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## The Linear Constituent Order of the Noun Phrase: An Optimality Theoretic Account\*

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This paper provides an analysis of the linear constituent order of the NP in three different types of languages based on 36 languages: the NP with the prenominal modifiers, the NP with the postnominal modifiers, and the NP with both prenominal and postnominal modifiers (the mixed NP). Languages have NPs that feature different linear orders of the NP constituents. We attribute such different linear constituent orders within the NP to the linguistic distance and the limits imposed by the constituency and adjacency. We use the various kinds of alignment constraints which properly reflect the linguistic distance between the noun and each constituent. Language universals on word order provide us some general orders of various NP constituents. If we adopt the linguistic distance, the limits imposed by the constituency and the adjacency, and the alignment constraints, we can explain the complicated differences of NP constituent orders of languages of the world.

[constituents/Optimality Theory/alignment/constraints,  
구성소/최적이론/배열/제약]

### 1. INTRODUCTION

A noun phrase is composed of the obligatory noun (Head)<sup>1)</sup> and its preceding and

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following optional modifiers such as Demonstratives, Adjectives, Numerals, Possessive pronouns, etc. The head of a noun phrase (hereafter NP) can be the initial constituent, the final or the medial (flanked by both preceding and following constituents). The first type of the NP will be referred to as 'Postnominal NP', the second is termed 'Prenominal NP', and the third type will be classified as 'Mixed NP'. In each type of the NP, the linear order of the optional constituents might be different in different languages.

The purpose of this study is twofold. The first is to discuss the word order universals of constituents within the NP; the second is to provide an analysis of the linear order of NP constituents based on Generalized Alignment (McCarthy & Prince, 1993b) which is set within Optimality Theory (McCarthy & Prince, 1993a). The linear order of various constituents will be accounted for by the relevant constraints and their ranking.

The organization of the paper is as follows. In section 2, the scope of the study will be introduced. In section 3, the data will be presented. In section 4, word order universals will be discussed. In section 5, an optimality theoretic account will be provided. And finally the summary and implication of the study will follow in section 6.

## II. SCOPE OF THE STUDY

This is a pilot study investigating the linear constituent orders of a NP based on 36 languages (12 languages each type). We consider the linear NP constituent order of Demonstratives(D), Adjectives(A), Numerals(N), and Possessive pronouns(P). But we exclude a NP with more than one head connected by a coordinate conjunction. We will also exclude a NP with more than one attributive adjectives such as in (1).

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are solely my own responsibility.

1) We adopted the term "Head" traditionally having been used in the grammatical description of some types of phrase in linguistics.

(1) NPs with more than one adjective (Ney, 1983; Dixon, 1977)

- a. The restless black quivering tree...
- b. The generous young growing man...

We do not include possessive constructions which indicate the possessive relation by word order.

(2) Harau (Comrie 1989)

- nöbö ram
- man house 'man's house'

We will discuss Greenberg's (1966) implicational universals of word order. For example, Greenberg's original work on the order of Subject-Verb-Object, adposition (preposition or postposition), genitive, and adjective etc. We will also discuss the subsequent works on word order universals after Greenberg such as V(erb)O(bject)/OV typology of Lehmann (1973, 1974, 1978) and natural serialization principle of Vennemann (1974), which he developed from Lehmann's word order typology. Finally, we will touch on Hawkins' (1983) word order universals where he modified Greenberg's language universals (Dryer, 1992). We will pick three representative languages of each type to illustrate how optimality theory elegantly explain the different linear constituent orders within the NP.

In the next section, we will present the data and discuss some generalizations of constituent order within the NP for each type.

### III. DATA

The data of this study is divided into three groups. Each group contains 12 languages, which are listed in no special order. First, we will introduce languages that represent the prenominal NP in which all optional constituents precede the head.

## (3) General linear constituent orders of the prenominal NP

Language	Lan. Family	Wd Order	Constituent order
Chaha-Gurage (Polotsky 1951)	Semitic	SOV	(D)(P)(N)(A) Head
Chinese (Stefanowska 1989)	Sini-Tibetan	SVO	(D)(P)(N)(A) Head
Dutch (Donaldson 1997)	Germanic	SVO	(D)(P)(N)(A) Head
English (Ney 1983)	Germanic	SVO	(D)(P)(N)(A) Head
Finnish (Sulkala 1992)	Finno-Ugrian	SVO	(D)(P)(N)(A) Head
Garawa (Furby 1977)	Australian	VSO	(D)(N)(P)(A) Head
Imbabura-Quechua (Jake 1985)	Quechua	SOV	(D)(P)(N)(A) Head
Kannada (Sridhar 1990)	Dravidian	SOV	(D)(P)(N)(A) Head
Konkani (Almeida 1989)	Indo-Aryan	SVO	(D)(N)(A)(P) Head
Swedish (Granberry 1991)	Germanic	SVO	(D)(P)(N)(A) Head
Tamil (Asher 1982)	Dravidian	SOV	(P)(D)(N)(A) Head
W. Shoshoni (Dayla 1993)	Uto-Aztecan	SOV	(D)(P)(N)(A) Head

In languages with the prenominal NP, the adjective is the most frequent constituent which is the nearest to the head noun; 11 out of 12 languages show this pattern while only Konkani exhibits a different pattern where the possessive is positioned right before the head. Right before the adjective, 9 languages have the numeral constituent. 9 languages have the possessive as the third constituent from the head. And finally the demonstrative appears as the most peripheral constituent of the NP in all 12 languages. The distribution of constituents is shown in (4).

## (4) Distribution of syntactic categories in each constituent slot

Cat.	4th const.	3rd const.	2nd const.	1st const.	Head
D	12 lgs.	0	0	0	Noun
P	0	9 lgs.	2 lgs.	1 lgs.	Noun
N	0	3 lgs.	9 lgs.	0	Noun
A	0	0	1 lgs.	11 lgs.	Noun

Based on the data and the classification in (3) and (4), we can argue the following general linear constituent order of the NP with prenominal modifiers.

- (5) Linear constituent order of the prenominal NP  
(Demonstrative)(Possessive)(Numeral)(Adjective) Noun

Next we present and discuss the postnominal NP where all the optional constituents occur at the right side of the head.

- (6) General linear orders of the postnominal NP

Language	Lan. Family	Wd Order	Constituent order
Au (Foley 1986)	Papuan	SVO	Head (P)(A)(N)(D)
Babungo (Schaub 1985)	Berue-Congo	SVO	Head (A)(P)(D)(N)
Engenni (Thomas 1978)	Kwa	SVO	Head (A)(N)(P)(D)
Igbo (Emenanjo 1978)	Niger-Congo	SVO	Head (A)(P)(N)(D)
Khmer (Capell 1979)	Mori-Khmer	SVO	Head (A)(N)(P)(D)
Kobon (Davies 1981)	New-Guinea	SOV	Head (A)(P)(D)(N)
Manam (Lichtenberk 1983)	Oceanic	SOV	Head (P)(A)(N)(D)
Nkore-Kiga (Taylor 1985)	Bantu	SOV	Head (P)(D)(A)(N)
Ponapean (Rehg 1981)	Autronesian	SVO	Head (P)(A)(D)(N)
Sie (Lynch & Capell 1983)	Erromongo	SVO	Head (A)(D)(N)(P)
Khmu (Prensrirat 1987)	Austro-Asiatic	SVO	Head (A)(P)(N)(D)
Swahili (Vitale 1981)	Bantu	SVO	Head (P)(A)(D)(N)

The linear orders of postnominal constituents show more varied pattern with respect to the 2nd and the 3rd slot from the head than that of prenominal NP. The distribution of constituents in each position from the head is illustrated in (7).

- (7) Distribution of syntactic categories in each constituent slot

Head	1st const.	2nd const.	3rd const.	4th const.	Cat.
Noun	0	2 lgs.	3	7 lgs.	D
Noun	5 lgs.	4 lgs.	2 lgs.	1 lgs.	P
Noun	0	2 lgs.	6 lgs.	4 lgs.	N
Noun	7 lgs.	4 lgs.	1 lgs.	0	A

As shown in (7), the closest constituent to the head of the postnominal NP is the adjective while the most edge constituent within the NP is the demonstrative. Although it is not so distinctively represented, the linear order of the constituents between the possessives and the numerals is that the numeral occurs frequently farther away from the head than the possessive: 7 languages have the numeral as the third constituent while 4 languages have the possessive as the third constituent. Based on (6) and (7), we present the general linear order of postnominal NP.

(8) General linear order of postnominal NP

Head (Adjective)(Possessive)(Numeral)(Demonstrative)

Now we will present the data of the mixed NP.

(9) General linear constituent orders of the mixed NP

Language	Lan. Family	Wd Order	Constituent order
Amele (Roberts 1987)	Gun	SOV	(P)Head(A)(N)(D)
Epena (Harms 1994)	Chocó	SOV	(D)(P)Head(A)(N)
Indonesian (Johns 1978)	Austronesian	SVO	(N)Head(A)(P)(D)
Jacalteco (Craig 1977)	Mayan	VSO	(D)(P)Head(A)(N)
Karo Batak (Woollams 1996)	W. Austronesian	SVO	(N)Head(P)(A)(D)
Korean (Sohn 1994)	Altaic	SOV	(D)(P)(A)Head(N)
Kristang (Baxter 1988)	Malacca Creole Portuguese	SVO	(D)(P)(N)Head(A)
Mam (England 1983)	Mayan	SVO	(D)(N)(P)Head(A)
Norwegian (Strandskogen 1995)	Germanic	SVO	(D)(N)(A)Head(P)
Siori (Wells 1979)	Non-Austronesia	SOV	(P)Head(A)(N)(D)
W. Greenlandic (Fortescue 1984)	Eskimo-Aleut	OVS	(P)Head(A)(N)(D)
Usan (Reesink 1987)	Papuan	SOV	(P)Head(A)(N)(D)

If we only consider the number of preceding and following constituents of the head, there appear the three patterns of linear order in (9): 1-Head-3, 2-Head-2, and 3-Head-1. The interesting distribution of the constituents in (9) is that the demonstrative does not occur as the only constituent either at the left or the right

side of the head. It only occurs with some other syntactic categories and appears at the farthest away from the head. This also shows that the demonstrative does not group with the adjective. While the adjective and the possessive occur closest to the head, the numeral is the next constituent that appears closer to the head. The demonstrative consistently appears farther away from the head. The distribution of constituents before and after the head is exhibited in the following three tables each with the different combination of constituents emerged from (9).

(10) 1 constituent-Head-3 constituents

Cat.	1st const.	Head	1st const.	2nd const.	3rd const.
D	0	Noun	1 lgs.	0	6 lgs.
P	4 lgs.	Noun	0	1 lg.	0
N	2 lgs.	Noun	0	4 lgs.	0
A	0	Noun	5 lgs.	1 lg.	0

(11) 3 constituents-Head-1 constituent

Cat.	3rd const.	2nd const.	1st const.	Head	1st const.
D	4 lgs.	0	0	Noun	0
P	0	2 lgs.	1 lg.	Noun	1 lg.
N	0	2 lgs.	1 lg.	Noun	1 lg.
A	0	0	2 lgs.	Noun	2 lgs.

(12) 2 constituents-Head-2 constituents

Cat.	2nd const.	1st const.	Head	1st const.	2nd const.
D	1 lg.	0	Noun	0	1 lg.
P	0	2 lgs.	Noun	0	0
N	1 lg.	0	Noun	0	1 lg.
A	0	0	Noun	2 lgs.	0

So far we have presented the data with the different linear orders of constituents emerged from the prenominal, the postnominal, and the mixed NP. Each pattern

generally reveals that the adjective and the possessive are the constituents that occur closest to the head; the demonstrative is the most peripheral constituent while the numeral occurs between the adjective/possessive and the demonstrative.

The various linear orders within the NP can be explained by 'Iconic motivation (Iconicity)' (Hairman, 1980, 1983, 1985). Iconicity is a principle claiming that the grammatical structure of a language should mirror the structure of what is being expressed by a language. This means that the grammatical structure is grounded in a semantic structure or that the grammatical relations can reflect the semantic relations. In order to explain the various linear constituent orders within the NP, we follow a type of iconic motivation termed the conceptual distance studied in depth by Hairman (1980, 1983, 1985). The conceptual and linguistic distance between the two units is reflected by the extent of separation between the two grammatically related units. Thus, the grammatical or linguistic distance mirrors the conceptual distance. It is shown in (13) and (14) that how to measure the linguistic and the conceptual distance.

(13) Diminishing linguistic distance between X and Y (Hairman, 1985)

- a. X # A # B # Y
- b. X # A # Y
- c. X + A # Y
- d. X # Y
- e. X + Y
- f. Z [fusion of X and Y into a single form]

(14) Conceptual distance: two ideas are conceptually close to the extent that they

- a. share semantic feature, properties or parts;
- b. affect each other;
- c. are factually inseparable;
- d. are perceived as a unit, whether factually inseparable or not.

We apply 'Iconicity' to explain the linear order of NP because we assume that a constituent close to the head noun is more closely related to the basic meaning of a NP than a constituent positioned farther away from the head noun. For example, 'your book' or 'black book' narrows the set of books to a subset by establishing a relationship between a book and a possessor, or between a book and a property, whereas 'that book' does not restrict books except to identify it as any book which



is accidentally in a certain location away from the speaker. Likewise, 'two books' does not restrict books except to indicate that the subset contains more than one book. Thus, the adjective and the possessive affect the intrinsic properties or basic meaning of a noun more than the demonstrative or the numeral.

In the next section, we will discuss word order universals that are relevant to this study.

## IV. WORD ORDER UNIVERSALS

In this section, some important language universals are discussed. We discuss Greenberg's (1966) ideas on word order, Lehmann's (1973, 1974, 1978), and Vennemann's (1974) word order universals which he developed from Greenberg's language universals.

Based on 30 languages, Greenberg (1966) proposed three word order types: Verb-Subject-Object (VSO), Subject-Verb-Object (SVO), and Subject-Object-Verb (SOV). He claimed that the different position of the verb plays an important role in word order patterns. Several of his three word order universals, which relate to the position of a verb, an adposition, and an adjective, are listed in (15) in which we use Greenberg's universal numbering.

### (15) Greenberg's (1966) universals

- (U2) In languages with preposition, the genitive always follows the governing noun. In languages with postposition it almost always precedes.
- (U3) Languages with dominant VSO order are always prepositional.
- (U4) With overwhelmingly greater than chance frequency, languages with normal SOV order are postpositional.
- (U5) If a language has dominant SOV word order the genitive follows the governing noun, then the adjective likewise follows the noun.
- (U17) With overwhelmingly more than chance frequency, languages with dominant order VSO have the adjective after the noun.

Greenberg's universals are briefly summarized in the following in (16) along with its status. We follow Anderson (1983) and Hawkins (1983) in labeling each universal 'statistical', which admits a limited number of exceptions, or

'nonstatistical' or 'exceptionless'.

(16) Greenberg's universals with each with its status

(U2) Prep. → Noun-G(enitive), Postposition→ GNoun	Statistical
(U3) VSO → Preposition	Exceptionless
(U4) SOV → Preposition	Statistical
(U5) SOV+NounG → NounA(adjective)	Exceptionless
(U17) VSO → NounA	Statistical

Concerning (U2), there are 19 languages with preposition in this study. In 12 languages (63%) of 19 languages, the genitive follows the governing noun (Head). From 17 postpositional languages, 12 languages (82%) show GNoun order.

Greenberg's (U3) is now well reflected in the data of this study. There are only two VSO word order languages: Garawa and Jacaltec. Jacaltec has preposition but Garawa has postposition. With respect to Greenberg's (U4), it is well reflected in the data. There are 14 languages that have SOV word order. 12 languages (86%) have postpositions while only 2 languages (14%) has prepositions.

Greenberg's (U5) is well represented by the data. The three languages Nkore-Kiga, Kobon, and Manam show that they are SOV and NounG order. And also in all three languages the adjective follows the head noun. Greenberg's (U17) is not well represented in the data because Garawa and Jacaltec show the different word order between the head and the adjective. As we have seen, some of Greenberg's universals are well reflected in the data whereas some of them are not well represented in the data.

Lehmann (1973, 1974, 1978) modified Greenberg's word order universals by simplifying three word types into the VO and the OV type. He claimed that the subject does not play an important role in word order typology. The characteristics of his VO and OV type are listed in (17).

(17) Lehmann's VO/OV type

VO type	OV type
Preposition	Postposition
NounG	GNoun
NounA	ANoun
NounN(umeral)	NNoun
NounD(emonstrative)	DNoun

Lemann's characteristics of the VO type reflect the modifiers of postnominal NP while the positions of the optional constituents of the OV type represent the prenominal NP.

In the data of this study, there are 21 VO type languages. 9 (42%) out of 21 VO type languages show postnominal modifiers. 6 languages (29%) reflect prenominal modifier of the NP. 6 languages (29%) show the mixed modifiers of the NP.

As to the OV type of Lehmann's classification, 15 languages belong to the OV type in the data of this study. Among 15 languages, 6 languages (40%) show the harmonic word order of the OV type while 3 languages (about 20%) represent the opposite word order of the harmonic constituent order of the OV type. The remaining 6 languages (40%) have mixed combinations of modifying constituents in terms of the position of the constituents.

Vennemann (1974), based on Greenberg (1966), divided all of Greenberg's 'meaningful elements' (direct object and verb, adjective and noun, etc) into 'operator' and 'operand' categories on syntactic and semantic grounds. He claims that languages serialize all these elements in a consistent order: OV (or /XV) languages cooccur with the order operator before the operand, while VO (or /VX) languages cooccur with the order operand before the operator. The following table illustrates Vennemann's operator-operand distinction whose classification is similar to Lehmann's VO/OV type. We only listed the relevant operator-operand distinctions for the study.

(18) Operator-Operand distinction

Operator	Operand
Adjectives	Noun
Number marker	Noun
Genitive	Noun
Numeral	Noun
Determiner	Noun

Based on his word order categories such as operator and operand, Vennemann (1974) proposes the 'Natural Serialization Principle (NSP)': Languages serialize all their operator-operand pairs either the operator precedes the operand (OV/XV), or the operand precedes the operator as presented in (19).

## (19) Natural Serialization Principle

$$\begin{array}{l} \text{[operator [operand]] in OV languages.} \\ \{ \text{operator (operand)} \} \Leftrightarrow \\ \text{[operand [operator]] in VO languages} \end{array}$$

Vennemann's NPS predicts that in OV languages all operators such as the adjective, the genitive, the numeral, and the determiner precede the operand (the governing noun) while it is exactly the opposite in the VO languages. The operator-operand and operand-operator of NPS are the same as in Lehmann's OV/VO types. This implies that if we apply Vennemann's NPS to the data of the study in terms of constituent order, we will have some same results that we have seen from the application of Lehmann's VO/OV types of word order classification.

Though Lehmann's and Vennemann's works on word order typology shed light on Greenberg's universals, their works, only to some extent, have some indications on the linear constituent order of the noun phrase. For example, their claims on the word order only predict the consistent order of the prenominal and postnominal optional constituents within the NP when there is only a single constituent and the head. Thus, if there are three or four consecutive modifiers within the NP, the OV/VO type classification or the Operand-Operator and the Operator-Operand do not explain the relative linear orders of the modifiers within the NP. While we may have some problems of explaining the relative linear orders of constituents within the NP, we need to put special attention on Greenberg's (U20) specifying the sequencing the demonstratives, the numerals, and the adjectives with respect to the governing noun. Greenberg's (U20) is given in (20).

- (20) When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they are always found in that order. If they follow, the order is either the same or its exact opposite.

As we have seen the data on the general linear order of the prenominal NPs in (3), the postnominal NPs in (6), and the mixed NPs in (9), the word order universal in (20) is mostly observed but we can also realize that there are other linear sequences of constituents possible. Hawkins (1983) elaborates on Greenberg's (U20) and discusses other possible sequences of those modifiers of the NP. The possible sequences of the 3 NP sequences are illustrated in (21). Languages that are also

employed in this study are underlined.

(21) Sequences of those A(djective), D(emonstrative), N(umeral)) with the Noun (Hawkins, 1983)

a. 3 modifiers on the left/ 0 on the right

D-N-A-Noun Chinese (Mandarin), English,  
Finnish, Hindi, Hungarian, Maung.

b. 2 modifiers on the left/ 1 on the right

(i) D-N-Noun-A French, Italian  
(ii) \*D-A-Noun-N No example  
(iii) \*N-A-Noun-D No example

c. 1 modifier on the left/ 2 on the right

(i) D-Noun-A-N Kabardian, Warao  
(ii) N-Noun-A-D Basque, Eastern Island, Indonesian, Jacaltec,  
Maori, Vietnamese, Welsh  
(iii) \*A-Noun-N-D No example

d. 0 modifiers on the left/ 3 on the right

Noun-A-N-D Selept, Yoruba  
(for postposed modifier, only the preferred ordering is listed)

The examples in (21) reflect two important points we already discussed in section 3 that the adjective appears closest to the noun whether it is a premodifier or a postmodifier. The second point is that the demonstrative does not occur as a single postmodifier. Despite the fact that the order of pronominal constituents is harmonic with the universal in (20), the linear constituent order of the postnominal NP is hard to predict in that the adjective is adjacent to the demonstrative. Hawkins (1983) revised Greenberg's (U20) and proposed the following.

(22) Hawkins (1983)

When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they (i.e. those that do precede) are always found in that order. For those that follow, no predictions are made, though the most frequent order is the mirror-image of the order for preceding modifiers. In no

case does the adjective precede the head when the demonstrative or numeral follow.

Hawkins also laid out three major sources of variation of modifiers on the assumption that constituency emerges as a strong explanation for word order sequencing.

(23) Hawkins (1983)

- a. Languages may vary within the constraints permitted by constituency and adjacency.
- b. Languages may vary by having different constituent structures.
- c. Languages may vary in the extent to which adjacency holds.

Greenberg's (U20) and the revised version of Hawkins in (22) considered only 3 optional constituents but the study in this paper added one more constituent which is possessive. If we take account into Hawkins 3 major sources of variation of modifiers, it gives us some insights to explain the linear constituent order. However, he does not include the possessive. As we have seen the data in (6), the linear orders of 4 optional constituents are varied; the possessive appears in various positions such as right after the noun, as the second constituent after the adjective, and as the peripheral constituent. This indicates that predicting universal linear order of 4 optional constituents of the NP is complicated. The previous works on the linear order of the NP constituents are important by themselves because they give us some universal natures and tendencies of language of the world.

We admit that it is very difficult to explain the various linear constituent order within the NP but it is possible to account for such varied possible linear orders of the NP. We will present an account that can explain the various linear constituent orders within the NP in the next section.

## V. ANALYSIS

In this section, we will provide an analysis based on Optimality Theory (McCarthy & Prince, 1993a), especially with the notion of Generalized Alignment also proposed by McCarthy and Prince (1993b). The complicated linear constituent

orders within the NP can be explained if we adopt Haiman's iconicity, Hawkins' (1983) assumption on word order that constituency and adjacency impose an upper limit on sequencing within the NP, and the theoretical device proposed in Optimality Theory (McCarthy & Prince, 1993a). The former two provide us with the conceptual grounds of why there is a differing distance between the head and the optional constituents and why two constituents can occur next to each other and why some are not possible neighboring constituents. The latter gives us the methods to put the constituents in order.

The optimality theory is composed of 5 principles such as universality, violability, ranking, inclusiveness, and parallelism. The theory assumes that languages consist of universal constraints and each grammar is composed of a ranking of those universal constraints such that different grammars can be explained by permuting relevant constraints.

Generalized Alignment (McCarthy & Prince, 1993b) was proposed to capture how constituent edges figure in morphological and phonological processes. The basic ideas of generalize alignment is given in (24).

(24) Generalized Alignment

Align (Cat1, Edge1, Cat2, Edge2)

$\forall$  Cat1  $\exists$  Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide.

Where

Cat1, Cat2  $\in$  PCat  $\cup$  GCat

Edge1, Edge2  $\in$  {Right, Left}

Here PCat consists of the sets of prosodic categories and GCat is composed of the sets of grammatical (morphological or syntactic) categories. Those categories are given by linguistic theory. Thus, generalized alignment calls for the cooccurrence of a specified edge of each prosodic or morphological constituent Cat1 with that of some other prosodic or morphological constituent Cat2. For example, the alignment constraint: Align (PrWd, Left, Ft, Left) is satisfied in a hypothetical word [(CVCV)<sub>Pr1</sub>CV(CVVCV)<sub>Pr2</sub>]<sub>PrWd</sub> because the left edge of the prosodic word, which is signified by the square brackets, is aligned with the left edge of the first foot, which is indicated by parentheses. But the alignment constraint is violated by the second foot because the left edge of the second food does not begin at the left edge of the prosodic word.

In the next subsection we will analyze the linear constituent order of the NP with the examples of English.

## 1. Prenominal NP

In order to account for the linguistic distance between each constituent and the head of the NP in English, we employ the following alignment constraints which require that the right edge of each prenominal modifier coincides with the left edge of the noun. The relevant constraints are presented in (25).

### (25) Constraints for the English NP

a. Align (A, R, Noun, L): Align-A

The right edge of the adjective coincides with the left edge of the noun.

b. Align (N, R, Noun, L): Align-N

The right edge of the numeral coincides with the left edge of the noun.

c. Align (P, R, Noun, L): Align-P

The right edge of the possessive coincides with the left edge of the noun.

d. Align (D, R, Noun, L): Align-D

The right edge of the demonstrative coincides with the left edge of the noun.

e.  $*(D-P)_{NP}$ :  $*(D-P)$

The demonstrative and the possessive are not allowed to cooccur within the noun phrase.

The constraints in (25) capture the linguistic distance (iconicity), and the constituency and the adjacency between the head and each constituent. We may use the align left constraints which call for each constituent coincides with the left edge of the NP. However, if we use such constraints, they cannot reflect the conceptual relation between the head and each constituent, and between each neighboring constituent. The constraints in (25) are in conflict because all four premodifiers cannot occur right before the head noun. Since this is the case, we show the ranking among the constituents when a NP is composed of more than one premodifiers in it.

### (26) English NPs with the constraint ranking

a. two old houses: Align-A  $\succ$  Align-N

b. his two cars: Align-N  $\succ$  Align-P



- c. this thick book: Align-A › Align-D
- d. these four boxes: Align-N › Align-D
- e. \*this my book/\*my this book: \*(D-P)

The ranking relations illustrated in (26) reveal that Align-A dominates Align-N, Align-D, and Align-P but it does not show any ranking with \*(D-P). Align-N should be ranked higher than Align-D and Align-P while Align-D and Align-P do not show any ranking each other because they do not occur as neighboring constituents. Align-A and \*(D-P) are undominated in English. The ranking relations are exhibited in (27) and (28).

(27) Head with three constituents<sup>2)</sup>

(D)(N)(A)Noun	Align-A	Align-N	Align-D
these red three pens	*!		**
red three these pens	*!*	*	
three red these pens	*!	**	
three these red pens		**!	*
☞ these three red pens		*	**

The constraints and their ranking in (27) select the correct output which has the peripheral demonstrative followed by the numeral and in turn it is followed by the adjective. The constraint ranking in (27) reflects the closest linguistic distance between the head and the adjective which also represents the constituency and adjacency. The domination of Align-A over Align-N and Align-D indicates the relative linguistic distance between the head and the numeral, and between the head and the demonstrative.

2) In evaluating the alignment constraint, we count any constituent between the head and the constituent. For example, in (two tall men)NP the Align-N is violated only once with a single '\*' because the right edge of the numeral is one constituent (tall) away from the left edge of the noun.

## (28) Head with three constituents

(P)(N)(A)Noun	Align-A	Align-N	Align-P
small two my bags	*!*	*	*
small my two bags	*!*	*	*
two small my bags	*!	**	*
two my small bags		**!	*
☛ my two small bags		*	**

(28) illustrates the ranking conflict between the possessive and the adjective, and between the possessive and the adjective. Align-N is ranked higher than Align-P which in turn implies that the linguistic difference between the head and the numeral is closer than the linguistic difference between the head and the possessive. The constraint ranking established in (27) and (28) is presented in (29) where we included the undominated \*(D-P) and unestablished constraint between Align-D and Align-P in the ranking.

## (29) English NP constraint ranking

\*(D-P), Align-A > Align-N > Align-P, Align-D

The constraint ranking provided in (29) can account for the linear constituent order of English. With the ranking permutation, we also can explain the linear order of NP in other prenominal languages. For example, Konkani has the general NP order of D-N-A-P-Head. By permuting the constraint ranking Align-A and Align-P, we can explain the linear constituent order of NP in Engenni.

In the next subsection, we will illustrate the constraints and their ranking relation of postnominal NP with a case language of Engenni.

## 2. Postnominal NP

The postnominal NP of Engenni mirrors the opposite general linear constituent order of English NP. Engenni features the NP where the head noun is followed by up to 3 of the optional constituents: adjective, numeral, demonstrative, possessive, and language specific reinforcer (Rf)<sup>3</sup>. In order to account for the linear constituent

3) The reinforcer functions as emphatic element of the simple NP. Some of the reinforcers of this languages are as follows: a (also, even), lô (just), and ô (indeed).

order of Engenni, we employ the following constraints.

(30) Constraints for the Engenni NP

- a. Align (A, L, Noun, R): Align-L-A  
Align the left edge of the adjective with the right edge of the noun.
- b. Align (N, L, Noun, R): Align-L-N  
Align the left edge of the numeral with the right edge of the noun.
- c. Align (P, L, Noun, R): Align-L-P  
Align the left edge of the possessive with the right edge of the noun.
- d. Align (D, L, Noun, R): Align-L-D  
Align the left edge of the demonstrative with the right edge of the noun.

The constraints in (30) use the opposite edges of the head and each optional constituent in order to place all the possible constituents at the right of the head. The conceptual distance will be reflected in the following constraint conflict. The higher ranking signals the close perceptual distance between the head and the constituent.

(31) Engenni NP with the constraint ranking

- a. amo gberi avu: Align-L-A  $\succ$  Align-L-N  
head A N 'one small child'
- b. jomu esaa wo: Align-L-N  $\succ$  Align-L-P  
head N P 'your three pound'
- c. ani wo aka: Align-L-P  $\succ$  Align-L-D  
head P D 'that your wife'

The constraint conflicts and their ranking in (31) imply that the adjective shows the closest conceptual distance with the head, which is followed by the numeral, possessive, and demonstrative, respectively. This relation is exhibited in (32), (33), and (34) where we do not mark the tone of this language.

(32) Head with two constituents

Noun(A)(N)	Align-L-A	Align L-N
amo gberi avu		*
amo avu gberi	*!	

## (33) Head with two constituents

Noun(N)(P)	Align-L-N	Align-L-P
* ipamu esaa wo		*
ipamu wo esaa	*!	

## (34) Head with two constituents

Noun(N)(P)	Align-L-P	Align-L-D
* ari wo aka		*
ari aka wo	*!	

(32), (33), and (34) present the constraint conflicts among the relevant constraints and show their ranking. Each table also reflects the different linguistic distance between two neighboring NP constituents. *Align-L-A* dominates *Align-L-N*, which also dominates *Align-L-P*, which in turn dominates *Align-L-D*. Thus, *Align-L-A* dominates *Align-L-P* and *Align-L-D*. The overall ranking of the linear constituent order of the Engenni NP is given in (35).

## (35) Engenni NP constraint ranking

*Align-L-A* > *Align-L-N* > *Align-L-P* > *Align-L-D*

The various linear constituent orders of NP in other languages with postnominal modifiers can be accounted for by permuting relevant constraints used for Engenni. For example, Igbo has the general linear constituent order of the NP: Head-A-P-N-D. The linear constituent order difference between Engenni and Igbo can be explained if we permute *Align-L-N* and *Align-L-P*. This ranking permutation device endows us with ways to explain various other linear orders of NP constituents.

In the next subsection, we will discuss the linear order of NP constituents of the mixed type, which is exemplified by Korean language.

## 3. Mixed NP

The linear constituent order of the mixed NP, which has modifiers at both sides of the head, can be accounted for if we employ both types of constraints that we used for the prenominal NP and postnominal NP. We use Korean language as our

representative language for the mixed type of NP. Korean exhibits both prenominal modifiers and mixed type of modifiers (Sohn, 1994)<sup>4)</sup>. But we only take account into the mixed modifiers and its head. The general constituent order of NP in Korean is D-P-A-Head-N-(Noun Classifier). The linguistic distance between the head and the adjective is the closest among the prenominal modifiers while the numeral is the only postnominal modifier so it represents the closest conceptual distance as the postnominal modifier. The constraints that we adopted for the mixed type of the NP are given in (36).

(36) Constraints for the Korean NP

- a. Align (A, R, Noun, L): Align-A  
Align the right edge of the adjective with the left edge of the noun.
- b. Align (N, L, Noun, R): Align-L-N  
Align the left edge of the numeral with the right edge of the noun.
- c. Align (P, R, Noun, L): Align-P  
Align the right edge of the possessive with the left edge of the noun.
- d. Align (D, R, Noun, L): Align-D  
Align the right edge of the demonstrative with the left edge of the noun.
- e. \*(D-P)<sub>NP</sub>: \*(D-P)  
The demonstrative and the possessive are not allowed to co-occur within the noun phrase.

In (36), there are three constraints in conflict; they are Align-A, Align-P, and Align-D. Align-A dominates both Align-P and Align-D since the adjective has the closest conceptual distance with the head. On the other hand, Align-P and Align-D do not show particular ranking with each other since they are not allowed to occur within the same NP, which is regulated by the undominated \*(D-P) constraint. The numeral constituent is placed at the right side of the head and it is not in ranking

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4) It is possible that Korean has the prenominal NP and the mixed NP. In this paper we assume Korean noun phrase represents the mixed NP. This is because this type is more frequently used than the prenominal type of NP. Furthermore, to form a prenominal NP, we have to resort to the genitive particle '-iy', which is an equivalent of English 'of' used after a syntactic category where it is required. The following example shows that the Korean NP is prenominal type.

na-iy    tu-tae-iy    cha    'my two cars'  
I-Gen    two-CL-Gen    car

conflict with the other prenominal constituents but we rank this high because it is adjacent to the head while the demonstrative or the possessive are farther away from the head than the numeral. The ranking relations of Korean NP are given in (37).

(37) Korean NPs with the constraint ranking

a. naiv k<sup>h</sup>in cip: Align-A > Align-P

P A head 'my big house'

b. cə cəlmin namca: Align-A > Align-D

D A head 'that young man'

c. \*cə naiv c<sup>h</sup>a / \*naiv cə c<sup>h</sup>a: \*(D-P)

D P head P D head \*'that my car' / \*'my that car'

The constraint relations in (37) are illustrated by the constraint tables in (38), (39), and (40).

(38) Head with two constituents

(P)(A)Noun	Align-A	Align-P
☞ naiv k <sup>h</sup> in cip		*
k <sup>h</sup> in naiv cip	*!	

(39) Head with two constituents

(D)(A)Noun	Align-A	Align-D
☞ cə cəlmin namca		*
cəlmin cə namca	*!	

(40) Head with three optional constituents

(D)(A)Head(N)(CL)	Align-A	Align-L-N	Align-D
☞ cə cəlmin namca tu myəŋ			*
cəlmin cə namca tu myəŋ	*!		

In (40), we did not include a constraint for the CL because we regard it as part of the numeral consisting a constituent with the numeral. As exhibited in (38), (39), and (40), the constraints and their ranking we discussed in (36) and (37) can

account for the linear constituent order of Korean. The constraint ranking resulting from (38)-(39) is given in (41).

(41) Korean NP constraint ranking

\* (D-P), Align-A, Align-L-N ) Align-P, Align-D

The constraint ranking in (41) can explain other linear orders of mixed NP if we permute the relevant constraints. For example, the linear order of Kristang NP is D-P-N-Head-A. If we permute Align-L and Align-L-N and modify their the edges of each constraint: Align-L-A and Align-N, then we can explain the linear constituent order of Kristang NP.

In the next section, we will present the summary of the study and some implications of this study.

## W. CONCLUSION

In this study, we have considered the linear constituent orders of NP in three different structures of NP. We attributed the difference in the linear constituent order within the NP to iconicity (Haiman, 1980, 1983, 1985) and Hawkins's (1983) assumption on word order that constituency and adjacency impose an upper limit on sequencing within the NP. Optimality theory provided us with methods to capture the conceptual difference between the head and each constituent by alignment constraints which require adjacency between the head and the constituents. The constraint ranking of alignment constraints directly reflects the linguistic difference between the head and the constituents, and the ranking permutation can explain various other linear orders of NP constituents in other languages.

Some implications of this study are that while the language universals on word order outline the general constituent order within the NP, they still have trouble coming up with general linear orders of NP consisting of 3 constituents because it is so complicated. It would be more difficult to propose the general constituent orders if we include the possessive to the constituents. OT machinery provides us with elegant ways to account for variations in the linear orders in many languages. The OT concepts and constraints used in this study might be extended to other areas such as morpheme orders and word formation processes.

With respect to learning correct linear constituent order of English NP, it is desired that students have to understand both linear constituent order and the conceptual difference between the head and each element in the NP to facilitate their learning process.

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예시언어(Examples in): English

적용가능 언어(Applicable Languages): English

적용가능 수준(Applicable Levels): College/Higher

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