# Argument Structure and Focus Projection in Korean

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## Abstract

It has been claimed that syntactic structures and the argument types (e.g. theme, oblique) can determine the domain of focus: focus on a particular type of internal argument may project its focus domain to a larger syntactic constituent than the focused item. It is also known that focus often has prosodic reflections through the manipulations of prosodic phrasing, prominence relation of words, and duration. This paper examines the relationship between the focus projection (especially 'VP focus') and the argument structure in Korean by investigating the prosodic correlates of focus. Results show that there is no sensitivity of argument type in projecting the domain of focus to Verb Phrase (VP). Regardless of argument types or word order, VP focus was prosodically marked at the VP-initial word by initiating a large intonational phrase boundary, raising its pitch peak, and lengthening of the VP-initial syllable and word. The results do not support the claim that the argument structure is an important factor in determining the domain of focus projection in Korean.

## 1. Introduction

Traditional syntactic analyses of focus projection have argued that a focused word may have as its focus domain a larger syntactic constituent projected from the focused word. According to [14, 16], the focus on the internal argument can project to its head phrase recursively. For example, the focus on *box* in (1) can be the answer to either the PP focus question *Where did Mary put the book?* or the VP focus question *What did Mary do with the book?*. This is possible because *box* is an internal argument of a head phrase PP, and in turn the PP is an internal argument of a head phrase, VP. Along the same line, the focus on *box* can license its focus projection up to the whole sentence.

[Mary [put the book [in [a new [BOX]$_F$]$_F$]$_F$]$_F$]$_{FOC}$ (1)

In this approach, a special role is given to an internal argument in projecting the domain of focus, and non-arguments such as adjuncts and specifiers may not project focus to a larger constituent. However, researchers such as [9, 17] claim that this purely syntax-based analysis could not explain the true nature of focus projection. Vallduvi and Engdahl [17] proposed a new level of focus interpretation, called Information Structure, based on their *Information Packaging Theory*. In this framework, focus projection is accounted for by the interaction between argument types and grammatical functions rather than syntactic constituency.

Chung et al. [3] applied the information packaging theory to the HPSG (Head-Driven Phrase Structure Grammar, *See* [15]) feature structure, and proposed that focus projections in Korean are closely related to the hierarchical structure of arguments in a sentence. According to the HPSG framework in [3], the argument structure has the following hierarchy.

ARG-ST Hierarchy : (2)
SUBJ<OBJ<OBJ2<OBL (where if A precedes B in the argument-structure, A has a higher rank than (i.e. outranks) B.)

Based on the ARG-ST hierarchy, they argued that only the non-agentive highest ranking argument may recursively project the domain of focus to its head phrases in Korean. If a sentence contains theme (D.O) and oblique (I.O or LOC) arguments, for example, focus on the theme argument may project its focus to a VP while focus on the oblique argument may not. Thus, (3i) can be the answer to the VP focus question like *What did you do?* but (3ii) cannot because only the highest ranking argument, theme, may project focus to its head phrase.

i. [Mary-eykey [SENMWUL-UL]$_F$ cwuesse] $_F$ (3)
Mary-DAT present-ACC gave
'(I) gave a PRESENT to Mary.'

ii. *[[MARY-EYKEY] $_F$ senmwul-ul cwuesse] $_F$
Mary-DAT present-ACC gave
'(I) gave a present to MARY.'

It is assumed that focus projection priniples hold whether the focused thematic argument is positioned VP-initially or not, e.g. S+D.O+I.O+V or S+I.O+D.O+V. However, the validity of this principle has not been tested experimentally.

Crosslinguistic studies on the phonetic realization of focus have found that focus is generally cued by phrasing, prominence, pitch accent, and/or pitch range [1, 4, 5, 6, 8, 10]. For example, a new prosodic boundary can be inserted at the left or right edge of the focused word, the focused item can be lengthened, and/or pitch ranges of pre- and post-focus sequences as well as the focused item can be adjusted. For Korean, Jun and Lee [13] have found that a new prosodic boundary is inserted before the contrastively focused item and the following words tends to be phrased into the same phrase as the focused word, i.e., dephrasing. Though dephrasing was optional, the pitch range was always expanded on the focused item but significantly reduced after the focused word compared to that in the neutral sentences. They also found a substantial lengthening of the initial segment/syllable of the focused item. In this paper, we will examine how VP focus is acoustically realized and whether its realization is sensitive to the argument hierarchy in the sentences.

## 2. Experiment

To investigate the relationship between the argument structure and the focus projection, we selected two types of syntactic constructions: (i) Subj+I.O+D.O+Verb, sentences containing a goal argument (I.O) and a theme argument (D.O), and (ii) Subj+LOC+D.O+Verb, sentences containing a locative PP argument (LOC) and a theme argument (D.O).

The base stimuli consisted of eight sentences in each construction and the eight sentences vary in two versions on the basis of the number of syllables in each constituent, short (3-3-3-3) and long (3-4-4-5), as shown in Table 1. As mentioned above, Jun and Lee [13] showed that contrastive focus tended to invoke dephrasing after the focused item and this was more common in shorter phrases. It would be interesting to see whether VP focus triggers dephrasing after the first VP constituent. If dephrasing occurs, we expect more dephrasing in the short version than in the long version.

Table 1: *Sentence examples in short and long versions of each construction (Subj+I.O+D.O+Verb and Subj+LOC+D.O+Verb.)*

| Construction 1: Subj+I.O+D.O+Verb |
|---|
| Short: 3-3-3-3<br>jəŋhogɑ mɑlege dɑŋgiɲil məgjəs'ə<br>'Youngho fed carrots to the horse.'<br>Long: 3-4-4-5<br>jəŋugɑ minaege ziugæriɨl gənnezuəs' ə<br>'Youngu passed the eraser to Mina. |
| Construction 2: Subj+LOC+D.O+Verb |
| Short: 3-3-3-3<br>minziga bɑdɑge gɑbɑŋil noas'ə<br>'Minzi put the bag on the floor.'<br>Long: 3-4-4-5<br>gəmsɑgɑ gyodosoe dodugnomiɨl bonæbərjəs' ə<br>'The prosecutor sent the thief to the jail.' |

The 16 sentences (8 sentences (4 short and 4 long) × 2 constructions) were further divided into two different word order sets as shown in (4). Each set of 16 sentences was shuffled with 16 filler sentences with two different syntactic constructions, Subj+V and Subj+Mod+D.O+V.

Two Word Order Experiment Sets (4)
Set 1: a. Subj+I.O+D.O+Verb
c. Subj+LOC+D.O+Verb

Set 2: b. Subj+D.O+I.O+Verb
d. Subj+D.O+LOC+Verb

The procedures used in this experiment involved the oral reading of isolated sentences visually presented on the computer monitor. Subjects read each sentence twice for the purpose of elicitation of neutral focus, and then the sentence disappeared from the monitor. Then, they heard a question prompting the VP focus, *What did XX do?*. Subjects responded to the question by supplying the sentence they have read with focus on the VP constituent. Next, subjects heard another question prompting a narrow focus (e.g., *What did XX pass to Mina?*) and they responded with the same sentence narrowly focusing on the corresponding constituent (e.g., *XX passed the ERASER to Mina*). The filler sentences were followed by a broad question, *What did you say?*, to mask the predictability of the VP or narrow focus questions for target sentences. The production of narrow focus was used for another study and is not presented here. The first production, read twice with neutral focus, was used as control data. All readings and responses were recorded to a computer.

The experiment was conducted in two separate sessions, with the interval of at least two weeks. Each experiment contained one of the two experimental sets as shown in (4). Before the main experiment session, there was a practice session with six sentences which were not used in the main session.

A total of 32 sentences (16 sentences x 2 word orders) were produced by four native Seoul Korean speakers. F0 tracks of neutral and VP focus production were analyzed using *PitchWorks* (R & D Scicon). Duration was measured by referring to both spectrogram and waveforms. The prosodic phrasing and intonational pattern were transcribed by two of the authors adopting the K-ToBI conventions-developed in Jun [11, 12]. According to K-ToBI, Seoul Korean has two prosodic units, AP (accentual phrase) and IP (intonation phrase). An AP is smaller than an IP and is slightly larger than a word. It is marked by a tonal pattern, LHLH or HHLH depending on the first consonant (H-initial if the segment is a tense, aspirated consonant, or /s, h/). The first two tones (LH or HH) were associated with the phrase initial two syllables and the final two tones (LH) with the phrase final two syllables. If the AP consists of fewer than four syllables, one or two of the AP medial tones may be omitted. In this experiment, AP-initial H tone triggering segments were avoided in the word initial position so that all APs were controlled to start with an L tone—this was done so that it is easy to observe the influence of focus (but not the segment) on pitch range. In sum, the analysis was done phonologically (i.e., transcription of prosodic phrasing, AP or IP) and phonetically (i.e., measurements of pitch peaks and duration).

## 3. Results and Discussion

### 3.1. Prosodic Phrasings

In the neutral focus condition, all speakers produced each word in an AP, $[AP\text{-}AP\text{-}AP\text{-}AP]_{IP}$, except for two sentences (out of 128 sentences). In those two cases, an IP boundary was produced after the first or second word. However, in the VP focus condition, speakers showed a strong tendency of marking the VP focus by initiating a new IP boundary at the left edge of VP, i.e., $[AP]_{IP}\text{-}[AP\text{-}AP\text{-}AP]_{IP}$. The results of prosodic phrasing analyses in the VP focus condition are presented in Table 2.

Table 2: *Percentages of IPs used at the left edge of each argument in the VP focus condition.*

| Subj\ARG | a. S+[I.O+D.O+V] | | b. S+[D.O+I.O+V] | |
|---|---|---|---|---|
| | I.O | D.O | D.O | I.O |
| M1 (CY) | 88% | 0% | 88% | 38% |
| F1 (JE) | 38% | 0% | 50% | 25% |
| F2 (KH) | 50% | 13% | 75% | 25% |
| M2 (SH) | 50% | 13% | 13% | 13% |
| Average | 56.3% | 6.3% | 56.3% | 25% |

| Subj\ARG | c. S+[LOC+D.O+V] | | d. S+[D.O+LOC+V] | |
|---|---|---|---|---|
| | LOC | D.O | D.O | LOC |
| M1 (CY) | 75% | 13% | 88% | 38% |
| F1 (JE) | 63% | 0% | 100% | 38% |
| F2 (KH) | 88% | 0% | 75% | 63% |
| M2 (SH) | 100% | 13% | 25% | 0% |
| Average | 81.3% | 6.3% | 71.9% | 34.4% |

Overall, 66% of the VP initial argument was marked by a large intonational phrase boundary at its left edge. Unlike other speakers, Speaker SH did not consistently mark the VP focus by prosodic phrasing cue: He often employed IP at the left edge of VP when the VP-initial argument was oblique, i.e., in (a) and (c) constructions (50 and 100% respectively), but much less often when the VP-initial argument is thematic, i.e., in (b) and (d) constructions (13% and 25% respectively).

We did not find any clear evidence that the argument ranked higher (D.O) gets the focus over the lower ranked argument (I.O or LOC) in the VP focus condition. As can be seen in Table 2, D.O., the highest argument in the VP, was more likely to start a new IP only when it is located VP initially, as in (b) and (d). In (a) and (c), D.O, which is not VP-initial, rarely started a new IP. Such tendency was consistent across speakers. That is, speakers signaled the VP focus by starting a large intonational phrase boundary at the left edge of VP regardless of the ranking relationship between arguments. Therefore, our data do not support the claim ([3]) that focus projection in Korean is sensitive to the thematic rankings or syntactic relations between arguments.

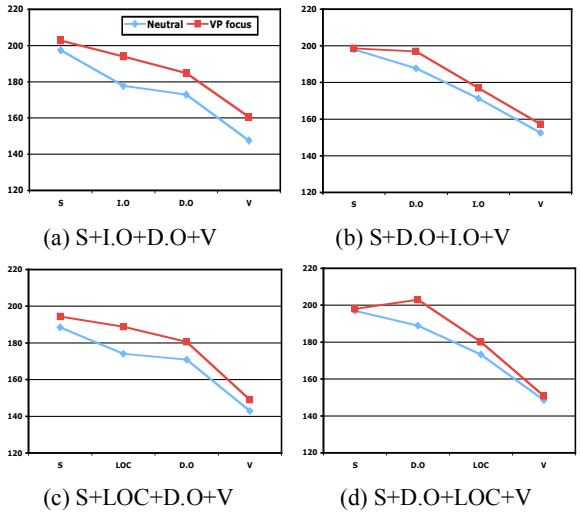
In addition, no clear tendency of dephrasing after the focused items was found in the domain of VP. Only eight out of 128 sentences showed dephrasing after VP. Dephrasing occurred only in short sentences: the last two words were dephrased into one prosodic unit, IP. We did not observe any case where the whole VP was dephrased into one IP. This indicates that dephrasing is closely related to the length of the phrase as expected, and that the acoustical cues signaling VP focus is not as strong as those signaling contrastive narrow focus in terms of prosodic phrasing (*See* [13]).

### 3.2. Pitch Peaks

Next, we examined how speakers used pitch range cues to represent the VP focus in Korean. The peak f0 value of each word was measured in the neutral and the VP focus condition. Figure 1 shows that the first word (Subj) has similar values in both neutral and VP focus conditions. In the domain of VP, f0s were higher than the neutral counterparts throughout the domain as in (a, c), or f0 was raised locally in one or two words at the VP initial position as in (b, d). Note that, in the VP focus condition, pitch is especially higher on the second word, i.e., the first argument of VP, across constructions.

Follow-up statistical analyses did not find any significant interaction between focus condition and word position. This suggests that the pitch range increase found in VP focus constructions was not influenced by the word order.

Figure 1: *Average f0 peak values of each word in the neutral and VP focus conditions.*




(a) S+I.O+D.O+V (b) S+D.O+I.O+V

(c) S+LOC+D.O+V (d) S+D.O+LOC+V

Again, we did not find any supporting evidence that, when focused, the argument ranked higher (D.O) behaves differently from the argument ranked lower (I.O and LOC) in terms of pitch range. In the VP focus condition, though the differences were not statistically significant, the average f0 values of the VP-initial arguments (2nd word in sentences) were always higher than those of the VP-medial arguments (3rd) regardless of the argument type. These findings were consistent whether the order of object arguments was reversed or not.

### 3.3. Duration

Previous studies [6, 13] found that a focused word is longer than a neutral word. In particular, Jun and Lee [13] reported that focus is marked by the increase of duration in the focused word initial syllable, which was always lengthened compared to that of the neutral word. Table 3 shows the average values of each word in the neutral and VP focus conditions. In general, the sentences in the VP focus condition have greater mean durations across words. Notable differences were found in the first and second word duration: the first and second words in the VP focus condition were significantly longer than those in the neutral condition (all *p*s. <.05).

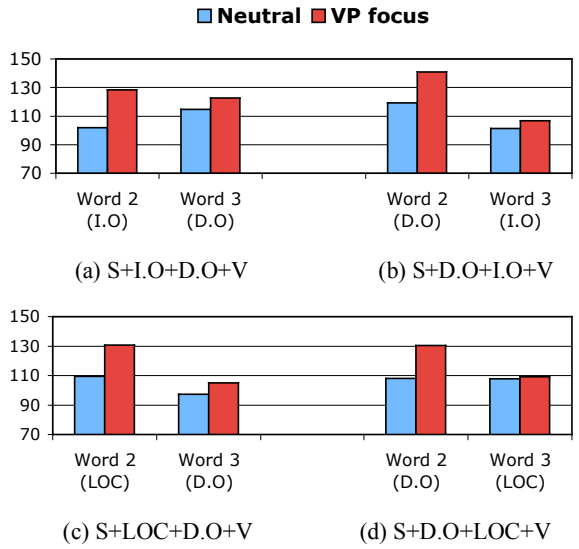
Table 3: *Mean duration (msec) of each word in the neutral and VP focus conditions and the difference (VP-Neutral).*

| Syntax | Focus | Word 1 | Word 2 | Word 3 | Word 4 |
|---|---|---|---|---|---|
| (a) | Neutral | 435.4 | 469.4 | 469.9 | 681.2 |
| | VP | 494.8 | 521.9 | 480 | 693.8 |
| | Difference | 59.4 | 52.5 | 10.1 | 12.6 |
| (b) | Neutral | 420.5 | 505.4 | 431 | 704.9 |
| | VP | 505.5 | 576.5 | 451.7 | 727.2 |
| | Difference | 85 | 71.1 | 20.7 | 23.7 |
| (c) | Neutral | 427.3 | 483.2 | 458.2 | 650.5 |
| | VP | 546.6 | 517.0 | 472.4 | 708.3 |
| | Difference | 119.3 | 33.8 | 14.2 | 57.8 |
| (d) | Neutral | 432.5 | 488.2 | 475.5 | 686.1 |
| | VP | 514.4 | 564.9 | 468.5 | 709.2 |
| | Difference | 81.9 | 76.7 | -7 | 23.1 |

It seems that lengthening of Word 1 in the VP focus condition is related to the fact that speakers tend to put an intonational phrase boundary (IP) at the end of the first word (Subj), that is, at the beginning of a Verb Phrase (*See* Section 3.1). Lengthening of Word 2 is related to the fact that this word is the first word of a focus phrase, since the initial syllable of a focused word was found to be extra-strengthened, compared to those in the neutral condition, at the left edge of the phrase [2, 7, 13].

Figure 2 shows the duration of the initial syllable of the second word (Word 2) and the third word (Word 3) of the sentence in the neutral condition and the VP focus condition. As shown in Figure 2, substantial initial strengthening was found in the second word in the VP focus condition whether its argument type is oblique (I.O or LOC) or thematic (D.O). That is, the initial lengthening occurred only in the VP-initial position. This suggests that the focused item in the VP focus condition is the VP-initial word (the second word). The initial syllable of the third word also showed some tendency of lengthening when the argument type was D.O, (i.e., (a) and (c)). However, statistical analyses showed that there was significant initial syllable lengthening in Word 2 but not in Word 3 compared to those in the neutral condition (all *p*s <.05 in Word 2 vs. all *p*s >.05 in Word 3). This suggests that the VP-focus is realized by focusing only the first word of a Verb Phrase in Korean.

Figure 2: *Duration of the initial syllable of Word2 (VP-initial) and Word 3 (VP-medial) in the neutral and VP-focus conditions.*




## 4. Conclusions

Taken together, the results found in the current study do not support the claim that argument types play an important role in focus projection in Korean. We have found that VP focus was marked by focusing on the VP-initial word, that is, by initiating a large intonational phrase boundary at the beginning of the VP, raising the pitch range of the VP-initial word, and extra-strengthening of VP-initial syllables. We observed that these phonetic (f0 peak, word duration) and phonological markers (i.e., prosodic phrasing) of focus were found the same regardless of the argument type or the order of arguments. That is, both thematic and oblique arguments behaved the same way under focus. Therefore, we conclude that the effect of argument ranking on the domain of focus projection proposed in the HPSG framework does not have any phonetic correlates. That is, our data do not show any positive evidence that argument rankings affect focus projection in Korean. The validity of Vallduvi and Engdahl [16]'s information packaging theory should be confirmed in other languages based on experimental data.

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