Wh-in-front-of-V and *Wh*-adjacency in Korean

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1. Introduction

Korean is a language in which *wh*-elements do not move overtly, and word order is free. Thus, the *wh*-elements in Korean have been assumed not to have any particular distributional property in that they appear in anywhere of interrogative sentences. Then, does the assumption correspond to the actual data? Is there indeed no possibility such that Korean *wh*-elements have patterns, for example, in positions they prefer? To answer these, this study examines empirical data of Korean *wh*-adjuncts via experiments. It compares the distribution of [+*wh*]s with that of [-*wh*]s, and gives theoretical explanations for two interesting patterns observed: i) preference of [+*wh*] adjuncts in preverbal position, that is '*wh*-in-front-of-V' and ii) preference of [+*wh*] adjuncts to be adjacent to each other, that is '*wh*-adjacency'. Specifically, this study suggests the principle of efficient computation and intonational patterns as a way to describe the distribution of *wh*-adjuncts.

2. The Actual Distribution of Korean [±*wh*] Adjuncts: Experiment

2.1. The Distinction between *Wh*-elements and Indefinite Pro-forms

Wh-elements and indefinite pro-forms in Korean appear in the same form. When a *wh*-element appears in a sentence, for instance, it can be interpreted as either a y/n-question (yes/no-question) or a *wh*-question as described in (1).

(1) Question: Yengi-ka Chelswu-lul encey manna-ass-ni?
Yengi-NOM Chelswu-ACC when/sometime meet-PST-Q
'When did Yengi meet Chelswu?', 'Did Yengi meet Chelswu sometime?'
Answer 1: Onul achim-ey.
today morning-at
'In this morning.'
Answer 2: Ung.
Yes.
'Yes, Yengi met Chelswu sometime.'

Therefore, it must be ensured that *encey* (when/sometime), *etise* (where/somewhere), *nwu*(*kwu*) (who/someone), *mwues* (what/something) would be interpreted as *wh*-elements rather than indefinite pro-forms before we discuss the distributional property of *wh*-elements.[1]

[1] *way* (why) is not used as an indefinite pro-form; it is used only as a *wh*-element.

However, in the sense that they are generally construed as *wh*-elements rather than indefinite pro-forms unless the particular context is given, and that *wh*-elements have the attribute of indefinite pro-forms (see Jang 1975, Suh 1987, Jun & Oh 1996, among others), we do not discuss the distinction between *wh*-elements and indefinite pro-forms.[2] In this paper, what we focus on is the distributional property of [+*wh*] elements, especially on [+*wh*] adjuncts, which is known to have free distribution.

2.2. Experimental Design

Fifty-five native speakers of Korean participated in the experiment.[3] They were asked to conduct a sentence completion task, which is designed to figure out whether there is a preferred position for [±*wh*] adjuncts in Korean. In this task, all participants were asked to complete 24 interrogative sentences and 18 declarative sentences by putting one or two given adjunct expressions, such as [-*wh*] *onul achimey* (in this morning), [+*wh*] *encey* (when).

The experiment consisted of two sets; Set 1 is designed to identify the preferred position for a [±*wh*] adjunct and Set 2 is designed to see the distribution of two [±*wh*] adjuncts in one declarative/interrogative sentence. The results from these two sets will be described in this section, in turn.

The factors in (2) were applied to the given adjunct expressions.[4]

(2) a. Type of adjuncts: [-*wh*] adjuncts vs. [+*wh*] adjuncts
b. Semantic classification: time (T), place (P), reason (R)
c. Positions: [ ]$_{P1}$ Subj [ ]$_{P2}$ Obj [ ]$_{P3}$ V

As in (2a) and (2b), the type of [±*wh*] and the meaning of the adjuncts were distinguished.[5] To see if there is a preferred position, three different locations were presented in each sentence as in (2c). Thus, six types of [±*wh*] adjuncts (e.g., [±*wh*.T], [±*wh*.P], [±*wh*.R]) are tested.

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[2] An experiment that distinguishes *wh*-elements from indefinite pronouns is carried out in further research.

[3] This experiment is approved by Sogang University's Institutional Review Board (IRB) (Approval number: SGUIRB-A-2005-14).

[4] For more concise display, the abbreviations in (2) were combined and used as in (i). The positions in (2c) displayed as [ ]$_{P1}$, [ ]$_{P2}$, and [ ]$_{P3}$ are abbreviated form of 'position 1: pre-subject', 'position 2: pre-object', and 'position 3: pre-verb', respectively. In addition, the case in which a *wh*-adjunct appears after the predicate is ignored since +*wh* adjunct are not allowed to appear in the position in Korean (cf. (23)). The given adjunct expressions (e.g., [±*wh*] adjuncts) are marked in [ ].

(i) a. [-*wh*.T]: time-related [-*wh*] adjunct, *onul achim-ey* (in this morning)
b. [-*wh*.P]: place-related [-*wh*] adjunct, *hakkyo apheyse* (in front of the school)
c. [-*wh*.R]: reason-related [-*wh*] adjunct, *kwacey ttaymwuney* (for homework)
d. [+*wh*.T]: time-related [+*wh*] adjunct, *encey* (when)
e. [+*wh*.P]: place-related [+*wh*] adjunct, *etise* (where)
f. [+*wh*.R]: reason-related [+*wh*] adjunct, *way* (why)

[5] In this experiment, the tool-related adjunct is not considered. According to Yoo J. (2019), 'time-place-tool' is the normative word order when 'time', 'place', and 'tool' related adjuncts appear together in a sentence. This indicates that tool-related adjuncts, placed in the last of the order, prefer to appear in a pre-verb position. However, an adjunct whose position is free in a sentence should be examined to see whether the distributional property of adjuncts would differ depending on [±*wh*]. Hence, tool-related adjunct was excluded from the investigation in that it has already had its favorite position.

2.3. The Distributional Property of Single [±*wh*] Adjuncts

Table 1 shows the distribution of [-*wh*] adjuncts in declarative sentences, depending on their meanings (time, place, and reason). The results are also exemplified in (4)-(6), the distribution ratio is put in square brackets, and the highest proportions of them are asterisk-marked. [-*wh*.T] type adjuncts are frequently chosen at the pre-subject position ([52.1%]$_{P1}$), while [-*wh*.P] and [-*wh*.R] type adjuncts are highly preferred in the pre-object position ([57.6%]$_{P2,}$ [71.5%]$_{P2}$, respectively).

[Table 1] The Distribution of [-*wh*] Adjuncts

[ ]$_{P1}$	Subject	[ ]$_{P2}$	Object	[ ]$_{P3}$	Verb.
-*wh*, TIME					
		-*wh*, PLACE			
		-*wh*, REASON			

(4) [-*wh*.TIME]: *onul achim-ey* (in this morning)
[*52.1%]$_{P1}$ Chelswu-ka [36.4%]$_{P2}$ Yengi-lul [11.5%]$_{P3}$ manna-ass-ta.
Chelswu-NOM Yengi-ACC meet-PST-DEC
'Chelswu met Yengi in this morning.'

(5) [-*wh*.PLACE]: *hakkyo apheyse* (in front of the school)
[17.0%]$_{P1}$ Chelswu-ka [*57.6%]$_{P2}$ Yengi-lul [25.5%]$_{P3}$ manna-ass-ta.
Chelswu-NOM Yengi-ACC meet-PST-DEC
'Chelswu met Yengi in front of the school.'

(6) [-*wh*.REASON]: *kwacey ttaymwuney* (for homework)
[14.5%]$_{P1}$ Chelswu-ka [*71.5%]$_{P2}$ Yengi-lul [13.9%]$_{P3}$ manna-ass-ta.
Chelswu-NOM Yengi-ACC meet-PST-DEC
'Chelswu met Yengi for homework.'

Do [+*wh*] adjuncts show the same patterns as the [-*wh*] adjuncts? As shown in Table 2, all [+*wh*] adjuncts appear most frequently at the pre-verb position ([ ]$_{P3}$), regardless of their meaning differences. Detailed figures and the relevant examples are also shown in (7)-(9).

[Table 2] The Distribution of [+*wh*] Adjuncts

[ ]$_{P1}$	Subject	[ ]$_{P2}$	Object	[ ]$_{P3}$	Verb.
				+*wh*.TIME	
				+*wh*.PLACE	
				+*wh*.REASON	

(7) [+*wh*.TIME] type adjuncts: *encey* (when)[6]
[18.2%]$_{P1}$ Chelswu-ka [35.5%]$_{P2}$ Yengi-lul [*46.4%]$_{P3}$ manna-ass-ni?
Chelswu-NOM Yengi-ACC meet-PST-Q
'When did Chelswu meet Yengi?'

(8) [+*wh*.PLACE] type adjuncts: *etise* (where)
[10.5%]$_{P1}$ Chelswu-ka [24.5%]$_{P2}$ Yengi-lul [*64.5%]$_{P3}$ manna-ass-ni?
Chelswu-NOM Yengi-ACC meet-PST-Q
'Where did Chelswu meet Yengi?'

(9) [+*wh*.REASON] type adjuncts: *way* (why)
[22.7%]$_{P1}$ Chelswu-ka [17.7%]$_{P2}$ Yengi-lul [*59.5%]$_{P3}$ manna-ass-ni?
Chelswu-NOM Yengi-ACC meet-PST-Q
'Why did Chelswu meet Yengi?'

Based on the data from Set 1 ([-*wh*] adjunct vs. [+*wh*] adjunct), the following distributional properties of [±*wh*] adjuncts are identified. First, [-*wh*] adjuncts show relatively free distribution as compared with [+*wh*] adjuncts. Second, [+*wh*] adjuncts tend to be adjacent to the predicate, and the preference for the pre-verb position (henceforth, '*wh*-in-front-of-V') applies to all the cases regardless of their meaning differences.

2.4. The Distributional Property of Multiple [±*wh*] Adjuncts

We observed that [+*wh*] adjuncts prefer the '*wh*-in-front-of-V' position. Based on this, we additionally examined declarative/interrogative sentences with two [±*wh*] adjuncts, to identify whether the distributional property of multiple [+*wh*] adjuncts are the same with that of single [+*wh*] adjuncts. Therefore, the sentences in Set 2 are designed for two different [±*wh*] adjuncts to be inserted in one sentence. The relevant examples are presented in (10); the declarative sentence in (10a) appears with two [-*wh*] adjuncts, and the interrogative sentence in (10b) appears with two [+*wh*] adjuncts.

(10) a. onul achim-ey hakkyo apheyse Chelswu-ka Yengi-lul manna-ass-ta.
today morning school in front of Chelswu-NOM Yengi-ACC see-PST-DEC
'Chelswu met Yengi in front of the school this morning.'
b. encey etise Chelswu-ka Yengi-lul manna-ass-ni?
when where Chelswu-NOM Yengi-ACC meet-PST-Q
'When and where did Chelswu meet Yengi?'

To illustrate six possible positions for the two [±*wh*] adjuncts, in (11a-c) two [+*wh*] adjuncts appear in the same position, while in (11e-f), two [+*wh*] adjuncts appear in different positions from each other.

[6] The figure 46.4% is considered as a significant rate for 'preferred position of [±*wh*] adjuncts' by the following reason. Since the average value of the three locations is about 33.3%, then about 33% of total responses indicate that they evenly distributed in the three positions. However, 46.4% indicates that there is tendency to be towards a particular position, resulting in a 'preferred position'.

(11) Combination of the positions for Multiple [+*wh*] Adjuncts (e.g., [*when*]·[*where*])[7]
a. '[ ]$_{P1}$[ ]$_{P1}$' = '[when] [where] Chelswu-ka Yengi-lul manna-ass-ni?'
b. '[ ]$_{P2}$[ ]$_{P2}$' = 'Chelswu-ka [when] [where] Yengi-lul manna-ass-ni?'
c. '[ ]$_{P3}$[ ]$_{P3}$' = 'Chelswu-ka Yengi-lul [when] [where] manna-ass-ni?
d. '[ ]$_{P1}$[ ]$_{P2}$' = '[when] Chelswu-ka [where] Yengi-lul manna-ass-ni?
e. '[ ]$_{P1}$[ ]$_{P3}$' = '[when] Chelswu-ka Yengi-lul [where] manna-ass-ni?
f. '[ ]$_{P2}$[ ]$_{P3}$' = 'Chelswu-ka [when] Yengi-lul [where] manna-ass-ni?

It is noteworthy that this study focuses on analyzing i) whether '*wh*-adjacency' exists between two [+*wh*] adjuncts and ii) whether '*wh*-in-front-of-V' phenomenon observed in single [+*wh*] adjunct is also preferred in multiple [+*wh*] adjuncts. In this view, the order difference between the two [±*wh*] adjuncts (e.g., [+*wh*.T]·[+*wh*.P] or [+*wh*.P]·[+*wh*.T]) is excluded from the analysis.

2.4.1. Results 1: *wh*-adjacency

This section shows an overall analysis of the results from Set 2, the distribution of multiple [±*wh*] adjuncts, mainly focusing on the '*wh*-adjacency'. The results are described in the order of [+*wh*.T]·[+*wh*.R], [+*wh*.P]·[+*wh*.R], and [+*wh*.T]·[+*wh*.P], comparing them with [-*wh*] adjuncts.

Table 3 shows that the rate when the [+*wh*.T] and [+*wh*.R] appear in the same positions (e.g., '[ ]$_{P1}$[ ]$_{P1}$', '[ ]$_{P2}$[ ]$_{P2}$', and '[ ]$_{P3}$[ ]$_{P3}$', see (11)), adjacent to each other. The relevant examples are also presented in (12).

[Table 3] *Wh*-adjacency: [+*wh*.T]·[+*wh*.R] ([*when*]·[*why*])

Position	[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$	Total
Adjacency	13.2%	8.6%	24.5%	46.4%

(12) a. encey etise Chelswu-ka Yengi-lul manna-ass-ni? (13.2%)
when where Chelswu-NOM Yengi-ACC meet-PST-Q
'When and where did Chelswu meet Yengi?'
b. Chelswu-ka encey etise Yengi-lul manna-ass-ni? (8.6%)
c. Chelswu-ka Yengi-lul encey etise manna-ass-ni? (24.5%)

The rate of [+*wh*.T]·[+*wh*.R] adjacency (46.4%) is slightly lower than that of non-adjacency (53.6%). Then, does this mean that there is no '*wh*-adjacency' between the two [+*wh*] adjuncts? To see this, let us compare the results from [+*wh*.T]·[+*wh*.R] in Table 3 with the results from [-*wh*.T]·[-*wh*.R] in Table 4.

[Table 4] Adjacency: [-*wh*.T]·[-*wh*.R] ([*this morning*]·[*for his homework*])

Position	[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$	Total
Adjacency	13.3%	11.5%	0.0%	24.8%

[7] The interpunct (·) is used to present combinations of two adjuncts in a sentence (e.g., [+*wh*.T].[+*wh*.P]).

The total rate of adjacency between the two [-*wh*] adjuncts is 24.8%; the adjacency rate of [+*wh*] adjuncts (46.4%, Table 3) is nearly twice as high as that of the [-*wh*] adjuncts. Based on the comparison of the adjacency rate between [+*wh*]·[+*wh*] and [-*wh*]·[-*wh*], we determined that [+*wh*.T] and [+*wh*.R] adjuncts in Korean tend to be adjacent to each other in a multiple [+*wh*] interrogative sentence.

Now consider the '*wh*-adjacency' observed in [+*wh*.P]·[+*wh*.R] combination. As shown in Table 5, the total ratio of [+*wh*] adjuncts adjacent to each other is 51.4%, which is slightly higher than the ratio of non-adjacency (48.6%). The relevant examples are presented in (13).

[Table 5] *Wh*-adjacency: [+*wh*.P]·[+*wh*.R] ([*where*]·[*why*])

Position	[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$	Total
Adjacency	11.8%	5.0%	34.5%	51.4%

(13) a. etise way Chelswu-ka Yengi-lul manna-ass-ni? (11.8%)
where why Chelswu-NOM Yengi-ACC meet-PST-Q
'Where and why did Chelswu meet Yengi?'
b. Chelswu-ka etise way Yengi-lul manna-ass-ni? (5.0%)
c. Chelswu-ka Yengi-lul etise way manna-ass-ni? (34.5%)

Comparing the results from [+*wh*.P]·[+*wh*.R] (Table 5) with [-*wh*.P]·[-*wh*.R] (Table 6), then, the difference in ratio between [+*wh*]s and [-*wh*]s become more obvious (51.4% > 30.9%). That is, observed adjacency rate in between [+*wh*] adjuncts ([+*wh*.P]·[+*wh*.R]) are much higher than that in between [-*wh*] adjuncts ([-*wh*.P]·[-*wh*.R]).

[Table 6] Adjacency: [-*wh*.P]·[-*wh*.R] ([*in front of the school*]·[*for his homework*])

Position	[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$	Total
Adjacency	4.8%	22.4%	3.6%	30.9%

Table 7 and the relevant examples in (14) show the tendency of [+*wh*.T] and [+*wh*.P] to be adjacent to each other. The total adjacency rate of the two [+*wh*] adjuncts are 65.5%, which is higher than the non-adjacency rate (34.5%).

[Table 7] *Wh*-adjacency: [+*wh*.T]·[+*wh*.P] ([*when*]·[*where*])

Position	[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$	Total
Adjacency	15.5%	12.3%	37.7%	65.5%

(14) a. encey etise Chelswu-ka Yengi-lul manna-ass-ni? (15.5%)
when where Chelswu-NOM Yengi-ACC meet-PST-Q
'When and where did Chelswu meet Yengi?'
b. Chelswu-ka encey etise Yengi-lul manna-ass-ni? (12.3%)
c. Chelswu-ka Yengi-lul encey etise manna-ass-ni? (37.7%)

When the ratios of adjacency observed in [+*wh*.T]·[+*wh*.P] is compared with that observed in [-*wh*.T]·[-*wh*.P], the existence of '*wh*-adjacency' becomes more obvious. As presented in Table 8, only 29.1% of adjacency is observed in [-*wh*.T]·[-*wh*.P] adjuncts, this is

a very low rate when it is compared with [+*wh*.T]·[+*wh*.P] adjacency ([+*wh*] adjacency: 65.5% > [-*wh*] adjacency: 29.1%).

[Table 8] Adjacency: [-*wh*.T]·[-*wh*.P] ([*this morning*]·[*in front of the school*])

Position	[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$	Total
Adjacency	20.0%	8.5%	0.6%	29.1%

To summarize, '*wh*-adjacency' between the two [+*wh*] adjuncts have been identified by comparison with [-*wh*] adjuncts. We have examined three different combinations of [+*wh*] adjuncts, [+*wh*.T]·[+*wh*.R], [+*wh*.P]·[+*wh*.R], and [+*wh*.T]·[+*wh*.P], and the results are summarized and compared with the adjacency rate observed in [-*wh*] adjuncts in Table 9. The 'adjacency' rate of [+*wh*] adjunct is higher than that of [-*wh*] adjuncts in all cases; therefore, we conclude that there is '*wh*-adjacency' at least in [+*wh*] adjuncts.[8]

[Table 9] Overall Results

	[+*wh*]·[+*wh*] adjacency	[-*wh*]·[-*wh*] adjacency
[TIME]·[REASON]	46.4%	24.8%
[PLACE]·[REASON]	51.4%	30.9%
[TIME]·[PLACE]	65.5%	29.1%

2.4.2. Result 2: '*Wh*-in-front-of-V' Preference

To identify if both or only one of [+*wh*] adjuncts prefers '*wh*-in-front-of-V' position, we looked at the following cases. First, the rate at which either or both [+*wh*] adjuncts that prefer '*wh*-in-front-of-V' position (e.g., [ ]$_{P3}$[ ]$_{P3}$ + [ ]$_{P1}$[ ]$_{P3}$ + [ ]$_{P2}$[ ]$_{P3}$: every response including [ ]$_{P3}$) was compared to that of [-*wh*] adjuncts. The overall proportion of the '*wh*-in-front-of-V' position was 67.6%-76.4%. This is much higher than the proportion of the rest of the positions ([ ]$_{P1}$[ ]$_{P1}$ + [ ]$_{P2}$[ ]$_{P2}$ + [ ]$_{P1}$[ ]$_{P2}$): 23.6%-32.4%.

Mainly focusing on the proportion of the '*wh*-in-front-of-V' position, the distribution of [+*wh*.T]·[+*wh*.R] is compared with [-*wh*.T]·[-*wh*.R] in Table 10. The ratio of '*wh*-in-front-of-V' position in which either or both [+*wh*.T]·[+*wh*.R] appears (71.8%) is much more than that of the other positions (23.2%). When we compare this with the ratio observed in [-*wh*.T]·[-*wh*.R] (30.3%), then it becomes more evident that [+*wh*] prefers '*wh*-in-front-of-V'.

[Table 10] '*wh*-in-front-of-V' Preference: [+*wh*.T]·[+*wh*.R]

	[ ]$_{P3}$[ ]$_{P3}$	[ ]$_{P1}$[ ]$_{P3}$	[ ]$_{P2}$[ ]$_{P3}$	'*wh*-in-front-of-V'	'Others'
[+*wh*.T]·[+*wh*.R]	24.5%	33.2%	14.1%	71.8%	23.2%
[-*wh*.T]·[-*wh*.R]	0.0%	24.8%	5.5%	30.3%	69.7%

*'*wh*-in-front-of-V': ([ ]$_{P3}$[ ]$_{P3}$ + [ ]$_{P1}$[ ]$_{P3}$ + [ ]$_{P2}$[ ]$_{P3}$), 'Others': ([ ]$_{P1}$[ ]$_{P1}$ + [ ]$_{P2}$[ ]$_{P2}$ + [ ]$_{P1}$[ ]$_{P2}$)

[8] Here, it is noteworthy that in this experiment, sentences including *wh*-arguments, such as *nwu-ka* (who-NOM) and *mwues-ul* (what-ACC), were also examined. The results were the same; i) *wh*-arguments appear most frequently at the pre-verb position (from 57.4% to 78.2%), and ii) the ratio of preference in '*wh*-adjacency' between *wh*-arguments was from 72.1% to 86.7%.

Now consider the number of responses in which [+*wh*.T] and [+*wh*.R] are adjacent to each other in the '*wh*-in-front-of-V' position in Table 11. Then, we can see that if both properties ('*wh*-adjacency' and '*wh*-in-front-of-V') are applied to the sentence, it becomes the most preferred multiple [+*wh*] sentence, as in (15). Interestingly, in this experiment, there was zero response for the case that [-*wh*.T]·[-*wh*.R] appears in [ ]$_{P3}$[ ]$_{P3}$ ('*wh*-in-front-of-V') adjacent to each other, while there were 54 responses (52.9%) for [+*wh*.T]·[+*wh*.R] adjacent in [ ]$_{P3}$[ ]$_{P3}$.

[Table 11] In both '*wh*-in-front-of-V' and '*wh*-adjacency' (±*wh* [TIME]·[REASON])

		[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$
[+*wh*.T]·[+*wh*.R]	responses	29	19	54
	%	28.4%	18.6%	52.9%
[-*wh*.T]·[-*wh*.R]	responses	22	19	0
	%	53.7%	46.3%	0.0%

(15) Chelswu-ka Yengi-lul encey way manna-ass-ni?
Chelswu-NOM Yengi-ACC when why meet-PST-Q
'When and why did Chelswu meet Yengi?'

In the distribution of [+*wh*.P]·[+*wh*.R], the '*wh*-in-front-of-V' preference is also observed. As shown in Table 12, the ratio of '*wh*-in-front-of-V' position ([ ]$_{P3}$[ ]$_{P3}$) in which either or both [+*wh*.P]·[+*wh*.R] appears (76.3%) is significantly more than that of the other positions (23.7%). On the other hand, considering [-*wh*.P]·[-*wh*.R], there is no significant difference between the ratio of '*wh*-in-front-of-V' (48.5%) and that of other positions (51.5%). Therefore, we can conclude that [+*wh*] adjuncts much prefer the '*wh*-in-front-of-V' position, and this is also consistent with the finding from single [+*wh*] adjuncts (see Section 2.3).

[Table 12] '*wh*-in-front-of-V' Preference ([+*wh*.P]·[+*wh*.R])

	[[ ][ ]]$_{P3}$	[ ]$_{P1}$[ ]$_{P3}$	[ ]$_{P2}$[ ]$_{P3}$	'*wh*-in-front-of-V'	'Others'
[+*wh*.P]-[+*wh*.R]	34.5%	24.1%	17.7%	76.3%	23.7%
[-*wh*.P]-[-*wh*.R]	3.6%	29.1%	15.8%	48.5%	51.5%

*'*wh*-in-front-of-V': ([ ]$_{P3}$[ ]$_{P3}$ + [ ]$_{P1}$[ ]$_{P3}$ + [ ]$_{P2}$[ ]$_{P3}$), 'Others': ([ ]$_{P1}$[ ]$_{P1}$ + [ ]$_{P2}$[ ]$_{P2}$ + [ ]$_{P1}$[ ]$_{P2}$)

The other case that [+*wh*] adjuncts are adjacent to each other in the '*wh*-in-front-of-V' position are presented in Table 13. [+*wh*.P] and [+*wh*.R] are adjacent in the position of '*wh*-in-front-of-V' at a rate of 67.3%, while [-*wh*.P] and [-*wh*.R] are adjacent in the position of '*wh*-in-front-of-V' at a rate of only 11.8%. Therefore, it is confirmed that adjacent [+*wh*] adjuncts much more prefer the '*wh*-in-front-of-V' position than adjacent [-*wh*] adjuncts that highly prefer the pre-object position ([ ]$_{P2}$[ ]$_{P2}$, 72.5%). Based on the result, the most preferred multiple [+*wh*] sentence type for [+*wh*.P]·[+*wh*.R] is presented in (16).

[Table 13] In both '*wh*-in-front-of-V' and '*wh*-adjacency' (±*wh* [PLACE]·[REASON])

		[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$
[+*wh*.P]·[+*wh*.R]	responses	26	11	76
	%	23.0%	9.7%	67.3%
[-*wh*.P]·[-*wh*.R]	responses	8	37	6
	%	15.7%	72.5%	11.8%

(16) Chelswu-ka Yengi-lul <u>etise</u> <u>way</u> manna-ass-ni?
Chelswu-NOM Yengi-ACC where why meet-PST-Q
'Where and why did Chelswu meet Yengi?'

Lastly, consider the distributional property observed in [+*wh*.T]·[+*wh*.P], adjacent to each other, and at the same time, appearing in the '*wh*-in-front-of-V' position. Table 14 shows that [+*wh*.T]·[+*wh*.P] also prefers '*wh*-in-front-of-V' position (67.7%) than the other positions (32.3%). This is compared to 33.9%, the preference rate for '*wh*-in-front-of-V' in [-*wh*.T]·[-*wh*.P].

[Table 14] '*wh*-in-front-of-V' Preference ([*when*]·[*where*])

	[ ]$_{P3}$[ ]$_{P3}$	[ ]$_{P1}$[ ]$_{P3}$	[ ]$_{P2}$[ ]$_{P3}$	'*wh*-in-front-of-V'	'Others'
[+*wh*.T]·[+*wh*.P]	37.7%	20.0%	10.0%	67.7%	32.3%
[-*wh*.T]·[-*wh*.P]	0.6%	27.3%	6.1%	33.9%	66.1%

*'*wh*-in-front-of-V': ([ ]$_{P3}$[ ]$_{P3}$ + [ ]$_{P1}$[ ]$_{P3}$ + [ ]$_{P2}$[ ]$_{P3}$), 'Others': ([ ]$_{P1}$[ ]$_{P1}$ + [ ]$_{P2}$[ ]$_{P2}$ + [ ]$_{P1}$[ ]$_{P2}$)

Table 15 shows that there is a meaningful difference between [+*wh*] adjuncts (57.6%) and [-*wh*] adjuncts (8.5%). Accordingly, the most frequently answered sentence type for the [+*wh*.T]·[+*wh*.P] is as in (17); the two [+*wh*] adjuncts are adjacent to each other in the pre-verb position.

[Table 15] In both '*wh*-in-front-of-V' and '*wh*-adjacency' (±*wh* [TIME]·[PLACE])

		[ ]$_{P1}$[ ]$_{P1}$	[ ]$_{P2}$[ ]$_{P2}$	[ ]$_{P3}$[ ]$_{P3}$
[+*wh*.T]·[+*wh*.P]	responses	34	27	83
	%	23.6%	18.8%	57.6%
[-*wh*.T]·[-*wh*.P]	responses	62	45	10
	%	53.0%	38.5%	8.5%

(17) Chelswu-ka Yengi-lul <u>encey</u> <u>etise</u> manna-ass-ni?
Chelswu-NOM Yengi-ACC when where meet-PST-Q
'When and where did Chelswu meet Yengi?'

The distributional patterns of [±*wh*] adjuncts observed in this experiment are summarized as follows. First, [+*wh*] adjuncts such as *encey* (when), *etise* (where), and *way* (why) prefer the '*wh*-in-front-of-V' position rather than the other positions. This is distinguished from the pattern in [-*wh*] adjuncts, which have relatively free distribution. Second, preference of '*wh*-in-front-of-V' position is also found in multiple *wh*-questions, and this is identified in all combinations of [+*wh*] adjuncts (average ratio: 72.0%), by comparison with [-*wh*] adjuncts

(average ratio: 37.6%). Third, it has been observed that there is '*wh*-adjacency' between [+*wh*] adjuncts in Korean (Table 9). Although the rate of '*wh*-adjacency' between [+*wh*.T] and [+*wh*.R] was relatively low at 46.4% ([+*wh*.P]·[+*wh*.R]: 51.4%, [+*wh*.T]·[+*wh*.P]: 65.5%), it turned out to be still higher than the rate of [-*wh*.T]·[-*wh*.R] (24.8%). By comparing the distributional properties between multiple [+*wh*] adjuncts and multiple [-*wh*] adjuncts; therefore, '*wh*-adjacency' in Korean is also verified, as well as '*wh*-in-front-of-V' preference.

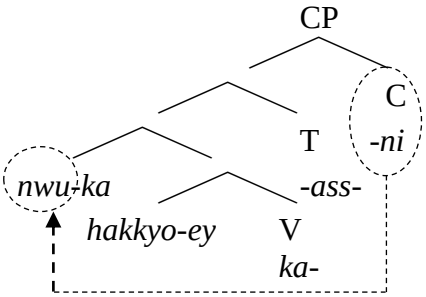
3. Basic Syntax of Korean *Wh*-questions

A *wh*-question in Korean is only valid when a *wh*-element and a Q-marker are agreed with each other. The following three different conditions for the *wh*-question have been previously suggested in the literature (Suh 1987, Chung 1996, etc.)

Condition 1: C-command. As shown in (18), Q-marker such as *-ni* (Q) should c-command *wh*-element (*nwu* (who)).

(18) a. nwu-ka hakkyo-ey ka-ass-ni?
who-NOM school-to go-PST-Q
'Who did go to school?'

b.



c-command & agreement

However, the sentence in (19) cannot be a *wh*-question, since Q-marker *-unka* (whether) cannot c-command the *wh*-element *nwu* (who), which is outside of the c-command domain of Q-marker *-unka*.

(19) *nwu-ka [Chelswu-ka hakkyo-ey ka-nu-unka] mwul-ess-ta.
who-NOM Chelswu-NOM school-to go-PRS-whether ask-PST-DEC
'Who asked whether Chelswu goes to school.'

Condition 2: Economy. The second condition for the *wh*-question is economy. In (20a), for instance, the *wh*-element inside the embedded clause agrees with the Q-marker *-ni* of the matrix clause. Then, the scope of the *wh*-element is the matrix clause in that the agreement indicates the scope of *wh*-element; hence, the main clause is realized as a *wh*-question.

(20) a. Chelswu-nun [nwu-ka o-n-ta-ko] mal-ha-yess-ni?
Chelswu-TOP who-NOM come-PRS-DEC-QUO say-do-PST-Q
'Who did Chelswu say comes here?'

b. Chelswu-nun [nwu-ka o-nu-unka] mal-ha-yess-ni?
Chelswu-TOP who-NOM come-PRS-whether say-do-PST-Q
'Did Chelswu say whether someone comes here?

However, the interrogative sentence in (20b) is not a *wh*-question but a y/n-question; the embedded *wh*-element does not agree with the Q-marker *-ni* in the matrix clause. Then why is it difficult to agree with Q-marker *-ni*? This is because the embedded clause also has a Q-marker *-unka* (whether), which is closer to the *wh*-element *nwu* (who), than matrix Q-marker *-ni*. This indicates that the notion of economy is involved in an agreement relationship between a *wh*-element and a Q-marker; the closer agreement should be accomplished. That is, the notion of economy excludes non-economic agreement relationships, and thus the Q-marker *-ni* of the matrix clause in (20b) cannot agree with the *wh*-element. Therefore, the sentence becomes a y/n-question.[9]

Condition 3: Sentence-final Intonation. Korean interrogative sentences have their own sentence-final intonation, depending on the question types (Lee, H. Y. 1996: 232-239). For instance, the y/n-question in (21a) ends with a high level intonation (→), while the *wh*-question in (21b) ends with a low level intonation (→).

(21) a. y/n-question: high level intonation
ku-ka wa-ass-ni?→
he-NOM come-PST-Q
'Did he come?'
b. *wh*-question: low level intonation
nwu-ka wa-ass-ni?→
who-NOM come-PST-Q
'Who is here?'

On the basis of the realization of intonation in Korean, Lee C. H. (2013) describes the contrast between (22) and (23) as follows. In (22b), so-called right dislocated construction, the object *Yengi-lul* (Yengi-ACC) is dislocated to the post-verbal position. In (23b), however, the *wh*-element cannot appear in the post-verbal position (Lee J-S. 2009, Lee C. H. 2009, Chung D-H. 2009). This is because there is no overt *wh*-element within the c-command area of Q-marker due to the right-dislocated *wh*-element, hence the Q-marker *-ni* is realized as [*-wh*] sentence-final intonation.[10] At this point, the right-dislocated *wh*-element, which requires [*+wh*] intonation, conflicts with the [*-wh*] intonation of the Q-marker. Therefore, the dislocation of *wh*-element in (23b) is not valid in that it causes the discrepancy for the realization of sentence-final intonation between the *wh*-element and the Q-marker.

(22) a. Chelswu-ka Yengi-lul manna-ass-ta.
Chelswu-NOM Yengi-ACC meet-PST-DEC
'Did Chelswu meet Yengi?
b. Chelswu-ka manna-ass-ta, Yengi-lul.
Chelswu-NOM meet-PST-DEC Yengi-ACC
'Chelswu met Yengi.'

[9] One might have an intuition that if *who* has much stronger stress than a typical *who* has, (20b) may be a *wh*-question. Investigating further the phonological properties of *wh*-elements is beyond the scope of this paper, hence, this is not discussed in this study.

[10] In the literature, right dislocated construction has been considered as a kind of movement, which are generally considered as a process of 'Copy + Merge + Delete' .

(23) a. Chelswu-ka nwukwu-lul manna-ass-ni?
Chelswu-NOM who-ACC meet-PST-Q
'Who did Chelswu meet?
b. *Chelswu-ka manna-ass-ni, nwukwu-lul?
Chelswu-NOM meet-PST-Q who-ACC
'Did Chelswu meet, whom?

(adapted from Lee C. H. 2013: 106)

On the other hand, the sentence in (24) is grammatical because the *wh*-element is not deleted but remained as an overt form in the original position even after it is right-dislocated. That is, in (24), not only is it possible that the overt *wh*-element is c-commanded by the Q-marker in syntactic derivation but also possible that the Q-marker has the [+*wh*] intonation in PF, which is also required for *wh*-element. (see Lee C. H. 2013: 116).

(24) Chelswu-ka nwukwu-lul manna-ass-ni? nwukwu-lul?
Chelswu-NOM who-ACC meet-PST-Q who-ACC
'Who did Chelswu meet? whom?'

To summarize, we have seen that there are three conditions for [+*wh*] agreement in *wh*-questions: i) c-command, ii) economy, and iii) sentence-final intonation.

4. Proposal: Explanations for the Distribution of Korean *Wh*-elements

4.1. The Guiding Principle

To explain two properties on Korean *wh*-adjuncts confirmed through the experiment, '*wh*-in-front-of-V' and '*wh*-adjacency', we take the so-called third factor (Chomsky 2005) as a guiding principle.

> "The third factor falls into several subtypes: (a) principles of data analysis that might be used in language acquisition and other domains; (b) principles of structural architecture and development constraints that enter into canalization, organic form, and action over a wide range, including principles of **efficient computation**, which would be expected to be of particular significance for computational systems such as language. It is the second of these subcategories that should be of particular significance in determining the nature of attainable languages." (Chomsky 2005: 6, emphasis ours).

The efficiency of computation in Chomsky's (2005) remark is in line with the 'Condition 2: Economy' (see Section 3). The notion of economy has two aspects; one refers to economy of distance, and the other refers to the economy of operation in a derivation (e.g., less operations, more economical) (Chomsky 1995, Collins 1997, Kitahara 1997, among others). In terms of economy, thus, 'Condition 2: Economy' is understood to be equipped with both 'economy of distance' and 'economy of operation'. We adopt the two aspects of economy to explain the '*wh*-in-front-of-V' and '*wh*-adjacency', and these will be considered in conjunction with 'Condition 3: Sentence-final intonation'.

4.2. A Proposal for '*Wh*-in-front-of-V'

The preference for the position of time-related [+*wh*] adjunct is given in (25) as an example; the distance between *wh*-adjuncts and verbs and the sentence preferences are proportional: the farther the distance, the lower the preference.

(25) Preference by the position of single *wh*-elements:

a.	encey	Chelswu-ka	Yengi-lul	manna-ass-ni?	least preferred
	when	Chelswu-NOM	Yengi-ACC	meet-PST-Q	
b.	Chelswu-ka	encey	Yengi-lul	manna-ass-ni?	
	Chelswu-NOM	when	Yengi-ACC	meet-PST-Q	
c.	Chelswu-ka	Yengi-lul	encey	manna-ass-ni?	
	Chelswu-NOM	Yengi-ACC	when	meet-PST-Q	most preferred

'When did Chelswu meet Yengi?'

No difference in preference between the sentences in (25) can be found under 'Condition 1: c-command' because each of *wh*-elements in (25) is c-commanded by Q-marker *-ni*. 'Condition 2: Economy' alone also fails to explain the difference in preference, because it concerns which of the two Q-markers more efficiently agrees with a *wh*-element. But here, *wh*-elements and Q-markers are in one-to-one correspondence in each of the three cases.

Our proposal here is that economy of distance (Condition 2) for the sentence-final intonation (Condition 3) must be considered together to explain the difference in preference among the sentences in (25). As shown in (26), when the *wh*-element and Q-marker agree in the closest distance (economy of distance), the sentence is most preferred (25c). On the other hand, as in (25a) and (25b), the distance between *wh*-element and Q-marker is relatively farther than (25c), the sentences are less preferred.

(26)

(25a)		(25b)		(25c)	
encey	Chelswu-ka	encey	Yenge-lul	encey	manna-ass-ni?
when	Chelswu-NOM	when	Yengi-ACC	when	meet-PST-Q

'When did Chelswu meet Yengi?'

Based on the discussion, we conclude that there are at least two things to be considered for *wh*-questions in Korean: i) the realization of [+*wh*] sentence-final intonation (low level intonation (cf. (21)), and ii) economy of distance between *wh*-element and Q-marker.

4.3. A Proposal for *Wh*-adjacency

Recall that the second distributional property of *wh*-elements observed in the multiple *wh*-phrases, namely *wh*-adjacency. In the most preferred sentence (27c), *wh*-adjuncts are adjacent to each other, while in (27a) and (27b), *wh*-adjuncts are apart from each other, and less preferred. As an explanation of the data, in this section, we consider the sentence-final intonation and then turn to the economy of operation (see Section 4.1.).

(27) Preference by the position of Multiple *wh*-elements:

a.	encey	Chelswu-ka	etise	Yengi-lul	manna-ass-ni?	least preferred
	when	Chelswu-NOM	where	Yengi-ACC	meet-PST-Q	
b.	encey	Chelswu-ka	Yengi-lul	etise	manna-ass-ni?	
	when	Chelswu-NOM	Yengi-ACC	where	meet-PST-Q	
c.	Chelswu-ka	Yengi-lul	encey	etise	manna-ass-ni?	
	Chelswu-NOM	Yengi-ACC	when	where	meet-PST-Q	most preferred

'When did Chelswu meet Yengi?'

When *wh*-elements are adjacent to each other, a single rhythm unit (R-Unit) can be formed at PF, as shown in (28).[11] Then, to establish the [+*wh*] sentence-final intonation, the one-time operation between the rhythm unit and Q-marker is sufficient for the agreement at PF.

(28)

Chelswu-ka	Yengi-lul	[R-Unit encey	etise]	manna-ass-ni?	= (27c)
Chelswu-NOM	Yengi-ACC	when	where	meet-PST-Q	

'When and where did Chelswu meet Yengi?'

However, if *wh*-elements are not adjacent to each other, as in (29), two different rhythm units are formed for each *wh*-element, and this leads to two operations.

(29)

a.	[R-Unit encey]	Chelswu-ka	[R-Unit etise]	Yengi-lul	manna-ass-ni?	= (27a)
b.	[R-Unit encey]	Chelswu-ka	Yengi-lul	[R-Unit etise]	manna-ass-ni?	= (27b)

Here are two questions that arise for the discussion. First, in (29), everything seemed just fine with the agreement, because the Q-marker may have [+*wh*] intonation by agreeing with only one of the two *wh*-elements. That means the agreement has occurred only once in (29), not twice. Then why are the sentences in (29) less economical than (28)? To answer this, it should be noticed that the *wh*-element and indefinite pronoun have different PF properties. Unlike indefinite pronoun, *wh*-element is considered as a focus, and the *wh*-element as a focus should agree with Q-marker such as *-ni* (see Jang 1975, Suh 1987, Jun & Oh 1996, etc.). Thus, in order for *encey* (when) and *etise* (where) to be construed as *wh*-elements, two operations are required for each of them, as illustrated in (29).

Second, let us assume that *encey* (when), *Chelswu-ka* (Chelswu-nom), and *etise* (where) can form one rhythm unit (e.g., [R-unit *encey Chelswu-ka etise*]) in PF. Then, there would be only one agreement operation between the rhythm unit and the Q-marker, and as a result, the non-*wh*-adjacency sentence is preferable as much as (28). But this is not the case. Then why? The answer to this question is simple. Both *Encey* (when) and *etise* (where) are focuses, but *Chelswu-ka* (Chelswu-NOM) is not the focus. Therefore, [R-unit *encey Chelswu-ka etise*] is not preferred over [R-unit *encey etise*].

As such, the *wh*-adjacency in Korean multiple *wh*-questions is explained by considering the rhythm unit that takes place in PF, and the economy of operations.

[11] See Lee H-Y (1996) for more discussion on rhythm unit in Korean.

4.4. Expectations from the Discussion

According to the discussion in Section 4.2 and 4.3, it is predicted that the most preferred type of multiple *wh*-question would be the one that has both properties, '*wh*-in-front-of-V' and '*wh*-adjacency'. Then, (30f) would be the most preferred type in (30), because *wh*-elements are adjacent to each other in the pre-verb position. In reverse, (30a) would be the least preferred type in that it does not have any of the two properties.

(30) Types of multiple *wh*-questions						'*wh*-in-front-of-V'	'*wh*-adjacency'
a.	[+*wh*]	Subj	[+*wh*]	Obj	V	×	×
b.	[+*wh*]	Subj	Obj	[+*wh*]	V	△	×
c.	Subj	[+*wh*]	Obj	[+*wh*]	V	△	×
d.	[+*wh*]	[+*wh*]	Subj	Obj	V	×	○
e.	Subj	[+*wh*]	[+*wh*]	Obj	V	×	○
f.	Subj	Obj	[+*wh*]	[+*wh*]	V	○	○

Consider the actual data from the experiment, repeated from previous sections:

(31) Actual Data for (30): '*When and where did Chelswu meet Yengi?*'							
a.	[encey] Chelswu-ka	[etise]	Yengi-lul	manna-ass-ni?	(4.5%)	=	<u>(30a)</u>
b.	Chelswu-ka [encey]	Yengi-lul	[etise]	manna-ass-ni?	(10.0%)	=	(30c)
c.	Chelswu-ka [encey]	[etise]	Yengi-lul	manna-ass-ni?	(12.3%)	=	(30e)
d.	[encey] [etise]	Chelswu-ka	Yengi-lul	manna-ass-ni?	(15.5%)	=	(30d)
e.	[encey] Chelswu-ka	Yengi-lul	[etise]	manna-ass-ni?	(20.0%)	=	(30b)
f.	Chelswu-ka Yengi-lul	[encey]	[etise]	manna-ass-ni?	(37.7%)	=	<u>(30f)</u>

Not all, but at least two cases are consistent with our expectations (<u>underlined</u> in (31)). If the sentence does not include either of the two properties (e.g., *wh*-elements are not adjacent to each other and not in front of the verb), then it is least preferred. On the other hand, it is most preferred if the *wh*-question has both '*wh*-adjacency' and '*wh*-in-front-of-V' properties (31f).[12]

5. Additional Evidence

In this section, we briefly consider additional evidence to support our proposals concerning the rhythm unit: i) the particle *-yo*, which is a hearer-honorification marker in Korean, and ii) its effects on *wh*-questions.

The particle *-yo* is not allowed to be attached to the *wh*-element (32a), while it is possible for non-*wh*-elements (32b).

(32) a.	nwu-ka-(??yo)	keki-ey	ka-ass-eyo?
	who-NOM-yo	there-to	go-PST-eyo
	'Who did go there?'		

[12] The explanation of the difference among the sentences in (31b)-(31e) is postponed for further research, it will be necessary to consider, for example, whether '*wh*-adjacency' and '*wh*-in-front-of-V' differ in preference and whether they differ depending on the types of meaning of *wh*-element, and others.

b. Chelswu-ka-(yo) keki-ey ka-ass-eyo?
Chelswu-nom-yo there-to go-pst-eyo
'Did Chelswu go there?'

The following properties of *-yo* explain why (32a) is degraded. First, *-yo* can appear in sentence-medial, only if the sentence-final ending also accompanies an honorific marker, as presented in (33).

(33) a. Chelswu-ka-yo Yengi-lul-yo manna-ass-eyo/supnita.
Chelswu-NOM-yo Yengi-ACC-yo meet-PST-eyo/supnita
'Chelswu met Yengi.'
b. *Chelswu-ka-yo Yengi-lul-yo manna-ass-e/ta.
Chelswu-NOM-yo Yengi-ACC-yo meet-PST-DEC
'Chelswu met Yengi.'

Another property of sentence-medial *-yo* is to form a prosodic boundary (see Kim 1983, Kim M. R. & Lim C. K. 2014, Dobashi 2016). So, when the particle *-yo* is attached to the *wh*-element, the prosodic boundary is formed between the *wh*-element and the Q-marker. However, there should be no prosodic boundary between *wh*-element and Q-marker for the *wh*-question to have [+*wh*] sentence-final intonation (see Kim S. C. 1996, Kim M. et al. 2000, Park S. 2020). To be clear, Kim M. et al. (2000: 211) argues that a *wh*-element in *wh*-question terminates the prosodic boundary of the following elements, and forms itself as a single accentual phrase unless there is an intentional pause. Therefore, *-yo* and *wh*-element are different from each other in terms of forming a prosodic boundary; the former forms it while the latter does not.

To illustrate the prosodic boundary formed by sentence-medial *-yo* and how it blocks the agreement between the *wh*-element and Q-marker, consider the examples in (34), repeated from (32) with other additions. In (34a), there is no prosodic boundary between the *wh*-element *nwu* (who) and Q-marker *-e*, and the sentence is grammatical.[13] However, in (34b), if sentence-medial *-yo* is attached to the *wh*-element *nwu* (who), then the *wh*-question becomes ungrammatical/degraded.

(34) 'Who did go there?'

a. nwu-ka keki-ey ka-ass-e-yo?
who-NOM there-to go-PST-Q-yo

b. ??nwu-ka-*yo* keki-ey ka-ass-e-yo?
who-NOM-yo there-to go-PST-Q-yo

c. ??nwu-ka keki-ey-*yo* ka-ass-e-yo?
who-NOM there-to-yo go-PST-Q-yo

[13] *-eyo* is analyzed as *-e* and *-yo*, and *-e* is the ending. Additionally, ending *-e* is used in various sentence types such as declaratives, interrogatives, and imperatives. It is determined which sentence type it will be depending on the sentence-final intonation and the pragmatic contexts.

For a *wh*-question to have [+*wh*] sentence-final intonation, as we discussed, *wh*-element and Q-marker should agree with each other at PF. The agreement at PF is only possible if there is no prosodic boundary between them. In (34b) and (34c), however, the prosodic boundary formed by *-yo* is blocking the agreement between the *wh*-element and Q-marker. The failure of the agreement makes the sentence degraded.

Before closing this section, we present the other supportive evidence observed in the experiment. The properties found in *wh*-adjuncts, '*wh*-in-front-of-V' and '*wh*-adjacency', are also observed in *wh*-arguments such as *nwu-ka* (who-NOM) and *nwukwu-lul* (who-ACC).[14] The examples and percentages in (35) show the gap of preference between *wh*-adjacency (86.7%) and non-adjacency (13.3%). In (35a), the *wh*-arguments are adjacent to each other in the pre-verb position, and the sentence is highly preferred. In contrast, *wh*-arguments in (35b) are apart from each other, and it is the least preferred sentence. The data of the *wh*-argument shows that the two properties we have discussed so far not only occur at [+*wh*] adjuncts but also [+*wh*] arguments.[15]

(35) a. onul achim-ey nwu-ka nwukwu-lul manna-ass-ni? (86.7%)
today morning-in who-NOM who-ACC meet-PST-Q
'Who met whom in this morning?'

b. nwu-ka onul achim-ey nwukwu-lul manna-ass-ni? (13.3%)
who-NOM today morning-in who-ACC meet-PST-Q
'Who met whom in this morning?'

6. Conclusion

This study has identified noticeable distinctions between [-*wh*] and [+*wh*] adjuncts. [-*wh*] adjuncts have free distribution, while [+*wh*] adjuncts have distribution on a par with two properties: '*wh*-in-front-of' and '*wh*-adjacency'. That is, [+*wh*] elements tend to be adjacent to the verb, and also prefer to be adjacent to each other. Economy of distance between *wh*-element and Q-marker makes the *wh*-element adjacent to the verb to which the Q-marker is accompanied: the farther the distance, the lower the preference. Economy of operation prefers to *wh*-elements adjacent to each other.

[14] In particular, the gap between adjacency and non-adjacency observed in *wh*-arguments (86.7% vs. 13.3%) was considerably higher than the gap observed in *wh*-adjuncts (*wh*-adjacency: 65.5% vs. non-adjacency: 34.5%). Although there are some differences depending on the example, it is clear that the preference for the *wh*-adjacency is maintained.

[15] The distribution of *wh*-arguments will be addressed in detail in a follow-up study based on an experimental design that clearly distinguishes between indefinite pronouns and *wh*-elements.

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