal unit as the second, as shown in (42).

(42) a. kɛɛŋ khǐaw wǎan

curry green sweet ‘green curry’

b. phâa chét tua

cloth wipe body ‘towel’

Then, Thai is not recursive in compounding. Thus, the value of the compounding parameter is negative rather than positive. Then, the lack of recursive compounding follows from the righthand strength.

6.3. Afroasiatic (Hebrew): Ultimate Stress

Hebrew, an Afroasiatic language with an ultimate stress system, is reported to be non-productive in compounding by Snyder (2001). However, compounding in Hebrew is not recursive according to Mukai (2008: 194). Štekauer et al. (2012: 97) give a Hebrew example (43), but it is phrasal in the sense that it uses a preposition.

(43) 'af 'al pi xen < af 'al pi < 'al pi

also-on-mouth-so also on mouth on-mouth ‘nevertheless, all the more so’

Glinert (1989: 440) describes how in Modern Hebrew compounds are fairly numerous and are semi-productively coined. However, all of the examples he gives are two-word compounds such as (44).

(44) a. kadur-máyim

ball-water ‘waterpolo'

b. Hay-dak

life-thin ‘microbe'

Thus, Modern Hebrew is not productive in N-N compounding. This is explained by its ultimate stress system.

6.4. Afroasiatic (Egyptian Arabic): Right-Oriented Stress

Egyptian Arabic is the other Afroasiatic language which Snyder lists as having non-productive compounding. It has a right-oriented stress system according to Goedemans and van der Hulst (2011b). However, Mukai (2008) observes that compounding in Arabic is not recursive. Benmamoun (2000: 148) observes that genuine compounds in Arabic and Hebrew can consist of two members at most, as shown in (45).

(45) bit l-ma

room the-water 'toilet'

Benmamoun (2000: 148) also shows another type of recursive construction in Standard Arabic.

(46) [kitaab-u [muʕallim-i [ʔibn-i l-mudiir-i]]]

book-NOM teacher-GEN son-GEN the director-GEN

'the book of the teacher of the director's son'

Benmamoun (2000: 149) argues that this construction is different from lexical compounds. In the analysis presented here, this construction is a phrase rather than a compound. Then, we can conclude that Arabic does not have recursive compounding. Since the stress system in Egyptian Arabic is right-oriented, which is the same as German and Dutch, we need to investigate this stress type more carefully. German and Dutch have initial stress in compounds while the stress location of two-word compounds in Egyptian Arabic is not clear. I will leave this matter open here.

6.5. Austroasiatic (Khmer): Ultimate Stress

Khmer is a language with ultimate stress. Our analysis predicts that it does not have productive compounding. Although Snyder (2001) assigns positive value to the compounding parameter in Khmer, examples of compounds consisting of more than two words seem to be phrasal, as shown in (47) (cf. Orawan 2008: 175, 181)

(47)	a.	neak	tvəə	mhoop
		person (pt.)	do (p.)	food (n.)
		‘a cook’		
	b.	kɑnlaeŋ	prɑcɔəl	moan
		place (n.)	to case to confront one another and fight (p.)	chicken (n.)
		‘a place for chicken fighting’		

The second word is a predicate taking a complement noun on its right. Then, Khmer is not recursive in compounding.

6.6. Slavic (Russian and Serbo -Croatian): Unbounded Stress

Slavic languages also have variation in word-stress location. Russian and Serbo-Croatian are described as unbounded (stress can be anywhere) by Goedemans and van der Hulst (2011b). The productivity of compounding is controversial. Sussex and Cubberley (2006: 484) observe that compounding is a common phenomenon in Slavic. They show Russian examples in (48).

(48) a. divàn-krovát

settee-bed

'bed-settee'

b. vagón-restorán

restaurant-car

However, Bidwell (1969) observes that historically, English type compounding has been rare in Slavic. Štekauer et al. (2012: 97) observe that in Slavic languages, recursive compounding is in principle unproductive and restricted to specific cases, such as copulative adjectives in Russian and Slovak, as shown in (49).

(49) a. anglo-nemecko-yaponsko-rusko-vengersky slovar

English-German-Japanese-Russian-Hungarian dictionary

b. červeno-modro-biela zástava

red-blue-white flag

It is interesting to compare the Russian example (48b) with the parallels in other Slavic languages (Sussex and Cubberley 2006: 484).

(50) a. wagon restauracyjny (Polish)

car restaurant (ADJ)

b. jidelní vůz (Czech)

restaurant (ADJ) car

Polish, a penultimate stress language, uses a phrase instead of a compound as in (50a), and Czech, an initial stress language, uses head-initial order as in (50b). These facts conform to our analysis, i.e. that lefthand stress languages have productive compounding while righthand stress languages do not.

6.7. Bantu (Lingala): Penultimate (or Initial)

Lingala, a Bantu language, has regional differences in word-stress location. Guthrie and Carrington (1988: 8) explain that stress falls on the penultimate syllable of each word in the East and on the first syllable of the stem in the West (the Lower River area). They also note that where a stem contains more than two syllables, the penultimate is also stressed in the Western area as well as the first syllable of the stem. We cannot tell which dialect is considered in Snyder (2001). The data in Meeuwis (2010: 52) contain no example of recursive compounds, only two-word compounds such as (51).

(51) a. tatá-mwásí

father-woman 'paternal aunt'

b. ndáko-Nzámbe

house-God 'church'

Considering that Bantu languages generally have penultimate stress (Swahili and Chichewa), it is possible to assume that Lingala also has a penultimate stress system.[7] Then, we can explain the non-recursivity in compounding in Lingala by its righthand stress location.

7. Conclusion

As we have seen, our cross-linguistic analysis of productive compounding including recursivity shows a different result in some of the languages in the list at (8), taken from Snyder (2001).

(52)	Resultatives	N-N compound	Recursive	*word-stress*
American Sign Language	yes	yes	*?*	*?*

[7] Mchombo (2004: 117) reports that in Chichewa "Cases of noun-noun compounding, while not impossible, are less common." I thank an anonymous reviewer for pointing out this to me.

Austroasiatic (Khmer)	yes	yes	*no*	*ultimate*
Fin-Ugric (Hungarian)	yes	yes	*yes*	*initial*
Germanic (English, German)	yes	yes	*yes*	*right-oriented*
Japanese-Korean (Japanese, Korean)	yes	yes	*yes*	*no stress*
Sino-Tibetan (Mandarin)	yes	yes	*yes?*	*left in dysyllabic*
Tai (Thai)	yes	yes	*no*	*righthand*
Basque	no	yes	*yes*	*lefthand or righthand*
Afroasiatic (Egyptian Arabic, Hebrew)	no	no (?)	*no*	*right-oriented, ultimate*
Austronesian (Javanese)	no	no	*no*	*right-edge*
Bantu (Lingala)	no	no	*no*	*penultimate (or initial)*
Romance (French, Spanish)	no	no	*no*	*right-edge*
Slavic (Russian, Serbo-Croatian)	no	no	*no*	*unbounded*

We can conclude that this result confirms our hypothesis that lefthand stress allows recursive compounding while righthand stress does not.[8] Problems remain in some languages including American Sign Language, which seemingly does not have phonological stress.[9] We will need to consider these languages further.

As for language acquisition, this interface approach makes it possible to do away with the proposed

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[8] Note again that I classify right-oriented stress as lefthand stress. See section 2.2 and footnote 3.

[9] Brentari (1998) argues for the parallelism between stress in spoken languages and complex movements in American Sign Language. If this analysis is on the right track, we predict that American Sign Language has a stress system that is similar to languages with productive compounding. However, the stress location in American Sign Language has not been made clear.

compounding parameter. Assuming the interface condition proposed by Chomsky (2000), it is theoretically desirable that a phonological parameter decides a number of morphosyntactic properties. We have seen that there is a correlation between word-stress location and the compounding parameter. I argued that the correlation stems from the asymmetry between left-branching structure and right-branching structure in the syntax-phonology interface. If the effects of the compounding parameter can be derived from the unmarked stress location, as I have argued, the compounding parameter is not necessary in language acquisition. Moreover, if Snyder's (2001) analysis in terms of semantic connection is correct, setting the value of comparative parameter leads to the presence and absence of complex predicate constructions. Then, children need to learn only word-stress location to acquire some part of the grammar of the language.[10] This is a welcome result if we want to achieve one of the goals of the Minimalist Program, that is, to explain the nature of language acquisition. I hope that this study shows a possible route toward that goal.

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[10] Roeper et al. (2002: 32) argue that the child could in principle use the presence or absence of recursive compounds in the input to decide whether compounding is productive. In our analysis, the child does not need any direct access to recursive compounds.

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