Linguistic Research 38(Special Edition): 101-120
DOI: 10.17250/khisli.38..202109.005

The role of modality in cross-linguistic syntactic priming

Myeongeun Son
(Nagoya University of Commerce and Business)

Son, Myeongeun. 2021. The role of modality in cross-linguistic syntactic priming. *Linguistic Research* 38(Special Edition): 101-120. This study investigates whether L2 learners share abstract syntactic representations between an L1 and an L2 that have different word orders, and if so, whether modality affects access to the shared representation. In a syntactic priming experiment, 38 L1-Korean advanced English L2 learners completed English target fragments to describe pictures after either listening to or reading aloud different types of Korean dative sentences. The results show cross-linguistic syntactic priming between Korean and English; however, only reading led to priming effects, and the magnitude of the effects differed depending on the type of Korean dative in the prime sentence. These results suggest that L2 learners can share syntactic representations between L1 and L2, but that their access to such representations can be restricted by language-specific features and modality. **(Nagoya University of Commerce and Business)**

Keywords modality, cross-linguistic syntactic priming, dative structures

1. Introduction

Second language (L2) input can be aural or written. How these two modalities affect L2 learning and L2 processing and production has been widely investigated but remains controversial in the field of second language acquisition (SLA) (e.g., Kuiken and Vedder 2011; Weissberg 2000; Zalbidea 2017).

For one, some previous studies have argued that type of input modality may lead to significant differences in L2 learners' development of knowledge and of complexity, accuracy, lexical diversity, and fluency in their production, based on some fundamental distinctions between the two modalities (e.g., Zalbidea 2017). In particular, aural and written input are processed by different subsystems of the brain (Penney 1989). In addition, written input allows repeated access and can be processed at leisure, while aural input must be processed synchronously. In contrast, some studies have found different

* I would like to thank the Editor and two anonymous reviewers for their constructive feedback and valuable insights on this study. Any errors that remain in this paper are my own.

modes of input to lead to negligible differences in L2 learners' performance and development (e.g., Kormos 2014).

Another question about modality is whether it influences L2 learners' abstract syntactic representations. Specifically, according to the shared-syntax account, L2 learners gradually develop an abstract syntactic representation that is shared between L1 and L2 (e.g., Hartsuiker, Pickering, and Veltkamp 2004). In other words, this account suggests that L2 learners do not possess two different representations, one for their L1 and another for their L2; rather, they can use identical representations for both if the two languages have similar features to some extent. Thus, the shared representation can facilitate L2 learners' processing of their two languages.

Cross-linguistic syntactic priming has provided evidence for shared syntactic representations from experiments testing various structures and employing diverse methodologies (e.g., Bernolet, Hartsuiker, and Pickering 2007, 2013; Hwang, Shin, and Hartsuiker 2018). This line of research has demonstrated that L2 learners' processing or production of either the L1 or the L2 can facilitate following processing or production of the other language. Investigations have focused not only on cross-linguistic syntactic priming itself, but on several factors that may or may not influence priming effects. For instance, previous studies have explored whether priming effects can occur if the L1 and L2 have different word orders, with mixed results (Bernolet et al. 2007; Chen et al. 2013; Loebell and Bock 2003; Shin and Christianson 2009; Son 2020; Song and Do 2018; Weber and Indefrey 2009). Meanwhile, although input modality is another factor that might well interact with shared syntactic representations, this possibility has not yet been investigated.

This study explores the effects of different L1–L2 word order and input modality on cross-linguistic syntactic priming. Specifically, the study investigates cross-linguistic syntactic priming between Korean prime sentences and English target sentences after L1-Korean English learners either listen to or read Korean prime sentences.

2. Literature review

2.1 Cross-linguistic Syntactic Priming

When language users are processing or producing language structures, they take

advantage of similar structures they have recently encountered or produced (see also Kim, Park, and Seo 2020); this is the phenomenon known as syntactic priming (e.g., Ahn et al. 2014; Bock 1986; Park and Chung 2012). Syntactic priming has provided evidence for a language user's mental grammatical representations. Specifically, the lexicalist residual activation model (Pickering and Branigan 1998) suggested that not only lemmas but also grammatical uses of the lemmas (i.e., combinatorial nodes) are linked to each other. An activated combinatorial node leads a language user to reuse it, and therefore to be more likely to produce it compared to other grammatical structures that would be appropriate in the same context.

Syntactic priming also has been found between bilingual language users' two languages, and Hartsuiker et al. (2004) argued for the shared-syntax account based on this phenomenon. They demonstrated that cross-linguistic syntactic priming can occur, which they explained as combinatorial nodes in the brain being shared between the two languages. In other words, a language user does not have separate syntactic representations for each language. Rather, integrated representations are shared between L1 and L2, when these two languages have some degree of similarity in aspects of their syntax. For instance, in Hartsuiker et al.'s study, L1-Spanish L2 learners of English produced English passive sentences more frequently after they were exposed to Spanish passive sentences than after they were exposed to other types of Spanish sentences. The authors concluded that the priming effects took place because Spanish and English have an identical syntactic representation for passive structures.

Cross-linguistic syntactic priming has been widely tested (e.g., Bernolet et al. 2007, 2009, 2012, 2013; Hartsuiker et al. 2016; Hwang et al. 2018); in addition, some factors that might affect the priming effects, such as word order and syntactic variations, have been considered (e.g., Son 2020; Song and Do 2018). First, there have been mixed findings regarding priming effects between two languages that have different word orders. When Hartsuiker et al. (2004) tested priming effects between English and Spanish, which have the same word order, they compared their results to those reported by Loebell and Bock (2003) for English and German, which have different word orders. English and Spanish showed greater priming effects, leading the authors to conclude that identical word order allows a greater degree of shared representation, and may be a prerequisite for cross-linguistic syntactic priming.

However, some previous studies raised the issue that cross-linguistic syntactic priming between two languages that share word order such as English and Spanish may occur

not because of abstract syntactic representations but because of the shared word order (e.g., Bernolet et al. 2007; Chen et al. 2013; Loebell and Bock 2003; Shin and Christianson 2009; Son 2020; Song and Do 2018; Weber and Indefrey 2009). In other words, in order to produce an L2 (L1) sentence as a target, L2 learners may simply repeat the word order of an L1 (L2) sentence rather than accessing a mental representation. These studies have argued for the importance of investigating cross-linguistic syntactic priming between languages with different word orders to provide better understanding of shared representation. For instance, Son (2020) conducted a picture-description task to look for priming effects from L1 Korean to L2 English. Korean and English have different word orders (i.e., SOV in Korean; SVO in English). However, Korean and English have conceptually similar alternating dative constructions with an agent, a recipient, and a theme, in which the order of the recipient and theme can be switched, as in the following examples, which are from Son's (2020) study.

English

(1) John gave Mary an apple.

(2) John gave an apple to Mary.

Korean

(3)	John-i	Mary-lul	sagwa-lul	cwu-ess-ta.
	John-NOM	Mary-ACC	apple-ACC	give-PST-DECL
(4)	John-i	sagwa-lul	Mary-eykey	cwu-ess-ta.
	John-NOM	apple-ACC	Mary-to	give-PST-DECL

Son revealed that when the L2 learners were completing an English fragment to describe a picture, they were more likely to employ the type of dative they had just encountered in the Korean prime, despite the different word order of the sentences. She argued that these priming effects between Korean and English provide evidence for the shared-syntax account, and that the effects can be teased apart from repetition of surface word order.

2.2 Modality in SLA

While the modality of prime sentences may be another candidate for a factor in

priming effects, the role of modality in L2 processing and production is still unclear, as already mentioned (e.g., Kim and Godfroid 2019; Zalbidea 2017). Task-based language teaching (TBLT) studies comparing L2 complexity, accuracy, and fluency in different modalities have had inconsistent results (e.g., Gilabert et al. 2016; Granfeldt 2007; Kormos and Trebits 2009; Kuiken and Vedder 2011; Tavakoli 2014; Vasylets, Gilabert, and Manchon 2017; Zalbidea 2017). For example, Zalbidea (2017) and Kuiken and Vedder (2011) used similar tasks in which L2 learners were required to explain a decision either orally or in writing. Zalbidea found higher complexity in the oral task and higher accuracy and fluency in the written task; Kuiken and Vedder found the opposite.

Another line of research has explored how L2 learners' comprehension might differ depending on input modality. VanPatten's 1990 study and a series of studies attempting to replicate it (Greenslade, Bouden, and Sanz 1999; Leow, Hsieh, and Moreno 2008; Morgan-Short et al. 2012; Morgan-Short et al. 2018; Wong 2001) asked L2 learners to attend to form and meaning simultaneously while processing L2 input. Some of the studies utilized aural input while others used written input, and except for this modality difference, the studies' instructions and experimental settings were similar. However, the extent to which the L2 learners comprehended the input was different. For instance, both VanPatten (1990) and Wong (2001) had intermediate learners as participants. In VanPatten's study, the stimuli were aural, while in Wong's study, the stimuli were written. In both, one group of participants was instructed to attend to form and meaning while the other was instructed to focus on the content. VanPatten found that the form and meaning group showed poorer comprehension than the content group while Wong found no difference between the two groups.

These previous studies suggest that modality influences L2 learners' processing and production without providing sufficient evidence of how it does so, which is sufficient motivation for further investigation of the role of modality, particularly in cross-linguistic syntactic priming.

Moreover, moderate effects of modality have been reported in some previous syntactic priming research. Mahowald, James, Futrell, and Gibson (2016) conducted a meta-analysis of syntactic priming. They categorized 73 peer-reviewed journal articles including within-language (i.e., L1-L1 and L2-L2) and cross-linguistic (i.e., L1-L2, L2-L1) studies. They used three coding schemes (i.e., auditory, visual, visual with reading aloud) to explore whether or not modality had influenced syntactic priming in previous studies. They did not find any significant effect of modality on priming effects. However,

the meta-analysis did not focus on cross-linguistic research to explore the effects of modality, which may have led to the nonsignificant effects of modality. In addition, there is no empirical study that directly compares priming effects between different modalities using identical experimental settings and stimuli. In other words, a one-to-one comparison may shed new light on the effects of modality on cross-linguistic syntactic priming.

2.3 The present study

The current study investigates whether cross-linguistic syntactic priming occurs regardless of the moderating effects of word order differences, and, if so, whether the priming effects differ depending on modality. Adopted from Son (2020), a picture-description task is employed to examine cross-linguistic syntactic priming between L1 Korean and L2 English, which have different word orders but comparable dative alternations.

Considering the effects of modality on processing and production, cross-linguistic syntactic priming may or may not occur when the L2 learners are given prime sentences in different modalities. In addition, the extent to which the different word order influences the priming effects may differ depending on modality. By addressing these issues, the current study seeks to provide a clearer picture of the effects of modality on cross-linguistic syntactic priming.

Research Questions

1. Does cross-linguistic syntactic priming occur between Korean and English dative alternations, regardless of modality of the primes?

2. If priming effects occur, do the effects of different word order between Korean and English on cross-linguistic syntactic priming differ depending on the modality of the primes?

3. Method

3.1 Participants

Thirty-eight Korean EFL learners at a university in South Korea participated (age: *M*

= 23.33, *SD* = 2.54). They had advanced proficiency based on their standardized test scores (e.g., TOEFL, TOEIC, IELTS; Papageorgiou, Tannenbaum, Bridgeman, and Cho 2015). The participants were pseudo-randomly assigned to two groups. One group was given aural prime stimuli (N = 20), whereas the other group was given written prime stimuli (N = 18).

3.2 Materials

The experimental materials were 18 pairs of a Korean prime sentence and an English target fragment with a picture. The Korean primes were ditransitive (double-object; DO) sentences, post-prepositional (PO) sentences, or transitive sentences (as a baseline). The number of each type of the prime sentence was six. Animate entities were always used as both the agent and the recipient, while inanimate entities were always used as the theme. Three entities used in a certain prime sentence were not repeatedly used in other 17 prime sentences; the entire prime sentences were semantically separated. The English target fragments consisted of two parts: a main clause with a subject, a verb, and the complementizer that (e.g., *Bill thought that*…) and parentheses that included three noun phrases and a verb for the subordinate clause.

The words in parentheses were given to facilitate the participants' production of the target sentence (Jackson and Ruf 2017; Song and Do 2018). The order of the words was randomized to exclude any repetition effects of word order on the participants' production.[1] The verb in the English target fragment never shared an equivalent meaning with the verb in the Korean sentence to avoid a lexical boost in the priming effects (Bernolet et al. 2013; Cai et al. 2011; Schoonbaret et al. 2007; Song and Do 2016). The critical items were distributed with 96 pairs of fillers, such as passive sentences and sentences with intransitive verbs.

The three verbs *cwuta* (give), *karuchida* (teach), and *meokita* (feed) are among the very few that can be used in Korean DO (Jung and Miyagawa 2004; O'Grady 1991), and therefore were used in all of the prime sentences. In other words, each verb was used twice to create two prime sentences within one of the prime types. Six verbs for the English targets were selected from Gries's (2007) corpus-based word preference lists,

1 The case that the order of the noun phrases in a Korean prime sentence and the order of the noun phrases in a English target fragments in parentheses was identical was 11% of the stimuli. The case did not have any significant effects on the priming effects ($F(1, 620) = .21$, $p = .65$).

considering frequency and verb-biases toward particular constructions (e.g., Gries and Wulff 2009): *tell*, *show*, and *offer* prefer a ditransitive verb and *bring*, *pass*, and *sell* prefer a prepositional dative construction. Each of the six verbs was used once in each category (i.e., DO, PO) of target fragment. The transitive sentences were used as the baseline condition (Bernolet and Hartsuiker 2010).

For each English target fragment, three noun phrases and a verb describing an action were provided in parentheses along with the picture. The pictures included three entities matched with the noun phrases and engaged in the actions. The pictures functioned as cues to the thematic role of each noun phrase in a target sentence. A pair of English target fragment and a picture was not repeatedly used. The fillers were also presented with corresponding pictures. A Korean native speaker recorded the entire set of stimuli for the aural prime sentence condition. The entire set was identical, regardless of the prime condition that each participant received; however, the order of the stimuli was adjusted for a balanced distribution of the main stimuli and fillers. Figure 1 provides an example of three prime-target pairs in this study, suggesting that in each trial, the participants were given one of the 18 prime sentences (i.e., either DO, PO, or Baseline) and one of the 18 target fragments with corresponding pictures.

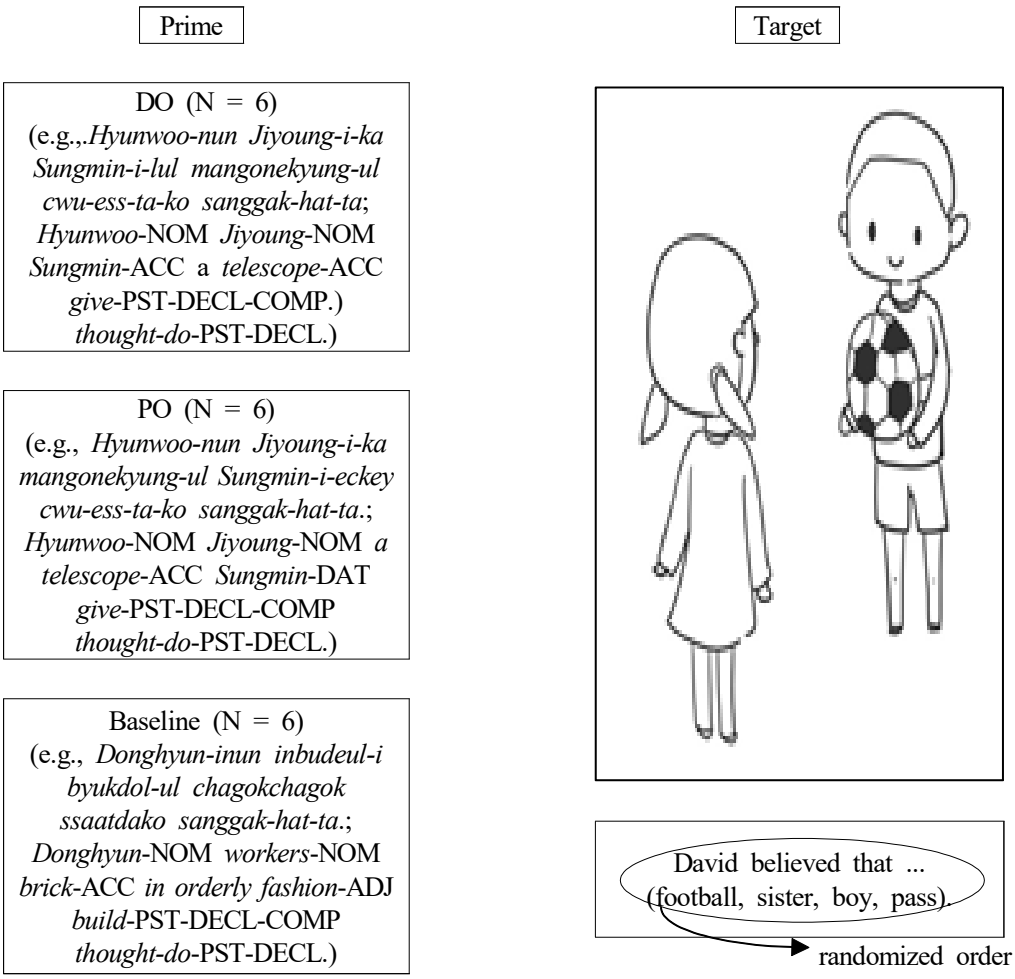

Figure 1 Example of prime and target items

3.3 Procedure

Individual participants completed the experiment using a computer while guided by the researcher. Written instructions was given on the computer screen, and the researcher explained orally if the participants had further questions. The experiment was programmed on E-prime, and participants' answers were recorded using Apple iPhone X. Participants were instructed to either read aloud or listen to a Korean sentence and then answer a comprehension question by pressing either *j* for yes or *f* for no on the keyboard. In the aural prime sentence condition, a plus sign (+) appeared in the middle of the screen. On this page, the participants listened to a prime sentence. Afterward, they

pressed the space bar to move to the next page, where they were required to answer a comprehension question. In the written prime sentence condition, using a self-paced reading paradigm, each prime sentence was provided in the middle of the screen. Participants were then asked to read the sentence aloud as fast as possible. After reading each prime sentence, similar to the aural condition, the participants moved to a comprehension question by pressing the space bar themselves. The comprehension question confirmed that the participants paid attention to the sentence.[2] The question included some of the lexical items used in the prime sentence. When the question appeared after the targeted structure (i.e., the dative structure), it was not related to the relationship between the agent, the recipient, and the theme in the dative structure. Then, an English fragment was presented with the four keywords in parentheses and the picture. Participants were asked to complete the English sentence, speaking it aloud, by using the keywords to describe the picture. Their oral production was recorded. They were instructed to press the space bar to move to the next item. Several preliminary practice items helped the participants understand the experimental procedure. The main experimental stimuli were given in pseudo-random order. In particular, the critical pairs did not appear three times in a row. Figure 2 illustrates the entire procedure of the experiment.

2 The number of comprehension questions accounted for approximately 30% of the entire stimuli. All participants showed great accuracy (more than 70%), which allowed for the inclusion of all responses in the data analysis (see also, Jiang 2018).

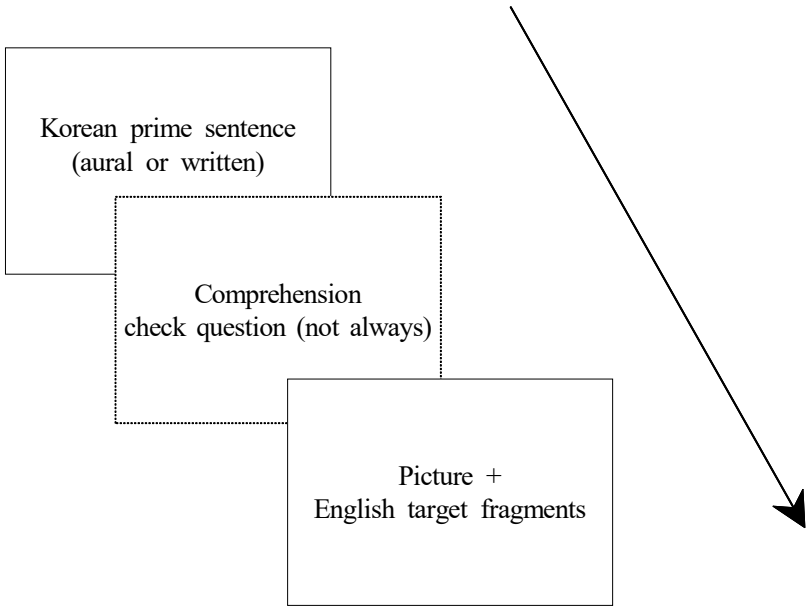

Figure 2. Procedure of the experiment

3.4 Scoring

Participants' oral productions were transcribed and coded as DO, PO, or other. "Other" included ungrammatical sentences and sentences including unprovided vocabulary. Pronunciation errors and incorrect determiners were ignored.

4. Results

In the aural prime condition, the participants produced 296 sentences (DO: 72; PO: 207; "other": 17). In the written prime condition, the participants produced 378 sentences (DO: 66; PO: 275; "other": 36). Only DO and PO responses were included in the statistical analyses. To analyze the data, logit mixed effect regression models were created using the lme4 package of R (R Core Team, 2018). The results indicated that the L1-Korean learners of English produced PO structures more often regardless of modality. Notwithstanding this preference, in the written modality, the ratio of English DO to PO differed depending on the type of Korean prime: After reading Korean DOs (POs), the learners were more likely to produce DOs (POs), respectively. For instance, the

percentage of English DOs was greater after reading Korean DOs (after DO prime: 30.95% vs. after PO prime: 7.14%) (see Table 1).

Table 1. Descriptive statistics of responses

Modality	Prime	English target production	No. of structure	Percent (%)
Aural	DO	DO	27	26.5
		PO	68	66.7
		other	7	6.9
	PO	DO	23	22.5
		PO	73	71.6
		other	6	5.9
	baseline	DO	22	21.6
		PO	73	71.6
		other	7	6.9
Written	DO	DO	39	31
		PO	77	61.1
		other	10	7.9
	PO	DO	8	6.3
		PO	108	85.7
		other	10	7.9
	baseline	DO	20	15.9
		PO	90	71.4
		other	16	12.7

The first model explored statistical differences in the participants' responses to each type of dative sentence. Type of English target sentence (i.e., DO and PO) was the dependent variable. The fixed effects were type of Korean prime sentence (i.e., DO and PO; PO: referential level), modality (i.e., aural and written; aural: referential level), and the interaction between type of Korean prime sentence and modality. To avoid a convergence problem, the model only included by-subject and by-item intercepts and excluded additional random slopes since convergence errors were found.

The L2 learners preferred to produce English PO after they had processed a Korean dative sentence (β = 1.50, *SE* = .60, z = 2.49, p = .01). Without consideration of the Korean prime's modality, processing the Korean DO did not lead to greater production of English DO production with significance (β = -.19, *SE* = .73, z = -.26, p = .79). However, the participants' responses after aural stimuli were significantly different from those after written stimuli (β = 1.79, *SE* = .62, z = 2.89, p = .004); in addition, the

interaction between type of Korean prime sentence and modality was significant in the model (β = -2.17, *SE* = .61, *z* = -3.55, *p* < .001), suggesting that Korean DO facilitated the production of English DO in the written mode.

Next, the second model included the responses in the baseline condition to investigate the extent to which the priming effects differed from the L2 learners' general preference for PO. The dependent variable was type of English target sentence. The fixed effects were type of prime sentence (i.e., DO, PO, baseline; baseline is the referential level), modality, and the interaction. As in the previous model, only by-subject and by-item intercepts were included and additional random slopes were excluded due to convergence errors.

The model showed the L2 learners' general preference for PO in their production, regardless of modality (β = 1.76, *SE* = .58, *z* = 3.04, *p* = .002). Without considering the modality of the prime sentence, neither DO nor PO led to significant priming effects (DO: β = -.42, *SE* = .68, *z* = -.62, *p* = .54; PO: β = -.22, *SE* = .69, *z* = -.32, *p* = .75). However, when modality was considered, priming effects were found. In particular, the interaction between PO and modality was significant in the model (β = 1.51, *SE* = .61, *z* = 2.47, *p* = .01), indicating that the learners were more likely to produce English POs after reading aloud Korean PO sentences and that PO priming effects were greater than the learners' general preference for PO in the written mode. In contrast, the interaction between DO and modality had a negative coefficient; however, it was not significant (β = -.68, *SE* = .52, *z* = -1.31, *p* = .19). That is, reading aloud DO led the participants to produce English DO to some extent, but its effect was negligible (see Table 2).

Table 2. Results from the second model including the baseline

	Estimate	SE	*z*	*p*
Intercept	1.76	.58	3.04	.002**
Prime: DO	-.42	.68	-.62	.54
Prime: PO	-.22	.69	-.32	.75
Modality: written	.27	.56	.48	.63
DO * written	-.68	.52	-1.31	.19
PO * written	1.51	.61	2.47	.01*

Note. *<.05, **<.01, ***<.001

In sum, only in the written mode, cross-linguistic syntactic priming occurred between Korean and English dative structures: L1-Korean L2 learners of English were more likely

to produce English DO (PO) after they read aloud Korean DO (PO). In addition, compared to the responses to the baseline, only PO's priming effects were greater in the written mode.

5. Discussion

This study addressed whether or not cross-linguistic syntactic priming occurs with different modalities of priming stimuli and whether or not the effects of L1-L2 word orders on the priming effects differ depending on modalities. The study conducted a picture description task that asked L1-Korean L2 learners of English to complete an English fragment with assigned keywords to describe a picture after either listening to or reading aloud a Korean prime sentence. The results showed that cross-linguistic syntactic priming occurred despite the different word orders of Korean and English. However, the priming effects were only found in the written modality.

This study lends support to the argument that cross-linguistic syntactic priming can occur regardless of word order (Chen et al. 2013; Desmet and Declecq 2006; Hwang et al. 2018; Shin and Christianson 2009; Son 2020; Song and Do 2018), countering the arguments made by Bernolet et al. (2007) and Loebell and Bock (2003). Korean has SOV word order while English has SVO; however, the learners showed a tendency to follow the type of Korean prime (either DO or PO) they had just encountered when producing an English sentence. This observation of priming effects between Korean and English allows a better understanding of L2 learners' shared syntactic representations. Specifically, the results indicate that L1-Korean L2 learners of English may possess an abstract representation of dative alternations that is shared between their L1 and L2; therefore, cross-linguistic syntactic priming may occur not because of surface word order but because of the shared representation between the two languages.

In addition, the dative alternations showed different magnitudes of priming effects (Jackson, 2018; Shin & Christianson, 2009; Son, 2020; Song & Do, 2018). In this study, the learners produced English DOs more often after encountering Korean DOs than after encountering Korean POs. However, the statistical comparison between their production of English DO (PO) and a baseline revealed that only processing Korean PO led to production significantly different from their inherent preference for PO, which is consistent with the claims of Kaan and Chun (2017), Shin and Christianson (2009), and

Son (2020). These previous studies also demonstrated the weaker priming effects of DO; moreover, Kaan and Chun (2017) did not find immediate priming effects from DO structures.

As Son (2020) discussed, the limited priming effects of Korean DOs may result from learners' limited exposure to English DO in their L2 learning experience (McDonough, 2006); for instance, Yook (2012) found that English PO is more frequently used in Korean EFL textbooks. In addition, English PO is acquired earlier in the natural L2 developmental progress, which may in turn yield greater opportunities to process or produce English PO rather than DO (Hawkins 1987; Shin and Christianson 2009, 2010). The learners' limited exposure may have a negative influence on the development of "balanced" syntactic representations of dative alternations.

However, the priming effects between the two languages with different word order were only found in the written mode; in other words, listening to a Korean prime sentence did not have a significant effect on the type of structure the learners chose in their following English production. This finding is inconsistent with the results of Mahowald et al.'s (2016) meta-analysis. As discussed earlier, they did not find a clear effect of modality on syntactic priming. However, as mentioned, their meta-analysis included both within- and cross-linguistic priming research. They found that cross-linguistic priming had similar but weaker effects than within-language priming (Pickering & Ferreira, 2008). In addition, although the current study showed cross-linguistic priming effects between languages with different word orders, it is possible that the different word orders weakened the observed effects (e.g., Bernolet et al. 2007). Hence, it may be that Mahowald et al.'s meta-analysis would have found modality effects if they had excluded within-language priming research. Dealing with two different languages may create an additional cognitive burden, which would influence the learners' sensitivity to different modalities. That is, compared to a representation for either L1 or L2, a shared representation between L1 and L2 may be more sensitive to other factors, including modality, that influence processing.

Another possible explanation for this study's finding of different priming effects depending on modality may be related to the experimental setting. Previous studies have pointed out that task difficulty can be affected by modality (e.g., Cho 2018; Kormos 2014; Vasylets et al. 2017; Zalbidea 2017). In the current study, the participants in the written prime condition were instructed to read each stimuli sentence as quickly as possible, but there was no time limitation to force them to move forward; thus, some

of the differing inherent characteristics of aural and written modalities may have affected the results. Specifically, compared to the aural prime group, the written prime participants may have been able to spend more time (re)processing the prime sentence, which could in turn have strengthened the priming effects.

This study is an initial attempt to directly compare the priming effects of two different modalities of otherwise identical stimuli and in identical experimental settings; future research should further explore this issue with different languages and stimuli. However, this study has some limitations that necessiate cautious interpretation of the results and call for further research on the effects of modality on cross-linguistic syntactic priming. For one, the number of participants in each group was not sufficient, suggesting that future research with larger sample sizes are warrented for greater generalizability.

Another limitation is that the task manipulation in this study may have a mediating influence on the priming effects. In particular, Mahowld et al.'s (2016) meta-analysis of syntactic priming research categorized learners' production of prime sentences based on visual aids (either produced by him or via simple rote repetition) and learners' processing of aural prime sentences as modalities of prime sentences (see also Pickering and Ferreira 2008). They showed that these two modalities had no significant difference in terms of the priming effects. Following the results obtained by Mahowle et al. (2016), this study required the participants who were given the written stimuli to read aloud each sentence to ensure their processing (e.g., Gibson 2008; O'Mally et al. 2008), while it required the participants who were given the aural stimuli to listen to the prime sentence only. However, one of the anonymous reviewers suggested that the requirement in the written modality could yield the additional task (i.e, read aloud) better compared with processing an aural prime sentence only, and the requirement may lead to the priming effects. Nevertheless, there is no clear evidence on whether the additional task yielded priming effects as well. To investigate the effects of modality on purely syntactic priming without any additional tasks, future research could make use of some unobtrusive methods, such as the eye-tracking paradigm, to measure L2 learners' processing of written prime sentences.

6. Conclusion

Although Korean and English have different word orders, this study revealed

cross-linguistic syntactic priming between Korean and English dative sentences. Each of the dative alternations showed a different magnitude of priming effects, and significant priming effects were only found in the written modality. These findings suggest that L1-Korean L2 learners of English share a syntactic representation of the dative alternation to some extent; however, their access to the shared representation may be sensitive to modality.

This direct comparison suggests the possibility of modality effects on cross-linguistic syntactic priming, but future research comparing written and aural modes of priming should incorporate a time limitation on reading to provide a better understanding of the role of modality in cross-linguistic syntactic priming and of shared abstract representations between L1 and L2.

References

Ahn, Hee-Don, Yongjoon Cho, Jong-Bai Hwang, Moongee Jeon, Kisub Jeong, and Jieun Kim. 2014. L2 morphological processing of Korean nominal marker –ka: evidence from masked and cross-modal priming with advanced Chinese learners. *Linguistic Research* 31(2): 305-323.

Bernolet, Sarah and Robert Hartsuiker. 2010. Does verb bias modulate syntactic priming?. *Cognition* 114(3): 455-461.

Bernolet, Sarah, Robert Hartsuiker, and Martin Pickering. 2009. Persistence of emphasis in language production: A cross-linguistic approach. *Cognition* 112(2): 300-317.

Bernolet, Sarah, Robert Hartsuiker, and Martin Pickering. 2013. From language-specific to shared syntactic representations: The influence of second language proficiency on syntactic sharing in bilinguals. *Cognition* 127(3): 287-306.

Bernolet, Sarah, Robert Hartsuiker, and Martin Pickering. 2007. Shared syntactic representations in bilinguals: Evidence for the role of word-order repetition. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 33: 931-949.

Bock, Kathryn 1986. Syntactic persistence in language production. *Cognitive Psychology* 18(3): 355-387.

Cai, Zhenguang, Martin Pickering, Han Yan, and Holly Branigan 2011. Lexical and syntactic representations in closely related languages: Evidence from Cantonese–Mandarin bilinguals. *Journal of Memory and Language* 65(4): 431-445.

Chen, Baoguo, Yuefang Jia, Zhu Wang, Susan Dunlap, and Jeong-Ah Shin. 2013. Is word-order similarity necessary for cross-linguistic structural priming?. *Second Language Research* 29(4): 375-389.

Cho, Minyoung. 2018. Task complexity and modality: Exploring learners' experience from the perspective of flow. *The Modern Language Journal* 102: 162-180.

Desmet, Timothy and Mieke Declercq. 2006. Cross-linguistic priming of syntactic hierarchical configuration information. *Journal of Memory and Language* 54: 610-632.

Gibson, Sally. 2008. Reading aloud: a useful learning tool?. *ELT journal* 62(1): 29-36.

Gilabert, Roger, Rosa Manchón, and Olena Vasylets. 2016. Mode in theoretical and empirical TBLT research: Advancing research agendas. *Annual Review of Applied Linguistics* 36: 117-135.

Granfeldt, Jonas. 2008. Speaking and writing in French L2: Exploring effects on fluency, complexity and accuracy. In Stijin Van Daele, Alex Housen, Fokert Kuiken, Michel Pierrard and Ineke Vedder (eds.), *Complexity, accuracy and fluency in second language use, learning & teaching,* 87-98. Belgium: University of Brussels.

Greenslade, Terri, Lynne Bouden, and Christina Sanz. 1999. Attending to form and content in processing L2 reading texts. *Spanish Applied Linguistics* 3: 65-90.

Gries, Stefan Th. 2007. Coll.analysis 3.2. A program for R in Windows.

Gries, Stefan Th and Stefanie Wulff. 2009. Psycholinguistic and corpus-linguistic evidence for L2 constructions. *Annual Review of Cognitive Linguistics* 7(1): 163-186.

Hartsuiker, Robert, Saskia Beerts, Maaike Loncke, Timothy Desmet, and Sarah Bernolet. 2016. Cross-linguistic structural priming in multilinguals: Further evidence for shared syntax. *Journal of Memory and Language* 90*:* 14-30.

Hartsuiker, Robert, Martin Pickering, and Eline Veltkamp. 2004. Is syntax separate or shared between languages? Cross-linguistic syntactic priming in Spanish-English bilinguals. *Psychological Science* 15(6): 409-414.

Hawkins, Roger. 1987. Markedness and the acquisition of the English dative alternation by L2 speakers. *Interlanguage Studies Bulletin (Utrecht),* 3(1): 20-55.

Hwang, Heeju, Jeong-Ah Shin, and Robert Hartsuiker. 2018. Late bilinguals share syntax unsparingly between L1 and L2: Evidence from crosslinguistically similar and different constructions. *Language Learning,* 68(1): 177-205.

Jackson, Carrie. 2018. Second language structural priming: A critical review and directions for future research. *Second Language Research* 34(4): 539-552.

Jackson, Carrie and Helena Ruf. 2017. The priming of word order in second language German. *Applied Psycholinguistics* 38(2): 315-345.

Jiang, Nan. 2018. *Second language processing: An introduction*. New York, United States: Routledge.

Kaan, Edith and Eunjin Chun. 2018. Priming and adaptation in native speakers and second-language learners. *Bilingualism: Language and Cognition* 21(2): 228-242.

Kim, Euhee, Myung-Kwan Park, and Hye-Jin Seo. 2020. L2ers' predictions of syntactic structure and reaction times during sentence processing. *Linguistic Research* 37(Special Edition): 189-218.

Kim, Kathy and Aline Godfroid. 2019. Should we listen or read? Modality effects in implicit and explicit knowledge. *The Modern Language Journal* 103(3): 648-664.

Kormos, Judit. 2014. Differences across modalities of performance. In Heidi Byrnes and Rosa Manchón (eds.), *Task-based language learning--Insights from and for L2 writing,* 193-216. Amsterdam, The Netherlands: John Benjamins.

Kormos, Judit and Anna Trebits. 2009. *Task-related differences across modes of performance*. In Task Based Language Teaching Conference, Lancaster.

Kuiken, Folkert. and Ineke Vedder. 2011. Task complexity and linguistic performance in L2 writing and speaking. In Peter Robinson (ed.), Second language task complexity: *Researching the Cognition Hypothesis of language learning and performance,* 91-104. Amsterdam, The Netherlands: John Benjamins.

Leow, Ronald, Hui-Chen Hsieh and Nina Moreno. 2008. Attention to form and meaning revisited. *Language Learning,* 58: 665-695.

Loebell, Helga and Kathryn Bock. 2003. Structural priming across languages. *Linguistics* 41: 791-824.

Mahowald, Kyle, Ariel James, Richard Futrell, and Edward Gibson. 2016. A meta-analysis of syntactic priming in language production. *Journal of Memory and Language* 91: 5-27.

Morgan-Short, Kara, Jeanne Heil, Andrea Botero-Moriarty, and Shane Ebert. 2012. Allocation of attention to second language form and meaning. *Studies in Second Language Acquisition* 34: 659-685.

Morgan-Short, Kara, Emma Marsden, Jeanne Heil, Bernard Issa II, Ronard Leow, Anna Mikhaylova, Sylwia Mikolajczak, Nina Moreno, Roumyana Slabakova, and Pawel Szudarski. 2018. Multisite replication in second language acquisition research: Attention to form during listening and reading comprehension. *Language Learning* 68(2): 392-437.

O'Malley, Shannon, Micheal Reynolds, Jennifer Stolz, and Derek Besner. 2008. Reading aloud: spelling-sound translation uses central attention. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 34(2): 422.

Papageorgiou, Spiros, Richard Tannenbaum, Brent Bridgeman, and Yeonsuk Cho. 2015. *The association between TOEFL iBT® test scores and the Common European Framework of Reference (CEFR) levels*. Ed. James Carlson. New Jersey: Educational Testing Service.

Park, Myung Kwan and Wo Nil Chung. 2012. Processing semeantic and phonological factors in derivcational morphology by Korean L2 learners of English: An ERP cross-modal priming study. *Linguistic Research* 29(3): 639-664.

Penney, Catherine. 1989. Modality effects and the structure of short-term verbal memory. *Memory & Cognition* 17: 398-422.

Pickering, Martin and Holly Branigan. 1998. The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language,* 39(4): 633-651.

Pickering, Martin and Victor Ferreira. 2008. Structural priming: a critical review. *Psychological Bulletin* 134(3): 427-459.

Schoonbaert, Sofie, Robert Hartsuiker, and Martin Pickering. 2007. The representation of lexical and syntactic information in bilinguals: Evidence from syntactic priming. *Journal of Memory*

and Language 56(2): 153-171.

Shin, Jeong-Ah and Kiel Christianson. 2009. Syntactic processing in Korean–English bilingual production: Evidence from cross-linguistic structural priming. *Cognition* 112(1): 175-180.

Son, Myeongeun. 2020. Cross-linguistic syntactic priming in Korean learners of English. *Applied Psycholinguistics* 41: 1223-1247.

Song, Yoonsang and Youngah Do. 2018. Cross-linguistic structural priming in bilinguals: priming of the subject-to-object raising construction between English and Korean. *Bilingualism: Language and Cognition* 21(1): 47-62.

Tavakoli, Parvaneh. 2014. Storyline complexity and syntactic complexity in writing and speaking tasks. In Heidi Byrnes and Rosa Manchón (eds.), *Task-based language learning--Insights from and for L2 writing,* 217-236. Amsterdam, The Netherlands: John Benjamins.

VanPatten, Bill. 1990. Attending to form and content in the input: An experiment in consciousness. *Studies in Second Language Acquisition* 12: 287-301.

Vasylets, Olena, Roger Gilabert, and Rosa Manchón. 2017. The effects of mode and task complexity on second language production. *Language Learning* 67(2): 394-430.

Weber, Kirsten and Peter Indefrey. 2009. Syntactic priming in German–English bilinguals during sentence comprehension. *NeuroImage* 46(4): 1164-1172.

Weisberg, Bob. 2000. Developmental relationships in the acquisition of English syntax: Writing vs. speech. *Learning and Instruction* 10(1): 37-53.

Wong, Wynne. 2001. Modality and attention to meaning and form in the input. *Studies in Second Language Acquisition* 23: 345-368.

Yook, Cheong-min. 2012. A corpus-based approach to English dative constructions and its implications for EFL textbooks. *Foreign Languages Education* 19(2): 53-79.

Zalbidea, Janire. 2017. 'One task fits all'? the roles of task complexity, modality, and working Memory capacity in L2 Performance. *The Modern Language Journal* 101(2): 335-352.

Myeongeun Son
Assistant Professor
Faculty of International Studies
Nagoya University of Commerce and Business
Sagamine 4-4 Komenokicho, Nisshin, Aichi, Japan 470-0193
E-mail: myeongeun_son@nucba.ac.jp

Received: 2021. 01. 31.
Revised: 2021. 09. 04.
Accepted: 2021. 09. 10.