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L2 Structural Generalizations Through Structural Priming*

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People often reuse the same structure as the one they heard or spoke before. This tendency is called structural priming, and this study examined L2 learners' structural generalizations to novel items through structural priming, employing a pre- and post-test design and using the double-object dative and phrasal-verb constructions as the target structures. 45 Korean learners of English participated in the experiment, assigned to one of three structural priming treatment conditions: typical structural priming (SP), implicit structural priming (ISP), and explicitly instructed structural priming (ESP). The results showed that structural priming helped Korean L2 English learners generalize L2 syntactic knowledge to new instances and improve L2 production, and that structural priming combined with explicit instruction is more effective in the phrasal-verb construction than the other structural priming conditions. The overall results of this study are discussed in terms of its theoretical, methodological, and pedagogical significance.

**[structural priming/syntactic priming/generalization/L2 grammar/production/
통사구조 점화/통사 점화/일반화/제2언어 문법/언어 산출]**

I. INTRODUCTION

The term *priming* in the psycholinguistic research refers to "the phenomenon in which prior exposure to specific language forms or meanings either facilitates or interferes with a speaker's subsequent language comprehension or production" (Trofimovich & McDonough, 2013, p. 4656). For example, people access the meaning of the word *doctor* more quickly and accurately if they have recently encountered the word *nurse* as compared

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to an unrelated word, such as *clock*. This is the example of lexical priming; in particular, it is called "semantic priming" because the words, *doctor* and *nurse*, are semantically related, and the meaning of the word *nurse* facilitates the access of the meaning of the word *doctor*.

Likewise, syntactic structures can be primed as well as words. The term *structural priming* (or *syntactic priming*) refers to a tendency of people to repeat the same structural pattern as one that they previously encountered (Bock, 1986). For instance, if a speaker uses a double-object dative, such as "the lawyer gave his client the document," the same structure (i.e., the double-object dative structure) tends to be more frequently used in a subsequent utterance like "the girl sent her dad a letter" than the alternate prepositional dative structure, "the girl sent a letter to her dad." It is because the structure of the previous utterance facilitates the use of the identical structure in the subsequent utterance.

In the psycholinguistic or cognitive psychology research, structural priming has been discussed as evidence for an underlying cognitive mechanism in language comprehension, production, and processing, as well as an experimental paradigm to investigate human language processing and learning (Pickering & Ferreira, 2008). In general, priming itself involves an implicit process that occurs with little consciousness (Trofimovich & McDonough, 2013). However, regarding structural priming two different approaches have accounted for the underlying processes it involves: explicit memory processes and implicit learning processes.

The explicit memory approach by Pickering and Branigan (1998) holds that structural repetition can occur due to the residual activation of the previous sentence (i.e., prime) that immediately precedes the target sentence in explicit memory (also called declarative memory), which involves conscious processes by remembering prior episodes and recollecting things or facts (Stadler & Frensch, 1998). In other words, roughly speaking, processing the argument structure of the previous prime sentence can lead to an increased probability that the identical structure will be selected in subsequent production of the target sentence.

However, Bock and her colleagues (Bock & Griffin, 2000; Chang, Dell, & Bock, 2006; Chang, Dell, Bock, & Griffin, 2000) argue that structural priming is a form of implicit learning in that structural priming involving syntactic processing in the assembly of sentences normally occurs outside of awareness (Bock, 1982), that structural priming helps people produce fairly complex sentences (Bock & Loebell, 1990), and structural priming is unintentional, procedural repetition (Bock & Griffin, 2000). Thus they argue that those characteristics of structural priming meet three criteria of implicit learning, which Seger (1994, 1998) identified, and structural priming involves implicit learning processes.

Employing structural priming as a research paradigm or evidence for underlying cognitive mechanisms, SLA researchers recently began to tackle several issues related to L2 learning and underlying cognitive processes (McDonough & Chaikitmongkol, 2010).

McDonough and her colleagues examined the benefits of structural priming on L2 development in collaborative and/or interactive contexts (Y. Kim & McDonough, 2008; McDonough, 2006; McDonough & Chaikitmongkol, 2010; Neumann & McDonough, 2015). J. Shin and Christianson (2012) examined the beneficial effect of structural priming involving implicit and/or explicit learning on L2 production. Given that structural priming is effective in learning of L2 grammar and L2 production, it is necessary to investigate whether structural priming can be also effective in helping learners generalize structural knowledge to novel items. Therefore, this study addresses the following research questions:

1) Can structural priming help learners generalize L2 structural knowledge to novel items?
2) Is there any difference among three types of structural priming in L2 learners' structural generalizations, i.e., typical structural priming (SP), implicit structural priming (ISP), and explicitly-instructed structural priming (ESP) conditions?
3) Are L2 learners' structural generalizations influenced by two construction types (i.e., double-object dative and phrasal-verb constructions)?

II. LITERATURE REVIEW

1. Structural Priming and L2 Learning

In the L1 structural priming literature, Pickering and Ferreira (2008) have described three potential functions of structural priming: facilitating alignment in dialogue, promoting fluency, and implicit learning of language. Structural priming can serve as one mechanism to facilitate alignment of their linguistic representation with interlocutors during dialogue (Pickering & Garrod, 2007). The second potential function that structural priming may serve is to promote fluency such as speech rate. The reuse of the previously encountered structures can reduce cognitive resources and lessen the planning time of utterance, which increase fluency (Corley & Scheepers, 2002; Smith & Wheeldon, 2001). The last function of structural priming is to facilitate language learning implicitly. Structural priming effects were retained despite intervening time and material between primes and targets (Bock & Griffin, 2000; Hartsuiker, Bernolet, Schoonbaert, Speybroeck, & Vanderelst, 2008). For instance, Bock and Griffin (2000) found that structural priming persisted over 10 intervening sentences, which suggests that there is long-term persistence and adaptation in the cognitive mechanisms of sentence generation.

Inspired by this line of research, recent cross-linguistic research has examined the

bilingual mind employing structural priming across languages, specifically addressing a question whether syntactic processing is shared or separate in the bilingual mind (Bernolet, Hartsuiker, & Pickering, 2007; Chen, Jia, Wang, Dunlap, & J. Shin, 2013; Desmet & Declercq, 2006; Hartsuiker, Pickering, & Veltkamp, 2004; J. Shin & Christianson, 2009). In addition, SLA researchers have investigated beneficial relations between the occurrence of structural priming in L2 production and learning, using a variety of structures in English such as datives (McDonough, 2006; J. Shin & Christianson, 2012), relative clauses (Trofimovich, McDonough, & Neumann, 2013), passives, phrasal-verbs (J. Shin & Christianson, 2012) and *wh*-questions (McDonough & Chaikitmongkol, 2011; McDonough & De Vleeschauwer, 2012; McDonough & Y. Kim, 2009).

As McDonough and Trofimovich (2009), in particular, suggested that structural priming is a useful paradigm in doing research on L2 processing and learning, SLA studies have increasingly employed structural priming paradigms to examine interaction activities in L2 development. For instance, McDonough (2006) and Y. Kim and McDonough (2008) investigated L2 structural priming in interactive contexts with prepositional-object datives and active and passive structures in L2 English learners, respectively, and reported that structural priming plays a beneficial role in the development of L2 grammar. In addition, McDonough and Mackey (2006, 2008) examined the beneficial effects of structural priming on L2 English question development. In both studies, they found that structural priming can improve learners' ESL question formation.

Moreover, a recent L2 structural priming study has explored the potential role of structural priming in implicit learning. J. Shin and Christianson (2012) addressed the issue of L2 learners' internal cognitive processes pertaining to implicit and explicit learning through structural priming, as well as the long-term effects of structural priming on L2 production. They categorized three types of structural priming conditions. The no-lag comparison condition was the typical structural priming condition in which participants were provided with a prime immediately followed by a target. This condition served as the baseline condition. The second type of the structural priming conditions was the long-lag implicit condition in which participants were given several intervening sentences (i.e., long lag) between a prime and a target. The last type of structural priming conditions was the explicitly instructed condition in which participants received word order notes (explicitly explaining the target grammar) after a prime and a target were provided without any lag. The results showed the improved production of target structures after the structural priming session, indicating that L2 structural priming involves not only explicit memory processes, but also implicit learning processes. Moreover, they found that implicit learning played a beneficial role in L2 production in the long run, especially in the case of the complex structure, i.e., double-object datives, compared to explicit instruction and explicit memory processes. On the other hand, the explicitly instructed learning condition was effective for

short-term training. These results can yield a suggestion that structural priming can be beneficial for L2 fluency development as a form of implicit learning and/or combined with explicit learning.

2. L2 Implicit/Explicit Learning and Complexity of Target Structures

The proliferation of SLA studies on instruction have examined the relative effectiveness of instructional treatments, comparing explicit instruction with implicit learning, and found positive results of explicit instruction (Doughty & Williams, 1998; Gass & Selinker, 2008). The previous studies mostly employed rule-based instruction as a form of explicit instruction and natural exposure as implicit learning (Norris & Ortega, 2000). Specifically, it is considered implicit learning if neither rule explanations nor directions to pay attention to particular grammatical forms are part of the treatment (DeKeyser, 1995).

However, it is still at issue whether explicit learning (or explicit instruction) is more effective than implicit learning or vice versa depending on structure types, i.e., simple and complex structures. Some SLA researchers including DeKeyser (2003) and Ellis (1993) have claimed that explicit instruction (or explicit learning) is significantly more effective than implicit learning for any structure and even for complicated structures. However, Robinson (1996) argued that explicit instruction is more effective than implicit learning when students learn simple structures involving easy rules, but it is not the case when they learn complex structures involving hard rules (e.g., pseudo-clefts of location as in the sentence *where Mary and John live is in Seoul*). In addition, others have argued that implicit learning can be more effective for complex structures in the end (Krashen, 1982, 1994; Reber, 1989).

This controversial issue was also tackled in J. Shin and Christianson's (2012) structural priming study. They exploited both grammaticality judgment tests and production tests to examine the effectiveness of explicit and implicit learning. Their findings showed no significant difference between the explicit and implicit learning conditions in the case of grammaticality judgments. In terms of production, however, the explicit learning group significantly outperformed other conditions during the treatment session in both simple and complex structures, indicating that explicit instruction is more effective in terms of leading to fast learning. However, they found that the implicit learning condition involving long-lag structural priming was beneficial for L2 production of complex double-object dative structures in the long run, compared to the other conditions. They observed that the retention rate did not drop in the purely implicit structural priming condition over a day, while that in the other conditions dramatically declined one day after the priming session.

Although the previous research illustrated that structural priming can facilitate L2 learners' access to abstract syntactic representations and enhance L2 production, these

studies cannot fully argue for the beneficial effect of structural priming on L2 learners' generalization of abstract syntactic knowledge to novel items. Research is necessary to examine whether explicit knowledge of form-meaning associations impacts learning from lexical specific to abstract syntactic knowledge and improves production, testing L2 learners' generalizability of abstract syntactic representations with novel items.

III. METHOD

1. Participants

Forty-five Korean learners of English participated in the study. They all had formal English instruction for at least six years, and the average number of years living in English-speaking countries speaking as an official language was three (range 1-8 years) according to the detailed information collected in the language background questionnaire after the experiment. The mean age was 29 (range 19-40). Participants were paid for their participation.

2. Target Structures and Materials

This study examined structural priming effects on the structural generalization to new items in the L2 grammaticality judgment and picture description production. To do so, this study used a pretest-treatment-posttest design and the same dative and phrasal-verb constructions as J. Shin and Christianson (2012) used. The target structures were double-object dative (e.g., *the clerk sold customers new laptops*) and separable phrasal-verb constructions (e.g., *the manager switched the engine off*) because both double-object datives and phrasal-verb structures are difficult for L2 learners (Celce-Murcia & Larsen-Freeman, 1999; Liao & Fukuya, 2004; McDonough, 2006). In addition, both target structures have a structural alternation as follows: *the clerk sold new laptops to customers* and *the manager switched off the engine*, respectively. This availability of two structural alternations makes the participants choose one between the target and alternate structures and produce it. After the treatment session in the post-tests it can be assessed whether the participants have learned the target structures and generalized them to new items.

In the pretests, 12 frequent verbs were selected in each target construction; the double-object dative verbs included *bring, give, loan, mail, pass*, *pay, sell, send, show, teach, throw,* and *write*, and the phrasal-verbs included *plug in, put on, put out*, *pull out, look up, shut down, switch off, take off, tie up, try on, turn down,* and *wake up*. The treatment session used a different set of 12 dative verbs such as *assign*, *award, cook, draw, feed,*

hand, make, lend, offer, *read, serve,* and *toss,* and 12 separable phrasal-verbs such as *check off, clear away, fill up, flip over, knock down, lace up, pour out, pull apart, push over, put down, take out,* and *wipe off*. In two post-tests (i.e., the grammaticality judgment and picture description production), participants were provided with six novel items for each target construction. The items in the post-tests were less frequent than those in the pretests and treatment session, including *bake, issue, knit, lease*, *paint,* and *pitch,* as dative verbs and *blow out*, *brush off, kick in, lay down, pin up,* and *tip over* as phrasal-verbs. Those verbs in the post-tests were classified as new items because the participants were not familiar with those verbs used in the double-object dative and separated phrasal-verb constructions.

3. Procedure

The participants took part in the experiment individually, seated in front of a computer in a lab. An overview of the procedure is illustrated in Figure 1. After taking the picture-description production and auditory grammaticality judgment pre-tests (see APPENDIX for samples), the participants went through the treatment session and were informed that they were going to look at pictures and listen to sentences describing the pictures at the same time and then were asked to repeat what they had previously heard when they saw the identical pictures. Also, they were told that if they would sometimes see pictures without spoken sentences, then they should describe the pictures using the word(s) presented below the pictures.

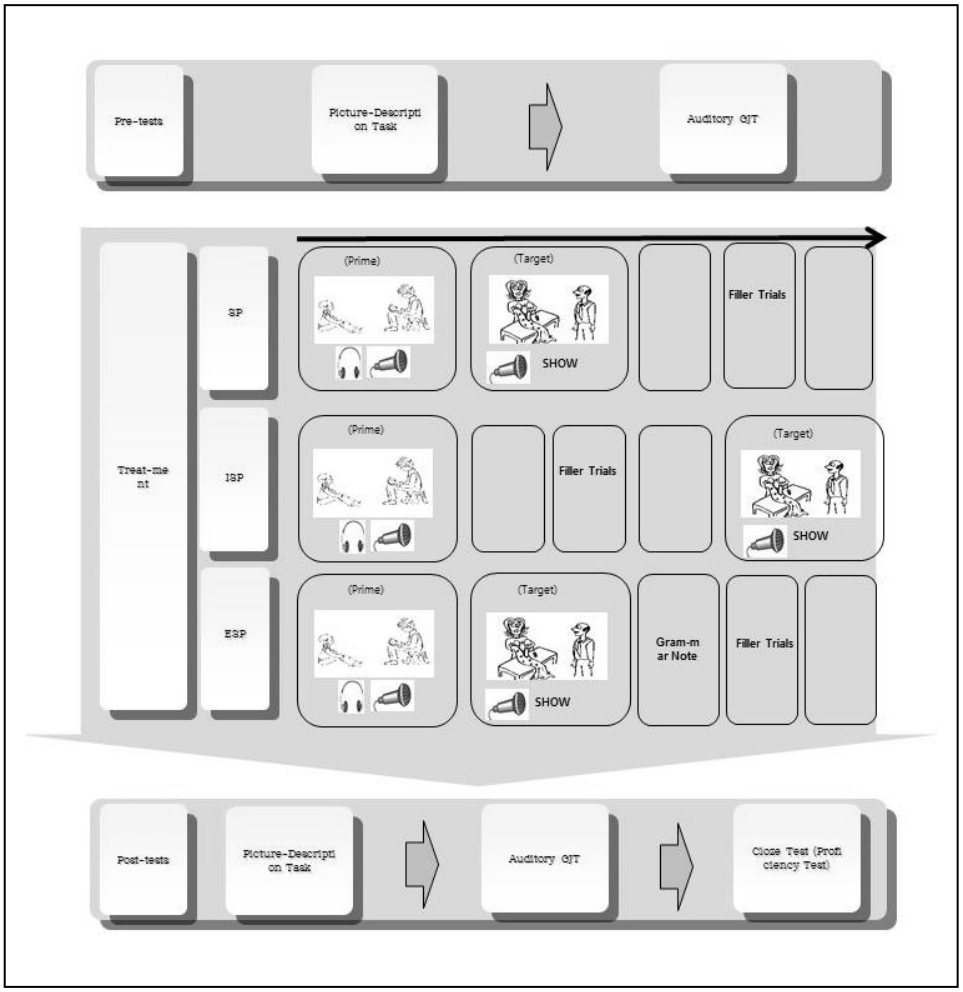


FIGURE 1 Procedure of the Experiment

During the treatment session the participants were equally and randomly assigned to one of three conditions: structural priming (SP), implicit structural priming (ISP), and explicitly-instructed structural priming (ESP) conditions. The participants in the SP condition were provided with target trials (in which they should describe the pictures using the given words) immediately after listening to the target structures and repeating them (i.e., the prime sentences). In other words, the SP condition is associated with a typical structural priming paradigm (immediate prime-target trials in consecutive order). On the contrary, the participants in the ISP condition were provided with the prime sentences way ahead of the target trials, so the prime and target trials were not presented in consecutive order. The participants in the ESP condition were provided with additional grammar notes to give explanations about the target structures right after each immediate prime-target trial. Moreover, the participants in the ESP condition only were instructed that they would sometimes encounter grammar notes after describing the picture and they should pay attention to the notes in order to use the information later when necessary. Note that the conditions were renamed as the SP, ISP, and ESP conditions, but they are the identical conditions to the "no-lag comparison," "long-lag implicit," and "explicitly reinforced" conditions in J. Shin and Christianson (2012), respectively.

In the post-tests, the participants performed another picture-describing production task and auditory grammatical judgment task similar to the pre-tests for ten minutes. Then a cloze test was administered to assess the participants' L2 proficiency. The experiment took 50-60 minutes in total.

4. Data Coding and Analyses

The pre-test and post-test items of the auditory grammaticality judgment were scored as *correct* and *incorrect*, measuring the response accuracy. Button responses were directly recorded by the computer program, i.e., the E-Prime software (Schneider, Eschman, & Zuccolotto, 2002). The verbal responses were first recorded on a digital voice recorder, and then they were transcribed and used for coding and scoring. The picture description was scored as *target* (double-object dative and separated phrasal-verb constructions), *alternate* (prepositional-object dative and unseparated phrasal-verb constructions), and *other* (other structures or incomplete sentences). Cloze tests (see APPENDIX for samples) were scored by a native speaker of English.

In order to examine whether structural priming is beneficial for L2 learners' syntactic generalizations to new items, two separate 2 (tests) x 3 (conditions) x 2 (construction types) repeated measures ANOVAs were performed on the picture description and auditory grammatical judgment data with the target structures. In particular, this study compared the pre- and post-test (research question 1), three types of structural priming

conditions (research question 2), and two construction types (research question 3).

IV. RESULTS

1. Picture Description

Table 1 reports the frequencies and proportions of the target structures during the picture description in the pre-test and post-test. Note that the items in the post-test were not used in either the pre-test or the treatment session, and they were novel items to the participants.

TABLE 1

Response Frequencies and Proportions of Picture Description in Pre-test and Post-test

	Pre-test			Post-test		
Condition	Target	Alternate	Other	Target	Alternate	Other
Dative verb						
SP	3 (1.67%)	95 (52.78%)	82 (45.56%)	11 (12.22%)	14 (15.56%)	65 (72.22%)
ISP	5 (2.78%)	121 (67.22%)	54 (30.00%)	17 (18.89%)	25 (27.78%)	53 (58.89%)
ESP	4 (2.22%)	100 (55.56%)	76 (42.22%)	23 (25.56%)	8 (8.89%)	59 (65.56%)
Phrasal verb						
SP	19 (10.56%)	133 (73.89%)	28 (15.56%)	63 (70.00%)	19 (21.11%)	8 (8.89%)
ISP	24 (13.33%)	135 (75.00%)	21 (11.67%)	60 (66.67%)	27 (30.00%)	3 (3.33%)
ESP	14 (7.78%)	137 (76.11%)	29 (16.11%)	69 (76.67%)	14 (15.56%)	7 (7.78%)

The results of repeated measures ANOVA showed that the participants in every condition group used the target structures significantly more when they were provided with new items in the post-test than in the pre-test ($F(1,42) = 54.72$, $p<.01$). That is to say, they were able to generalize their syntactic knowledge to novel items. In particular, overall they did better when they had the phrasal-verb structures compared to the double-object dative structures ($F(1,42) = 29.38$, $p<.01$), and after the treatment session they showed more improved performance in the phrasal-verb constructions than the double-object dative constructions ($F(1,42) = 9.69$, $p<.01$). However, the condition groups did not show significant differences or interaction.

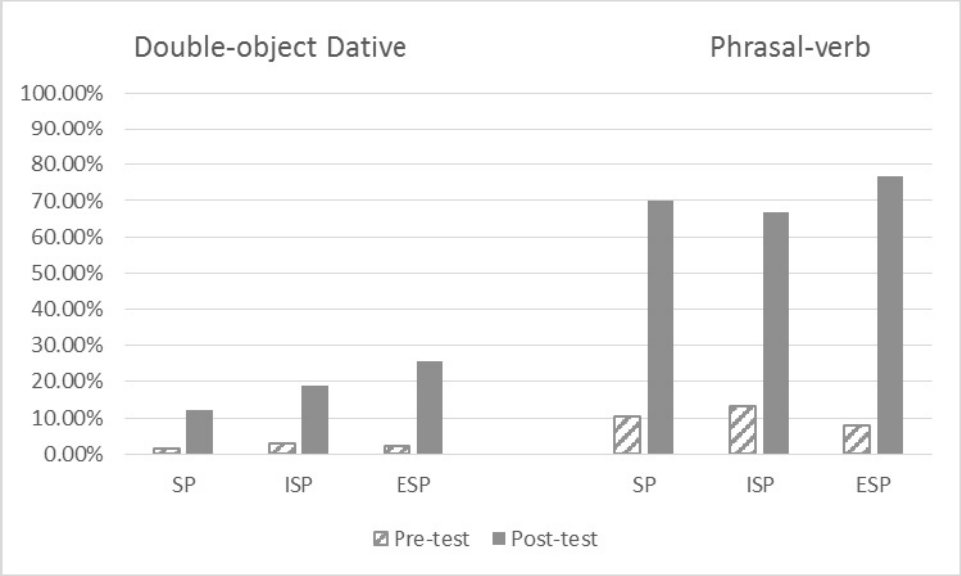


FIGURE 2 Proportions of the Target Structures in the Picture-Description Task

2. Auditory Grammaticality Judgment

In addition to the picture description production, the auditory grammaticality judgment tasks were administered in both pre- and post-tests. Table 2 illustrates the accuracy of the auditory grammaticality judgment tasks depending on the condition groups. As presented in Table 2, the improvement in accuracy was observed from the pre-test to the new items in the post-test. The results of repeated measures ANOVA showed the participants' improved judgment on grammaticality of novel items ($F(1,42) = 28.67$, $p<.01$). In particular, they did better when they had phrasal verb constructions than double-object dative constructions ($F(1,42) = 25.88$, $p<.01$), and after the treatment session they improved more in the phrasal-verb constructions than in the double-object dative constructions ($F(1,42) = 4.24$, $p<.05$). Also, as illustrated in Figure 3, an interaction effect between the condition group and construction type was found ($F(1,42) = 3.56$, $p<.05$), but the main effect of the condition group was not found.

TABLE 2
Response Accuracy in Grammaticality Judgment Tasks

Condition	Pre-test	Post-test
Dative verb		
SP	72.78%	75.56%
ISP	78.33%	82.22%
ESP	75.00%	80.00%
Phrasal verb		
SP	78.89%	88.89%
ISP	75.00%	90.00%
ESP	84.44%	97.78%

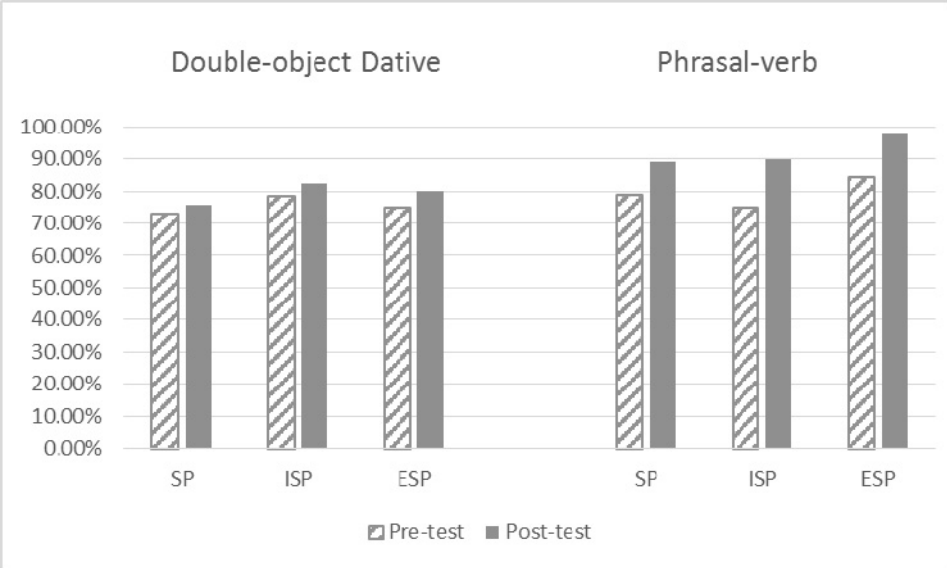


FIGURE 3 Accuracy Rates in the Auditory Grammaticality Judgment Tasks

V. DISCUSSION AND CONCLUSION

The experiment in this study examined 1) whether structural priming can help L2 learners learn L2 syntactic knowledge, generalize that knowledge to novel items, and improve L2 production, 2) whether three types of structural priming (typical structural priming, implicit structural priming, and explicitly instructed structural priming) can differ in learners' structural generalization to new items, and 3) whether the learners' generalizations can be affected by the construction types. To explore these research questions this study employed a pre- and post-test design involving both picture-description production tasks and auditory grammaticality judgment tasks.

The results of the picture-description responses showed that the participants were able to

generalize the target structures to novel items; however, no differences in three types of structural priming were found. With regard to the construction types, structural priming led to more target structures of the phrasal-verb construction than those of the double-object dative construction. Likewise, the results of the auditory grammaticality judgment showed the participants' improved judgment on grammaticality of novel items in the post-test compared to the pre-test. Similar to the picture description results, three types of structural priming did not lead to any difference in learners' structural generalizations. However, the participants' grammaticality judgment of the phrasal-verb construction was significantly better than the double-object construction in the post-test compared to the pre-test. An interaction effect between the construction type and condition group was also found, and the explicit condition showed much greater improvement in judging grammaticality of the phrasal-verb construction in the post-test (97.78%).

These results are consistent with major findings in the SLA literature that L2 learners were able to generalize their syntactic knowledge to novel items, especially with respect to learning simple structures involving easy rules (Robinson, 1997); in particular, explicit learning exerted beneficial effects in the grammaticality judgment test. This result might be due to the treatment of the explicitly instructed structural priming (ESP) condition. The participants in the ESP condition were provided with the grammar note about the target constructions. In the case of the simple construction, it is possible that the explicit learning condition might have yielded explicit knowledge that was assessed in the grammaticality judgment task, as most of the outcome measures in the SLA research allowed for some degree of monitoring (DeKeyser, 1994). However, the explicit learning condition was not outstanding in building up the implicit knowledge necessary for fluent spontaneous production, i.e., in the picture-description task.

In addition, the ability to generalize seems to be dependent on explicit syntactic knowledge, especially knowledge of form-meaning mappings (Robinson, 1995, 2003; Schmidt, 1990, 2001). If constructions are defined as form-meaning pairings (Goldberg, 2009), and awareness or noticing is required for learning form, meaning, and eventually constructions in an L2 (Ellis, 2005). In terms of noticing the target structures, the phrasal-verb constructions were easily learned in the explicit condition, compared to the double-object dative constructions, although the participants' mother tongue (i.e., Korean) has no equivalent structures for phrasal-verb constructions in Korean; instead, Korean has one-word equivalents like *extinguish* for *put out*, for example. Also, the immediate repetition of primes as well as the explicit grammar notes probably drew the participants' attention to the phrasal-verb target constructions, enhancing their performance in the SP and ESP conditions.

This seems to be in line with "focus on form" or "form-focused" instruction research, which argues for the importance of learners' attention to the target form during the

negotiation of meaning (Doughty & Williams, 1998; Spada, 1997). “Form-focused instruction” entails any pedagogical effort that is designed to draw the learners’ attention to form in language either implicitly or explicitly and to provide the language form in either spontaneous or predetermined ways, whereas “focus on form” is restricted to meaning-based communicative and pedagogical events in which attention is drawn to language (N. Kang, 2009; J. Kim, 2014). In this respect, structural priming with explicit instruction (i.e., ESP condition) can be interpreted as a kind of “form-focused instruction” to facilitate the access to the grammatical knowledge and to enhance accuracy.

One of the central questions in SLA is to account for L2 learning processes, and this study touched on the issue of implicit and explicit learning processes through structural priming among L2 learners, specifically investigating how structural priming impacts learners′ development of syntactic knowledge of target structures. The results of the study showed that structural priming facilitates L2 learners′ access to abstract syntactic information without consciousness and leads to their generalizations to novel items (i.e., ISP condition), and it may promote implicit learning of target syntactic structures (Ellis, 2002). However, this study has limitations in that this study did not explicitly check whether the target items were new to the participants. Although the study used the infrequent items that were assumed to be novel to L2 learners, some of the target items might not be novel to the participants because some participants were high-proficiency learners. Nonetheless, this study demonstrated the results that structural priming facilitates the production of target structures, and it might help L2 learners (presumably those who have not acquired form-meaning connections) recognize that the syntactic form does not represent a lexically specific construction, but a general category.

In this respect, structural priming as implicit learning can facilitate the acquisition of abstract syntactic knowledge, and it can serve as an important underpinning for L2 syntactic development even when combined with explicit knowledge as well. Yet so far no pedagogical applications through repetition with higher level cognitive processes and with communicative settings have been introduced to the L2 research to enhance automaticity, and ultimately L2 fluency (J. Song & J. Lee, 2015). Thus it is essential to develop pedagogical techniques or applications that are supported by psychological rationales for structural priming and implicit learning. In addition, further research should examine the effect of structural priming as implicit learning and/or combined with a variety of explicit instruction methods on L2 fluency.

REFERENCES

Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (2007). Shared syntactic representations

in bilinguals: Evidence for the role of word-order repetition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33*(5), 931-949.

Bock, J. K. (1982). Toward a cognitive psychology of syntax: Information processing contributions to sentence formulation. *Psychological Review, 89*(1), 1-47.

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

Bock, J. K., & Griffin, Z. M. (2000). The persistence of structural priming: Transient activation or implicit learning? *Journal of Experimental Psychology: General, 129*(2), 177-192.

Bock, J. K., & Loebell, H. (1990). Framing sentences. *Cognition, 35*(1), 1-39.

Celce-Murcia, M., & Larsen-Freeman, D. (1999). *The grammar book: An ESL/EFL teacher's course*. Ann Arbor, MI: Heinle & Heinle Publishers.

Chang, F., Dell, G. S., & Bock, J. K. (2006). Becoming syntactic. *Psychological Review, 113*(2), 234-272.

Chang, F., Dell, G. S., Bock, J. K., & Griffin, Z. M. (2000). Structural priming as implicit learning: A comparison of models of sentence production. *Journal of Psycholinguistic Research, 29*(2), 217-229.

Chen, B., Jia, Y., Wang, Z., Dunlap, S., & Shin, Jeong-Ah. (2013). Is word-order similarity necessary for cross-linguistic structural priming? *Second Language Research, 29*(4), 375-389.

Corley, M., & Scheepers, C. (2002). Syntactic priming in English sentence production: Categorical and latency evidence from an Internet-based study. *Psychonomic Bulletin and Review, 9*(1), 126-131.

DeKeyser, R. M. (1994). How implicit can adult second language learning be? *AILA Review, 11*, 83-96.

DeKeyser, R. M. (1995). Learning second language grammar rules: An experiment with a miniature linguistic system. *Studies in Second Language Acquisition, 17*(3), 379-410.

DeKeyser, R. M. (2003). Implicit and explicit learning. In C. J. Doughty & M. H. Long (Eds.), *The handbook of second language acquisition* (pp. 313-348). Malden, MA: Blackwell.

Desmet, T., & Declercq, M. (2006). Cross-lingustic priming of syntactic hierarchical configuration information. *Journal of Memory and Language, 54*(4), 610-632.

Doughty, C., & Williams, J. (1998). Pedagogical choices in focus on form. In C. Doughty & J. Williams (Eds.), *Focus on form in classroom second language acquisition*. New York: Cambridge University Press.

Ellis, N. C. (1993). Rules and instrances in foreign language learning: Interactions of explicit and implicit knowledge. *European Journal of Cognitive Psychology, 5*(3),

289-318.

Ellis, N. C. (2002). Frequency effects and language processing: Investigating formulaic use and input in future expression. *Studies in Second Language Acquisition, 24*(2), 143-188.

Ellis, N. C. (2005). At the interface: Dynamic interactions of explicit and implicit language knowledge. *Studies in Second Language Acquisition, 27*(2), 305-352.

Gass, S. M., & Selinker, L. (2008). *Second language acquisition: An introductory course.* (3rd ed.). New York: Routledge.

Goldberg, A. E. (2009). The nature of generalization in language. *Cognitive Linguistics, 20*(1), 93-127.

Hartsuiker, R. J., Bernolet, S., Schoonbaert, S., Speybroeck, S., & Vanderelst, D. (2008). Syntactic priming persists while the lexical boost decays: Evidence from written and spoken dialogue. *Journal of Memory and Language, 58*(2), 214-238.

Hartsuiker, R. J., Pickering, M. J., & Veltkamp, E. (2004). Is syntax separate or shared between languages?: Cross-linguistic syntactic priming in Spanish-English bilinguals. *Psychological Science, 15*(6), 409-414.

Kang, Nayeon. (2009). Effects of form-focused instructions on the learning of English verb complementation by Korean EFL learners. *English Teaching, 64*(1), 3-25.

Kim, Jeong-eun. (2014). Timing of form-focused instruction and development of implicit vs. explicit knowledge. *English Teaching, 69*(2). 123-147.

Kim, Youjin, & McDonough, K. (2008). Learners' production of passives during syntactic priming activities. *Applied Linguistics, 29*(1), 149-154.

Krashen, S. (1982). *Principles and practice in second language acquisition*. Oxford: Pergamon.

Krashen, S. (1994). The input hypothesis and its rivals. In N. C. Ellis (Ed.), *Implicit and explicit learning of languages* (pp. 45-78). San Diego, CA: Academic Press.

Liao, Y., & Fukuya, Y. J. (2004). Avoidance of phrasal verbs: The case of Chinese learners of English. *Language Learning, 54*(2), 193-226.

McDonough, K. (2006). Interaction and syntactic priming: English L2 speakers' production of dative constructions. *Studies in Second Language Acquisition, 28*(2), 179-207.

McDonough, K., & Chaikitmongkol, W. (2010). Collaborative syntactic priming activities and EFL learners' production of wh-questions. *Canadian Modern Language Review, 66*(6), 817-841.

McDonough, K., & De Vleeschauwer, J. (2012). Prompt-Type frequency, auditory pattern discrimination, and EFL learners' production of wh questions. *Studies in Second Language Acquisition, 34*(3), 355-377.

McDonough, K., & Kim, Youjin. (2009). Syntactic priming, type frequency, and EFL learners' production of wh-questions. *The Modern Language Journal, 93*(3), 386-

398.

McDonough, K., & Mackey, A. (2006). Responses to recasts: Repetitions, primed production, and linguistic development. *Language Learning*, *56*(4), 693-720.

McDonough, K., & Mackey, A. (2008). Syntactic priming and ESL question development. *Studies in Second Language Acquisition, 30*(1), 31-47.

McDonough, K., & Trofimovich, P. (2009). *Using priming methods in second language research*. New York: Routledge.

Neumann, H., & McDonough, K. (2015). Exploring student interaction during collaborative prewriting discussions and its relationship to L2 writing. *Journal of Second Language Writing, 24*(1), 84-104.

Norris, J., & Ortega, L. (2000). Effectiveness of L2 instruction: A research synthesis and quantitative meta-analysis. *Language Learning, 50*(3), 417-528.

Pickering, M. J., & Branigan, H. P. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language, 39*(4), 733-651.

Pickering, M. J., & Ferreira, V. S. (2008). Structural priming: A critical review. *Psychological Bulletin, 134*(3), 427-459.

Pickering, M. J., & Garrod, S. (2007). Do people use language production to make predictions during comprehension? *Trends in Cognitive Sciences, 11*(3), 105-110.

Reber, A. S. (1989). Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General, 118*(3), 219-235.

Robinson, P. (1995). Attention, memory, and the "noticing" hypothesis. *Language Learning, 45*(2), 283-331.

Robinson, P. (1996). Learning simple and complex second language rules under implicit, incidental, rule-search, and instructed conditions. *Studies in Second Language Acquisition, 18*(1), 27-67.

Robinson, P. (1997). Generalizability and automaticity of second language learning under implicit, incidental, enhanced, and instructed conditions. *Studies in Second Language Acquisition, 19*(2), 223-247.

Robinson, P. (2003). Attention and memory during SLA. In C. Doughty & M. Long (Eds.), *Handbook of second language acquisition* (pp. 631-678). Malden, MA: Blackwell.

Schmidt, R. (1990). The role of consciousness in second language learning. *Applied Linguistics, 11*(2), 206-226.

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 3-32). New York: Cambridge University Press.

Schneider, W., Eschman, A., & Zuccolotto, A. (2002). *E-Prime Software*. Pittsburgh, PA: Psychological Software Tools.

Seger, C. A. (1994). Implicit learning. *Psychological Bulletin, 115*(2), 163-196.

Seger, C. A. (1998). Multiple forms of learning in implicit learning. In M. A. Stadler & P. A. Frensch (Eds.), *Handbook of implicit learning*. New York: Sage.

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

Shin, Jeong-Ah, & Christianson, K. (2012). Structural priming and second language learning. *Language Learning, 62*(3), 931-964.

Smith, M., & Wheeldon, L. (2001). Syntactic priming in spoken sentence production: An online study. *Cognition, 78*(2), 123-164.

Song, Jin Young, & Lee, Jin Hwa. (2015). The effects of planning time and the number of elements on EFL learners' speaking performance. *Modern English Education, 16*(1), 59-80.

Spada, N. (1997). Form-focussed instruction and second language acquisition: A review of classroom and laboratory research. *Language Teaching, 30*(1), 73-87.

Stadler, M. A., & Frensch, P. A. (Eds.). (1998). *Handbook of implicit learning*. Thousand Oaks, CA: Sage.

Trofimovich, P., & McDonough, K. (2013). Priming Research. In C. A. Chapelle (Ed.), *The Encyclopedia of Applied Linguistics* (Vol. VIII, pp. 4655-4662). Oxford, UK: Willey-Blackwell.

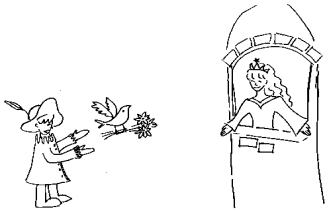
Trofimovich, P., McDonough, K., & Neumann, H. (2013). Using collaborative tasks to elicit auditory and structural priming. *TESOL Quarterly, 47*(1), 177-186.

APPENDIX

Samples of the Cloze and Picture Description Tests

Please fill in the blanks in the following passage. Each blank must have one and only one word.

Joe came home from work on Friday. It was payday, but he wasn't _____ excited about it. He knew that _____ he sat down and paid his _____ and set aside money for groceries, _____ for the car and a small _____ in his savings account, there wasn't _____ much left over for a good _____.



send

wake
up

Examples in: English
Applicable Languages: English
Applicable Levels: Tertiary

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