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Identification of Focus Information with Contextual and Lexical Cues by Korean Learners of English: Evidence from Reaction Times Analyzed by Linear Mixed-Effect Models*

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Chung, Wonil and Bum-Sik Park. 2019. Identification of focus information with contextual and lexical cues by Korean learners of English: Evidence from reaction times analyzed by linear mixed-effect models. *Korean Journal of English Language and Linguistics* 19-4, 587-612. The current study examined the interaction between contextual and lexical focus cues in sentence processing of the identification of focus information in double object construction by Korean Learners of English. The study conducted three self-paced reaction time experiments and the results were analyzed by linear mixed-effects models (LMM). We found Korean speakers preferred the context specifying focus on direct object when processing interrogative contexts specifying focus on either the indirect or direct object in double object constructions. We also found that unlike English speakers, Korean speakers had difficulty in processing the elliptical remnant, cued by lexical focus. We suggest that the processing difficulty might be ascribed to Korean speakers' insensitivity to the effect of relative positions of lexical focus cues.

Keywords: focus, double-object construction, focus particle, remnant

1. Introduction

The ultimate aim of sentence comprehension is that the reader/listener processes and perceives the sentence successfully, reflecting the intention of the speaker. In this paper we report the results of three self-paced reading tasks investigating how Korean L2 English speakers process the focus structure of sentence with contextual

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and lexical cues, and whether these cues affect processing of elliptical remnant.

In linguistic theories on focus, the function of focus is to show the presence of alternatives that are relevant for the interpretation of linguistic expressions (Krifka 2007, Rooth 1992). Focus is used to identify the sentential constituent which marks new information not shared by the speaker and the reader/listener (Halliday 1967, Jackendoff 1972). And Focus is used to indicate the informational importance of the respective word or phrase by prosodic (by a pitch accent) or syntactic means. For example, in a sentence such as *Mary invited TOM to dinner* with intonational focus on *Tom,* readers will understand the sentence to assert that it was Tom who Mary invited in contrast to other persons.

Experimental researches have shown that listeners comprehend more easily when focused information is marked using prosody than when it is not (Bock and Mazzella 1983, Noteboom and Kruyt 1987, Birch and Clifton 1995, 2002), that listeners perceive focused information more easily than non-focused information (Hornby 1974, Cutler and Fodor 1979), and that memory for focused information is increased (Singer 1976, Malt 1985). Other studies have shown that using prosody to mark focus can influence how ambiguous sentences are interpreted (Schafer, Carlson, Clifton and Frazier 2000). Furthermore, some researches have shown the focus structure of a sentence is marked by focus-sensitive particles like *only* (Paterson, Liversedge, Filik, Juhasz, White and Rayner 2007, Dimitrova, Stowe, Redeker and Hoeks 2010b), and also by context (Chomsky 1971, Kadmon 2001, Cowles, Klunder, Kutas and Polinsky 2007, Beaver and Clark 2008, Dimitrova, Stowe, Redeker and de Hoeks 2010a).

Focus particles like *only* associate with a focused expression, and lexicalize contrastive focus, specifying a contrast between the referent of a sentential constituent and its alternatives (Jackendoff 1972, Krifka 2008, König 1991, Rooth 1992). The examples in (1) and (2) show how the choice of focus can affect the interpretation of a sentence containing the focus particle *only.*

(1) Mary only introduced $[\text{Bill}]_F$ to Sue.
(2) Mary only introduced Bill to $[\text{Sue}]_F$.

With respect to the distribution of focus, in (1) the direct object *Bill* is focused and the indirect object *Sue* is focused in (2). If the particle *only* associates with the focused constituent, (1) should mean that *Bill alone was introduced to Sue*, and (2) should mean that Bill was introduced to no-one other than Sue (Jackendoff 1972).

Reinhart (1999) proposed that the particle *only* ranges over constituents that it c-commands. The particle *only* in a sentence associates with a focused constituent within this syntactic domain. For sentences (1) and (2), the particle *only* associates with the direct object *Bill*, the indirect object *Sue*, or the verb phrase *introduced Bill to Sue* but cannot associate with the subject noun phrase *Mary*. Jackendoff (1972) argued that when prosody marks the focused constituent within its range, the particle associates with this constituent, but when it marks a constituent outside of the particle's range, the sentence will be perceived as anomalous. However, explicit prosodic cues are absent in silent reading (Fodor 2002). Thus, during written sentence comprehension other factors will affect focus identification.

While focus is marked by prosodic and syntactic means at the sentence level, context has been used to investigate focus processing in focus structure of a sentence. A question marks an upcoming focus, and the answer to the question is perceived as being the focus of the sentence containing the answer (Chomsky 1971, Cutler and Fodor 1979). Rooth (1996) states there is a correlation between questions and the position of focus in answers. Focus to mark new and contrastive information is used in the question-answer dialogue, affecting how a sentence is related to its context. For examples below, (5a) is appropriate answer in the context of a *wh*-question like (3), but not in the context of a *wh*-question like (4). Conversely, (5b) might be an answer to (4), but probably not to (3). A question determines the focus of the answer by identifying the semantic value of a question with a set of potential answers, including both true and false answers (Hamblin 1973). Focus in (5a) or (5b) is considered to be informational focus that may introduce new, non-presupposed information (Kiss 1998, Rochemont 1986). This type of focus is commonly found in question-answer pairs like (3) or (4).

(3) Who did John introduce?
(4) Who introduced Mary?
(5) a. John introduced $[\text{Mary}]_F$.
b. $[\text{John}]_F$ introduced Mary.

(7b), which is the answer in the context of a question like (6), introduces information which contrasts with other, previously-stated information. This type of focus is considered to be contrastive focus. This type of focus is commonly found in contexts like that in (6). In both informational and contrastive focus, the focused

constituent is more informative than the non-focused element in the sentence.

(6) John introduced Mary?
(7) a. John introduced [Mary]$_F$.
b. (No,) John introduced [Sally]$_F$.

In the current study, we investigate how Korean learners of English process double object constructions with contextual focus and the lexical focus particle *only*, when processing interrogative *wh*-question contexts specifying focus on either the indirect or direct object in double constructions.

2. Previous Studies on Focus Identification

Birch and Rayner (1997) investigated the influence of a preceding interrogative context on focus processing, conducting an eye movement experiment using focus on various constituents within a target sentence based on question-answer pairs of sentences such as (8) and (9). Question (8) focused on a target phrase (e.g., *in the underground bunker*) of the answer sentence, and question (9) focused on a single word (e.g., *cards*) of the answer sentence.

(8) a. Where were the soldiers?
b. The soldiers /**in the underground bunker** /were playing /cards /to relieve their boredom.
(9) a. What were the soldiers playing?
b. The soldiers /in the underground bunker /were playing /**cards** /to relieve their boredom.

Birch and Rayner found participants read longer focused parts of target sentences than unfocused parts and suggested that readers encode focused information carefully, and context can influence processing focus information.

Paterson, Liversedge, Filik, Juhasz, White and Rayner (2007) investigated focus identification during sentence comprehension, using measures of eye movements. Participants read dative sentences like (10a-c), in which an elliptical remnant in second conjunct (her father/the pepper) of a sentence is composed of a congruous

contrast for either the indirect or the direct object in the first conjunct. (10a) is to investigate the effect of locating *only* in a position adjoining either the direct or the indirect object in dative sentences, (10b) is to examine this effect in double-object sentences, and (10c) is to investigate the processing of sentences without the focus particle *only*.

(10) a. Dative sentence with *only*
At dinner, Jane passed $_1$|[only] the salt to [only] her mother $_2$|but not (her father/the pepper) $_3$|as well because $_4$|she couldn't reach.$_5$
b. Double-object sentences with *only*
At dinner, Jane passed $_1$|[only] her mother [only] the salt $_2$|but not (her father/the pepper) $_3$|as well because $_4$|she couldn't reach.$_5$
c. Dative and double-object sentence without *only*
At dinner, Jane passed $_1$|the salt to her mother $_2$|but not (her father/the pepper) $_3$|as well because $_4$|she couldn't reach.$_5$
At dinner, Jane passed $_1$|her mother only the salt $_2$|but not (her father/the pepper) $_3$|as well because $_4$|she couldn't reach.$_5$

In (10c), construction without the particle *only*, there was no effect at the remnant region or the post-remnant region. However, in (10a) and (10b), constructions with *only*, reading times for remnants were shorter in congruous condition with indirect than direct object when *only* preceded the indirect object, and shorter in congruous condition with direct than indirect object when the particle *only* preceded the direct object. The congruency effect was stronger when the particle *only* preceded the direct object than when the particle *only* preceded the indirect object at the post-remnant region. Significant reading-time effects indicated that the surface position of the focus particle influenced processing. They concluded that the surface position of a focus particle affects focus identification during online sentence comprehension.

Sauermann, Filik and Paterson (2013) investigated the interaction between contextual and lexical focus cues, using three eye movement experiments reading sentences like (11). They used context to focus on either the indirect or direct object of a double object sentence, followed by a remnant continuation which was composed of either a congruous or incongruous contrast with the contextually focused object.

(11) a. IO-context (focus on the indirect object, e.g., *the children*)
John wondered who Sally would pass the apples. region 1| Sally passed region 2| [only] the children [only] the apples region 3| but not (the grownups/the cherries) region 4|, because r$_{region\ 5}$| they did not want them. region 6|

b. DO-context (focus on the direct object, e.g., *the apples*)
John wondered what Sally would pass the children. region 1| Sally passed region 2| [only] the children [only] the apples region 3| but not (the cherries/the grownups) region 4|, because region 5| they did not want them. region 6|

In Experiment 1, Sauermann et al. investigated the influence of interrogative *wh*-question contexts on the processing of elliptical remnant construction without the focus particle *only*. They found that longer reading time for remnants that formed incongruous with the contextually focused object and suggested that context was effective in specifying focus. In Experiments 2 with the particle *only* preceding the indirect object, they investigated the interaction between context and lexical focus cue arising from the particle *only* which specifies focus on the subsequent adjacent element. They found the conflict between lexical and contextual focus cues caused processing of the remnant element to be more difficult and was resolved in favor of the contextually focused element. In Experiment 3 they investigated the processing of remnant constructions when the particle *only* was placed between the indirect and direct objects. They found cue-conflict disrupted processing earlier in the sentence, but did not appear to be fully resolved during online sentence processing.

While many researchers have studied on how native English speakers process focus identification during sentence comprehension, there have been few empirical investigations for learners of English. Accordingly, the current study investigated how Korean learners of English process double object constructions with contextual and lexical cues to focus, followed by a remnant continuation. In Experiment 1, focus information was manipulated by interrogative contexts focusing on either indirect or direct object to investigate whether interrogative wh-question contexts affect processing of elliptical remnant constructions. In experiment 2 with the focus particle *only* preceding the indirect object, and in experiment 3 with the particle immediately preceding the direct object, we investigated whether match or mismatch between contextual focus cue and the focus particle affect processing of elliptical remnant constructions.

3. Experiment

3.1 Experiment 1

The goal of Experiment 1 is to investigate how Korean learners of English process the contextual focus in interrogative contexts by measuring reading times on focus-congruous and incongruous (elliptical) remnants. Specifically, this experiment is to examine how Korean learners process remnant elements with the contextually-focused object.

3.1.1 Participants

Thirty-six Korean learners of English (24 males) participated in this experiment, and they have no English immersion in any English speaking country. They were undergraduates between 20 and 30 years of age (M = 25.6, SD = 1.9). Their English proficiency was relatively high level; they had high scores on TOEIC (mean: 919.7; SD: 44.67; range: 850-990. They provided informed consent and were paid a small amount of money for their participation.

3.1.2 Design and materials

The experimental materials were constructed by using an interrogative *wh*-question sentence and the double-object sentence followed by a remnant continuation which was congruous or incongruous with either the indirect or direct object in a two-by-two factorial design, Context (IO-context or DO-context) and remnant Congruency (congruous or incongruous with contextually focused constituent), adopted from Sauermann et al. (2013). They consist of 32 sets of sentences. Each trial included an interrogative context sentence followed by a double-object sentence containing an elliptical remnant contrasting with either the indirect or direct object and a subordinate clause beginning with *because*, as shown in Table 1. Focus was modified by interrogative *wh*-question contexts focusing the indirect object or the direct object, and by the remnant region which is congruous or incongruous with the focused element.

Table 1. Contextual Focus in Interrogative Contexts

A. IO-context (focus on the indirect object), congruous remnant
John wondered who Sally would pass the apples.$_1$| Sally passed$_2$| **the children the apples$_3$| but not the grownups$_4$|, because$_5$**| they did not want them.$_6$|
B. IO-context (focus on the indirect object), incongruous remnant
John wondered who Sally would pass the apples.$_1$| Sally passed$_2$| **the children the apples$_3$| but not the cherries$_4$|, because$_5$**| they did not want them.$_6$|
C. DO-context (focus on the direct object), congruous remnant
John wondered what Sally would pass the children.$_1$| Sally passed$_2$| **the children the apples$_3$| but not the cherries$_4$|, because$_5$**| they did not want them.$_6$|
D. DO-context (focus on the direct object), incongruous remnant
John wondered what Sally would pass the children.$_1$| Sally passed$_2$| **the children the apples$_3$| but not the grownups$_4$|, because$_5$**| they did not want them.$_6$|

Note. Critical regions are highlighted.

The stimuli were divided into four lists in a Latin square design. Each experimental list contained 8 sentences of each condition. The 60 distracter sentences, which were not similar to that of target sentences, were added in order to make it difficult for the participants to detect the target structures. Each participant read one list, consisting of 32 target sentences and 60 distracter sentences.[1]

3.1.3 Procedure

The participants were seated in front of a computer monitor and were tested individually. The experimental sentences were run with E-prime (Psychology software tools Inc.), and reaction times (RTs) were measured. Before the start of each trial, a fixation point was presented at the center of the screen. After the whole interrogative *wh*-question was presented, the second sentence was presented in a phrase-by-phrase manner (as shown in Table 1 above), appearing at the center of the screen. The participants pressed the space bar to see each phrase. Each trial was followed by a 'yes' or 'no' comprehension question (e.g., *Did John pass anything to the children?*). The presentation of experimental sentences were randomized for each participant. Before the self-paced reading task, the participants were asked to press the button in order to perform the task. The experiment started with 8 practice sentences.

[1] The experimental materials include various ditransitive verbs like *give, show,* and *hand*.

3.1.4 Data analysis

For the statistical analyses, three scoring regions were performed: region 3 (the object region), region 4 (the remnant region), and region 5 (a post-remnant region, e.g., *because*). Prior to analysis of the RT data for each region, reading times smaller than 200 ms or above 4000 ms were removed. Furthermore, all the items that were more than 2.5 SD above the mean of each region were excluded. These cutoff procedures affected 8.3% for the region 3, 6.8% for the region 4, and 6.6% for the region 5, respectively. Results were not statistically different when a non-transformed data and log-transformed data were used. In order to compare the results in L2 speaker with that in L1 speakers, results for the untransformed data are summarized. The results for the log-transformed data are illustrated in Appendix. Contrast coding used for Context (IO-context: +0.5, DO-context: -0.5) and Remnant Congruency (congruous: +0.5, incongruous: -0.5), and coding for IO-context condition is positive because reading times in the IO-context condition were higher than the DO-context condition.

For analysis, linear mixed-effects models (LMM)[2] were used to estimate the fixed effects of Context, Remnant Congruency, and Context × Remnant-Congruency interaction and the random effects of Participants and Items for reaction times at each region, using the lmer function of the lme4 package (Bates, Maechler and Dai 2009) accessed in the R environment, version 3.6.1(R Development Core Team 2009).

3.1.5 Results

Results from the LMM on the reading times at each region are summarized in Table 2, respectively. The parameters for the fixed effects (Context effect and Remnant Congruency effect), the estimates of the reading time difference (b), standard errors (SE), t-values (t), and *p*-value are given. Reaction times on each condition in region 3 (the object region), region 4 (the remnant region), and region 5 (a post-remnant region, e.g., *because*) are illustrated in Table 3 and Figure 1.

In region 3 (objects), IO-context condition relative to DO-context condition showed

[2] It is a statistical model containing both fixed effects (i.e. all main effects and all interactions) and random effects (i.e., subject and item). Good points of using mixed effects in an analysis are that observations within a subject may be correlated and that in addition to estimation of the model parameters, between- and within-subject variability may be estimated.

a significant effect of Context, due to longer reading times (123 ms difference, b = 139.0, SE = 49.7, t = 2.80) when *wh*-question context specified focus on the indirect object (*who*) than on the direct object (*what*). The effect of Remnant Congruency and interaction of Context and Remnant Congruency was absent, resulting from no difference between congruous and incongruous conditions.

In region 4 (remnant), the effect of Remnant Congruency factor was significant, resulting from longer reading times for remnants that are incongruous with the contextually focused constituent than those that are congruous with the contextually focused constituent (83 ms difference, b = 94.9, SE = 29.2, t = 3.24). The absence of a significant effect of Context indicated that there was no difference between IO-context and DO-context.

In region 5 (post-remnant), there was a marginal interaction, due to larger congruent difference between incongruous and congruous condition (incongruous condition minus congruous condition) in DO-context condition rather than in IO-context condition (-3 ms in IO-context, 38 ms in DO-context). The absence of a significant effect of Context or a significant effect of Remnant Congruency indicated that there was no difference between IO-context and DO-context and also no difference between congruous and incongruous conditions.

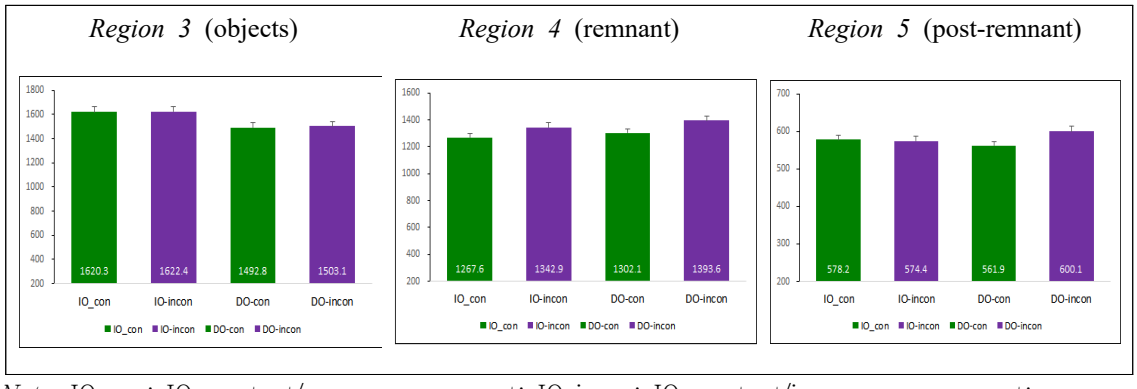
Table 2. The Results of the Linear Mixed Model in Experiment 1

	Estimate	SE	t-value	p-value
Region 3 (objects)				
(Intercept)	1590.96	56.95	27.934	0.000***
Context	139.03	49.73	2.796	0.009**
Remnant Congruency	-13.31	34.28	-0.388	0.698
Context × Remnant	14.38	68.85	0.209	0.834
Region 4 (remnant)				
(Intercept)	1340.25	53.22	25.182	0.000***
Context	-25.07	31.15	-0.805	0.427
Remnant Congruency	-94.69	29.21	-3.242	0.001**
Context × Remnant	15.78	58.88	0.268	0.788
Region 5 (post-remnant)				
(Intercept)	580.37	16.473	35.233	0.000***
Context	-6.033	11.576	-0.521	0.603
Remnant Congruency	-16.081	11.029	-1.458	0.145
Context × Remnant	42.674	22.149	1.927	0.054†

'***' 0.001, '**' 0.01, '*' 0.05, '†' 0.1

Table 3. Reading Times in Each Condition (and Standard Errors) in Experiment 1

	IO-context		DO-context	
	Remnant congruous	Remnant incongruous	Remnant congruous	Remnant incongruous
Region 3	1620.3 ms (43.1)	1622.4 ms (38.9)	1492.8 ms (37.1)	1503.1 ms (36.4)
Region 4	1267.6 ms (33.6)	1342.9 ms (34.3)	1302.1 ms (31.1)	1393.6 ms (36.3)
Region 5	578.2 ms (12.1)	574.4 ms (12.2)	561.9 ms (11.5)	600.1 ms (12.8)



Note. IO_con: IO-context/congruous remnant; IO_incon: IO-context/incongruous remnant; DO_con: DO-context/congruous remnant; DO_incon: DO-context/incongruous remnant

Figure 1. Reading Times in Each Region with Standard Error Bar

3.2 Experiment 2

The goal of Experiment 2 is to investigate how Korean learners process the interaction of the contextual focus cue and lexical focus cue. Specifically, with the focus particle *only* preceding the indirect object, this experiment investigated whether Korean learners detect conflict between the two cues.

3.2.1 Participants

Twenty-five Korean learners of English (18 males) participated in this experiment, and they have no English immersion in any English speaking country. They were undergraduates between 20 and 30 years of age (M = 25.7, SD = 2.3). Their English proficiency was relatively high level: they had high scores on TOEIC (mean: 920.6; SD: 49.2; range: 850-990. They provided informed consent and were paid a small amount of money for their participation.

3.2.2 Design and materials

The experimental materials were the same as in Experiment 1, except that the particle *only* precedes the indirect object, as shown in Table 4. The same factors of Context (IO-context or DO-context in interrogative *wh*-question context) and Remnant Congruency (congruous or incongruous with contextually focused constituent) were manipulated. The factor Context has a conflict between contextual focus and lexical focus cue (e.g., *only*). In the IO-context condition, contextual focus matches with lexical cue which focuses on the indirect object, while in the DO-context condition, there is cue-conflict because contextual focus is the direct object but the particle *only* focuses on the indirect object.

Table 4. Interaction of the Contextual Focus Cue and Lexical Focus Cue
(with *only* preceding the indirect object)

A. IO-context, congruous remnant (cue-match)
John wondered who Sally would pass the apples.$_1$| Sally passed$_2$| **only the children the apples$_3$| but not the grownups$_4$|, because$_5$**| they did not want them.$_6$|
B. IO-context, incongruous remnant (cue-match)
John wondered who Sally would pass the apples.$_1$| Sally passed$_2$| **only the children the apples$_3$| but not the cherries$_4$|, because$_5$**| they did not want them.$_6$|
C. DO-context, congruous remnant (cue-conflict)
John wondered what Sally would pass the children.$_1$| Sally passed$_2$| **only the children the apples$_3$| but not the cherries$_4$|, because$_5$**| they did not want them.$_6$|
D. DO-context, incongruous remnant (cue-conflict)
John wondered what Sally would pass the children.$_1$| Sally passed$_2$| **only the children the apples$_3$| but not the grownups$_4$|, because$_5$**| they did not want them.$_6$|

3.2.3 Procedure

The experimental procedure followed the same steps as that in Experiment 1.

3.2.4 Data analysis

The data analysis followed the same steps as that in Experiment 1. The items that were more than 2.5 SD above the mean of each region were removed, and these affected 13.7% for the region 3, 8.6% for the region 4, and 6% for the region 5, respectively.

3.2.5 Results

Results from the LMM on the reading times at each region are summarized in Table 5, respectively. The parameters for the fixed effects which are Context effect and Remnant effect, the estimates of the reading time difference (b), standard errors (SE), *t*-values (t), and *p*-value are given. Reaction times on each condition in region 3 (the object region), region 4 (the remnant region), and region 5 (a post-remnant region, e.g., *because*) are illustrated in Table 6 and Figure 2.

Table 5. The Results of the Linear Mixed Model in Experiment 2

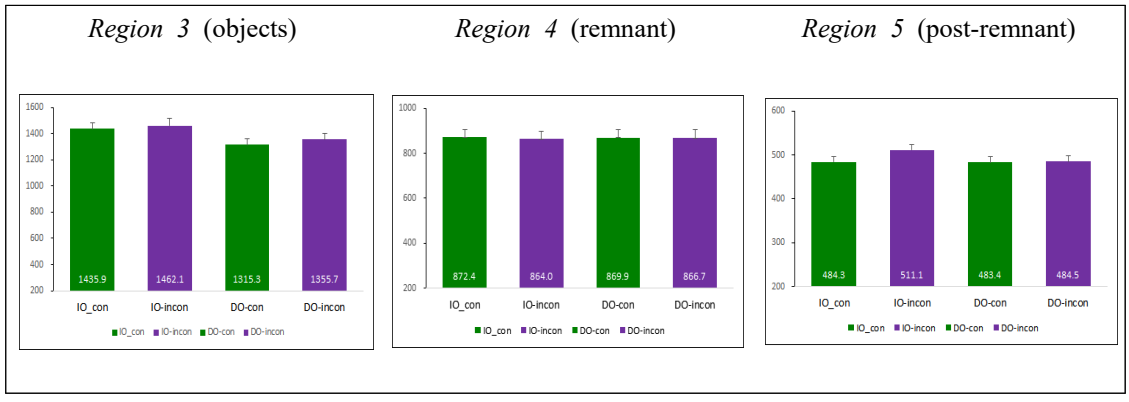
	Estimate	SE	t-value	*p*-value
Region 3 (objects)				
(Intercept)	1427.49	82.60	17.281	0.000***
Context	110.35	49.91	2.211	0.038*
Remnant Congruency	−15.46	39.31	−0.393	0.694
Context × Remnant	11.01	79.15	0.139	0.889
Region 4 (remnant)				
(Intercept)	883.106	63.111	13.993	0.000***
Context	5.206	29.088	0.179	0.859
Remnant Congruency	−5.181	26.769	−0.194	0.847
Context × Remnant	−15.548	53.866	−0.289	0.773
Region 5 (post-remnant)				
(Intercept)	490.408	20.573	23.837	0.000***
Context	15.737	11.489	1.370	0.189
Remnant Congruency	−14.661	9.853	−1.488	0.137
Context × Remnant	−27.209	19.860	−1.370	0.171

'***' 0.001, '**' 0.01, '*' 0.05, '†' 0.1

In region 3 (objects), there was a significant effect of Context, due to higher reading times in the IO-context (cue-match condition) than in the DO-context (cue-conflict condition) (113 ms difference, b = 110.35, SE = 49.9, t = 2.21). There was no effect of Remnant Congruency or interaction of Context and Remnant Congruency. In region 4 (remnant), there was no significant effect of Context, Remnant Congruency or interaction of Context and Remnant Congruency. There was little difference between reading times in IO-context and in DO-context, nor difference between congruous and incongruous conditions. In region 5 (post-remnant), like region 4, there wasn't any main effect.

Table 6. Reading Time in Each Condition (and Standard Errors) in Experiment 2

	IO-context		DO-context	
	Remnant congruous	Remnant incongruous	Remnant congruous	Remnant incongruous
Region 3	1435.9 ms (49.9)	1462.1 ms (51.4)	1315.3 ms (48.1)	1355.7 ms (46.7)
Region 4	872.4 ms (32.7)	864.0 ms (32.1)	869.9 ms (35.7)	866.7 ms (37.0)
Region 5	484.3 ms (11.3)	511.1 ms (12.2)	483.4 ms (12.1)	484.5 ms (12.9)



Note. IO_con: IO-context/congruous remnant; IO_incon: IO-context/incongruous remnant; DO_con: DO-context/congruous remnant; DO_incon: DO-context/incongruous remnant

Figure 2. Reading Times in Each Region with Standard Error Bar

3.3 Experiment 3

The goal of Experiment 3 is to investigate Korean learners' reactions to the interaction of the contextual focus cue and lexical focus cue when the particle *only* is placed between the IO and DO. Specifically, this experiment investigated whether Korean learners can detect conflict between the two cues.

3.3.1 Participants

Twenty-nine Korean learners of English (19 males) participated in this experiment, and they have no English immersion in any English speaking country. They were undergraduates between 20 and 29 years of age (M = 25.2, SD = 2.2). Their English proficiency was relatively high level: they had high scores on TOEIC (mean: 922; SD: 48.2; range: 850-990. They provided informed consent and were paid a small amount

of money for their participation.

3.3.2 Design and materials

The experimental materials were the same as in Experiment 2, except that the particle *only* precedes the direct object, as shown in Table 7. The same factors of Context (IO-context or DO-context in interrogative *wh*-question context) and Remnant Congruency (congruous or incongruous with contextually-focused constituent) were manipulated. The factor Context has a conflict between contextual and lexical focus cue (e.g., *only*). In the IO-context condition, contextual and lexical cues are in conflict, while in the DO-context condition, both cues focus the direct object.

Table 7. Interaction of the Contextual Focus Cue and Lexical Focus Cue
(with *only* preceding the direct object)

A. IO-context, congruous remnant (cue-conflict)
John wondered who Sally would pass the apples.$_1$| Sally passed$_2$| **the children only the apples$_3$| but not the grownups$_4$|, because$_5$**| they did not want them.$_6$|
B. IO-context, incongruous remnant (cue-conflict)
John wondered who Sally would pass the apples.$_1$| Sally passed$_2$| **the children only the apples$_3$| but not the cherries$_4$|, because$_5$**| they did not want them.$_6$|
C. DO-context, congruous remnant (cue-match)
John wondered what Sally would pass the children.$_1$| Sally passed$_2$| **the children only the apples$_3$| but not the cherries$_4$|, because$_5$**| they did not want them.$_6$|
D. DO-context, incongruous remnant (cue-match)
John wondered what Sally would pass the children.$_1$| Sally passed$_2$|**the children only the apples$_3$| but not the grownups$_4$|, because$_5$**| they did not want them.$_6$|

3.3.3 Procedure

The experimental procedure followed the same steps as that in Experiment 1 and 2.

3.3.4 Data analysis

The data analysis followed the same steps as that in Experiment 1 and 2. The items that were more than 2.5 SD above the mean of each region were removed, and these affected 13.9% for the region 3, 7% for the region 4, and 3.2% for the region 5, respectively.

3.3.5 Results

Results from the LMM on the reading times at each region are summarized in Table 8, respectively. The parameters for the fixed effects which are Context effect and Remnant effect, the estimates of the reading time difference (b), standard errors (SE), *t*-values (t), and *p*-value are given. Reaction times on each condition in region 3 (the object region), (the remnant region), and region 5 (a post-remnant region, e.g., *because*) are illustrated in Table 9 and Figure 3.

Table 8. The Results of the Linear Mixed Model in Experiment 3

	Estimate	SE	t-value	*p*-value
Region 3 (objects)				
(Intercept)	1587.94	70.09	22.655	0.000***
Context	246.57	42.45	5.808	0.000***
Remnant Congruency	17.64	33.84	0.521	0.602
Context × Remnant	19.63	68.01	0.289	0.773
Region 4 (remnant)				
(Intercept)	1239.05	63.726	19.444	0.000***
Context	−5.087	33.900	−0.150	0.881
Remnant Congruency	−54.61	29.987	−1.821	0.068†
Context × Remnant	64.84	60.084	1.079	0.280
Region 5 (post-remnant)				
(Intercept)	543.01	12.18	44.576	0.000***
Context	−12.26	11.20	−1.095	0.283
Remnant Congruency	17.61	10.61	1.659	0.097†
Context × Remnant	34.36	21.22	1.619	0.105

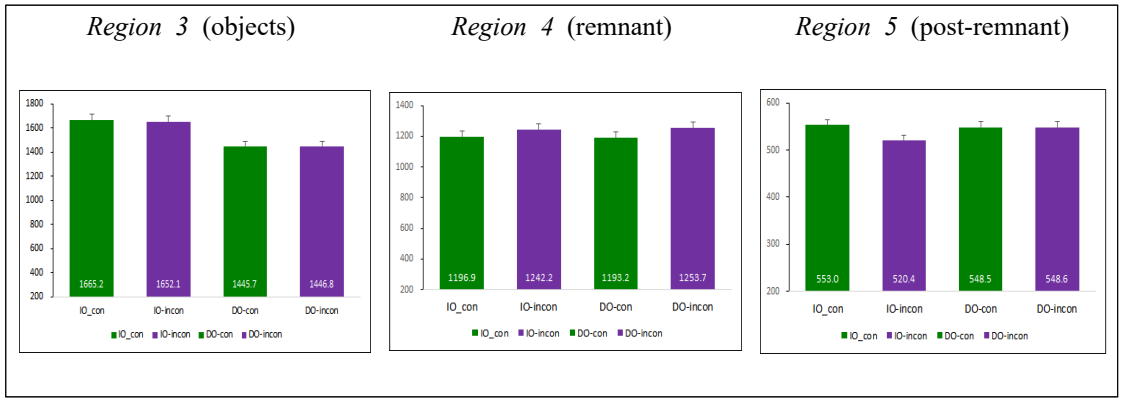
'***' 0.001, '**' 0.01, '*' 0.05, '†' 0.1

In region 3 (objects), there was a significant effect of Context, due to longer reading times in the IO-context (cue-conflict condition) than in the DO-context (cue-match condition) (212 ms difference, b = 246.5, SE = 42.4, t = 5.81) when contextual and lexical cues mismatch in the IO-context condition, and contextual and lexical cues match in the DO-context condition. There was no effect of Remnant Congruency or interaction of Context and Remnant Congruency. In region 4 (remnant), there was a marginal effect of Remnant Congruency, resulting from longer in the incongruous condition than the congruous condition (53 ms difference, b = 54, SE = 29.9, t = 1.82). There was no effect of Context or interaction of Context and

Remnant Congruency. In region 5 (post-remnant), there was a marginal effect of Remnant Congruency, arising from higher in the congruous condition than the incongruous condition (16 ms difference, b = 17, SE = 10.6, t = 1.66).

Table 9. Reading Time in Each Condition (and Standard Errors) in Experiment 3

	IO-context		DO-context	
	Remnant congruous	Remnant incongruous	Remnant congruous	Remnant incongruous
Region 3	1665.2 ms (47.3)	1652.1 ms (44.5)	1445.7 ms (38.8)	1446.8 ms (38.2)
Region 4	1196.9 ms (37.7)	1242.2 ms (37.0)	1193.2 ms (37.2)	1253.7 (37.6)
Region 5	553.0 ms (11.6)	520.4 ms (10.6)	548.5 ms (11.8)	548.6 ms (11.4)



Note. IO_con: IO-context/congruous remnant; IO_incon: IO-context/incongruous remnant; DO_con: DO-context/congruous remnant; DO_incon: DO-context/incongruous remnant

Figure 3. Reading Times in Each Region with Standard Error Bar

4. Discussion

The current three self-paced reading experiments investigated how Korean learners of English process focus information in double object constructions with contextual and lexical cues to focus, followed by a remnant continuation. Our three experiments produced two key findings.

First, Korean learners of English had difficulty in processing the focus information structure when the interrogative contexts specified on the indirect object in region 3 (objects region). Reading times in the objects region of experiment 1, 2 and 3 indicate

that the effect of Context resulted from longer reading times in IO-context than DO-context, regardless of the focus information structure imposed by the contextually focused cue or lexically focused cue (1621 ms vs 1497 ms in Experiment 1; 1448 ms vs 1335 ms in Experiment 2; 1658 ms vs 1446 ms in Experiment 3). Even in cue-match condition of Experiment 2, reading times in IO-context (cue-match condition) were longer than DO-context (cue-conflict condition). This effect of Context may indicate that grammatical function of the indirect and direct objects influenced processing double-object sentences, and/or that a violation of the given-before-new preference (Clifton & Frazier 2004, Bresnan et al. 2007) influenced processing difficulty in IO-context. More specifically, one might assume that the given-before-new preference facilitated processing the double object sentences when the interrogative contexts specified on the direct object (given-before-new order: *the children [the apple]*$_F$) than on the indirect object (given-before-new order (*[the children]*$_F$ *the apple*), which violates the given-before-new preference (but see further discussion below). However, the effect of Context did not last long and consistent effects were not observed at the remnant region or post-remnant region.

Second, the effect of Remnant Congruency occurred at the remnant region (region 4) without the effect of Context resulting from conflict between contextual and lexical focus cues. Korean learners of English had difficulty in processing the remnant when the elliptical remnant was incongruous with the contextually focused object, showing longer reading times than it was congruous with the contextually focused object. This effect indicated that preceding interrogative context influenced both the subsequent target sentence and the elliptical remnant construction (Experiment 1 and Experiment 3).

However, in Experiment 2 with cue-match between contextual and lexical cues, there was no Remnant Congruency effect, due to no difference of reading time between incongruous and congruous with the contextually focused cue, and there was no effect of Context at region 4 either.

In these findings, the results of effects in Experiment 2 differed from those in Experiment 1 (interrogative context without lexical focus *only*) and Experiment 3 (interrogative context and lexical focus *only* which was placed between the two objects). To identify whether the source of these different effects is a grammatical function or a violation of the given-before-new preference, as mentioned above, we performed additional analyses. First, we examined the acceptability of interrogative *wh*-question context as offline test[3]. The result of the offline showed there was a

significant difference between IO-context (*who*-question: 2.60; SD: 1.0) and DO-context (*what*-question: 3.93; SD: 0.8), $F(1, 112) = 61.39$, $p < 0.001$, due to higher preference in *what*-question condition. Second, we conducted the analysis of congruency effect between incongruous and congruous condition within DO-context condition which is the given-before-new order in each experiment. The results of the analysis showed that a marginal effect of Congruency in Experiment 1 (91 ms difference, $b = 99$, SE = 50.3, $t = 1.973$, $p = 0.057$), and a significant effect of Congruency in Experiment 3 (60 ms difference, $b = 85$, SE = 42.7, $t = 1.997$, $p = 0.047$), whereas there was no effect of Congruency in Experiment 2 (-3 ms difference, $b = 4.9$, SE = 42.5, $t = 0.116$, $p = 0.908$). The fact that there was no Remnant Congruency effect in Experiment 2 may indicate that the grammatical function influenced by the relative location of *only,* rather than the given-before-new order preference, might be a crucial factor. Note that in Experiment 2, the particle precedes both objects (*only the children the apple*), whereas in Experiment 3, it was placed between the two objects (*the children only the apple*).

The absence of Remnant Congruency effect in Experiment 2 may indicate that Korean learners tend to associate the focus particle with either of the two objects or both of them simultaneously, in contrast to English speakers who have the strong preference for associating only with its adjacent constituent (cf. Paterson et al. 2007). This tendency of Korean learners might be ascribed to their L1 influence in that Korean allows multiple sluicing and multiple fragments of [IO-DO] rather freely unlike English (cf. Park 2005, 2013), and this property might possibly allows Korean learners to strongly parse the combination of [IO-DO] as a unit. Further, the fact that [IO-DO] were presented simultaneously on the screen might cue Korean learners to process them this way. Pending on further investigations, we tentatively submit that such interferences might lead to the absence of the Remnant Congruency effect.

Some of these results contrast with those of English speakers. To compare them, we selected reading times revealed in total reading time based on eye movement experiment by Sauermann, Filik & Paterson (2013). They used to investigate whether the interaction between contextual and lexical cues influence sentence processing of focus structure in English native speakers. The effects at each region in each

[3] The offline test used a 5-point grading scale ("1" as not at all acceptable and "5" as definitely acceptable). Fifty-seven Korean undergraduate student participated. Materials included two conditions (*who*-question: *John wondered who Sally would pass the apples.* vs *what*-question: *John wondered what Sally would pass the children*).

experiment are summarized, as shown in Table 10.

As discussed above, regarding the effect of Context at the objects region (region 3), Korean learners process the interrogative contextual cue and lexical focus cue native-like in Experiment 1 and Experiment 3. However, in Experiment 2 Korean learners had processing difficulty with contextual cue or lexical focus cue, even with the cue-match condition, due to longer reading time in the IO-context than the DO-context condition.

Table 10. Comparison of the Effects between L2 and L1

		Region 3 (objects)		*Region 4* (remnant)		*Region 5* (post-remnant)	
		L2	L1	L2	L1	L2	L1
EXP 1	Context	**	*	–	–	–	–
	Remnant	–	–	**	*	–	*
	Context × Remnant	–	–	–	–	†	–
EXP 2	Context	*	–	–	*	–	*
	Remnant	–	–	–	*	–	–
	Context × Remnant	–	–	–	–	–	–
EXP 3	Context	***	*	–	*	–	–
	Remnant	–	–	†	*	†	*
	Context × Remnant	–	–	–	*	–	*

'***' 0.001, '**' 0.01, '*' 0.05, '†' 0.1

For the effect of Remnant Congruency and Context at the remnant region (region 4), Korean learners processed Remnant Congruency in interrogative context in the similar way English speakers did, with longer times in the incongruous remnant. However, for English speakers, there were effects of Remnant Congruency with both contextual and lexical cues regardless of positions of the particle *only*. In contrast, Korean learners did not show any significant effects, except for a marginal effect when the particle was placed between the two objects (Experiment 3). This difference in general indicates that Korean learners of English have difficulty in processing double-object construction with both contextual and lexical cues, including interrogative context and the focus particle *only*.

5. Conclusion

The current study examined the identification process of focus information by Korean learners of English based on interaction between contextual and lexical focus cues in double-object construction, using three self-paced reaction time experiments. We found Korean speakers preferred the context specifying focus on direct object rather than indirect object. It was also found that Korean speakers did not process the elliptical remnant, cued by lexical focus, as native English speakers did. We have suggested that these results may be caused by certain grammatical functions influenced by relative locations of the focus particle *only*, which might be interpreted as L1 influence. Needless to say, further in-depth research is required to reveal processing mechanisms of the identification of the focus information by L2 learners and its neural manifestations.

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Examples in: English
Applicable Languages: English
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Appendix

A1. Results of Log-Transformed Data in Experiment 1

	Estimate	SE	*t*-value	*p*-value
Region 3 (objects)				
(Intercept)	3.167	0.016	188.894	0.000***
Context	0.035	0.015	2.269	0.030*
Remnant	−0.007	0.009	−0.735	0.462
Context × Remnant	−0.001	0.019	−0.078	0.938
Region 4 (remnant)				
(Intercept)	3.087	0.019	158.372	0.000***
Context	−0.012	0.011	−1.082	0.288
Remnant	−0.029	0.009	−2.966	0.003**
Context × Remnant	0.004	0.019	0.212	0.832
Region 5 (post-remnant)				
(Intercept)	2.742	1.333	241.982	0.000***
Context	−4.426	7.307	−0.606	0.547
Remnant	−1.060	6.884	−1.540	0.123
Context × Remnant	3.173	1.381	2.298	0.021*

'***' 0.001, '**' 0.01, '*' 0.05, '†' 0.1

A2. Results of Log-Transformed Data in Experiment 2

	Estimate	SE	*t*-value	*p*-value
Region 3 (objects)				
(Intercept)	3.101	0.030	102.140	000***
Context	0.035	0.015	2.244	0.038*
Remnant	−0.002	0.013	−0.188	0.871
Context × Remnant	0.008	0.027	0.324	0.746
Region 4 (remnant)				
(Intercept)	2.880	0.032	88.225	0.000***
Context	0.016	0.015	1.093	0.279
Remnant	0.001	0.013	0.122	0.903
Context × Remnant	−0.017	0.027	−0.645	0.519
Region 5 (post-remnant)				
(Intercept)	2.666	0.018	144.097	0.000***
Context	0.018	0.010	1.675	0.110
Remnant	−0.010	0.008	−1.281	0.201
Context × Remnant	−0.025	0.016	−1.575	0.116

'***' 0.001, '**' 0.01, '*' 0.05, '†' 0.1

A3. Results of Log-Transformed Data in Experiment 3

	Estimate	SE	*t*-value	*p*-value
Region 3 (objects)				
(Intercept)	3.163	2.259	140.017	0.000***
Context	7.088	1.190	5.957	0.000***
Remnant	2.547	1.092	0.023	0.981
Context × Remnant	−1.668	2.194	−0.076	0.939
Region 4 (remnant)				
(Intercept)	3.046	0.023	127.877	0.000***
Context	−0.001	0.012	−0.120	0.904
Remnant	−0.024	0.011	−2.118	0.034*
Context × Remnant	0.022	0.022	0.977	0.329
Region 5 (post-remnant)				
(Intercept)	2.716	0.009	274.259	0.000***
Context	−0.009	0.007	−1.177	0.248
Remnant	0.012	0.007	1.701	0.089†
Context × Remnant	0.027	0.014	1.853	0.064†

'***' 0.001, '**' 0.01, '*' 0.05, '†' 0.1