The Effects of Interaction on Syntactic Priming: A Psycholinguistic Study Using Scripted Interaction Tasks

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Abstract

The aim of the present study is to reveal some of the cognitive processes of spoken language production of Japanese EFL learners by examining whether syntactic priming found in sentence completion tasks (i.e., monologues) can also be found in scripted interaction tasks (i.e., dialogues). There were 54 Japanese EFL learners and 17 L1 English speakers involved in the study, with the data of the latter being used as a baseline. The participants sat face to face with a partner (i.e., the experimenter) and performed a picture matching task where they described pictures alternatively with their partner and judged if the pictures on both sides were the same or different. The results show that, overall, L1 English speakers used the same structures as those produced by their partner significantly more than Japanese EFL learners did, unlike the results of previous studies using sentence completion tasks in the case of prepositional object (PO) and double object (DO) structures. This might be because the interaction tasks in the present study required the exchange of information (i.e., meaning) and the construction of syntactic structures at the same time. Such tasks might have put a higher cognitive load on Japanese EFL learners, who lack automaticity in sentence processing. The paper goes on to discuss the possibility of using syntactic priming to promote implicit learning of syntactic rules for language production.

1. Introduction

Japanese EFL learners (JEFLs, hereafter) are said to be weak in language production, especially in the case of speaking, which is essential for smooth interpersonal communications. This is partly because effective pedagogical methods have not been firmly established in Japan, and JEFLs have limited opportunities to speak English even inside the classroom.

According to Levelt’s spoken language processing model (1993; Figure 1), we first think about what we are going to say in the conceptualizer. Then, in the formulator, grammatical encoding accesses lemma information stored in one’s mental lexicon and builds syntax, while phonological encoding accesses lexeme information to retrieve a phonetic or articulatory plan for each lemma. Finally, the articulator retrieves successive chunks of internal speech and unfolds
them for execution (Levelt, 1989, 1999).

![Diagram](image)

*Figure 1.* Schematic representation of the processing components involved in spoken language use. Reprinted from Levelt (1993, p.2).

Although this speech process is automatic and simultaneously processed in the case of L1 speakers, it is a demanding one for L2 learners and trade-off effects are often observed between fluency, complexity, and accuracy of the speech (Morishita, 2010).

Pickering and Branigan (1998) proposed a partial model of the representation of syntactic information in the lemma stratum of one’s mental lexicon, as shown in Figure 2.

![Diagram](image)

*Figure 2.* A partial model of the representation of syntactic information associated with verbs in the production lexicon. The labels T, A, and N refer to tense, aspect, and number, respectively. Reprinted from Pickering & Branigan (1998, p.635).
There are said to be three types of syntactic information: (a) category information (e.g., noun, verb, adjective, etc.); (b) featural information (e.g., tense, aspect, number, etc.); and (c) combinatorial information, which specifies the way in which a word can combine with other linguistic units to form possible expressions of the language (i.e., syntactic structure) (Pickering & Branigan, 1998).

Syntactic priming refers to a general tendency for language users to produce a syntactic structure following previous experience with that structure. It might show their sensitivity to syntax and/or the strategy of saving themselves the trouble of creating a sentence from scratch. Pickering and Branigan (1998) hypothesized that syntactic priming can be explained in terms of activation at the lemma stratum in Figure 2 and conducted a psycholinguistic experiment using sentence completion tasks to elicit written production data of L1 English speakers as follows:

(1)a. The racing driver showed the torn overall ...
(1)b. The racing driver showed the helpful mechanic ...
(1)c. The racing driver gave the torn overall ...
(1)d. The racing driver gave the helpful mechanic ...

(2)The patient showed ...

The first fragment (1)a-d was the prime and the second fragment (2) was the target. Each prime and target fragment contained a subject followed by a verb that could appear with the prepositional object (PO) or the double object (DO) structure. The prime fragment also contained either a direct or an indirect object. Each subject noun phrase consisted of a definite article and a singular noun. Each prime fragment induced either a PO (e.g., [1]a and [1]c) or a DO (e.g., [1]b and [1]d) sentence. The verbs in the prime fragments were the same as the verbs in the target fragments in (1)a and (1)b, and they were different in (1)c and (1)d.

It was found that the participants tended to use the same structure for the target fragment as the prime fragment whether the target fragment had the same verb as well as the same internal structure of the verb (e.g., tense, aspect, and number) as the prime fragment or not. There are several psycholinguistic studies on the syntactic representation in the mental lexicon of JEFLLs using written and/or spoken sentence completion tasks (e.g., Morishita, 2011; Morishita, Satoi, & Yokokawa, 2010), and syntactic priming has been observed in the case of JEFLLs as with L1 English speakers.

Branigan, Pickering, and Cleland (2000) introduced scripted interaction tasks to explore the occurrence of syntactic priming based on whether speakers aligned in their use of syntactic structures during conversation. In the experiment, the participant and the scripted interlocutor (i.e., the confederate of the experimenter) took turns describing a set of pictures to each other, as shown in Figure 3.

The participant had pictures with a verb written under each one, and the confederate had a script with prime sentences. They listened to their partner’s descriptions and searched for matching pictures from a group of related pictures displayed on the table in front of them. The results show that strong syntactic priming was observed, providing evidence for a shared level of representation in comprehension and production in the context of interaction (Branigan et al., 2000). McDonough (2006) examined the occurrence of syntactic priming during interaction between L2 English learners based on Branigan et al. (2000). She found syntactic priming effects only in the case of PO structures and concluded that it was because the participants might not have had enough knowledge of DO structures. Recently, the procedure used for the scripted interaction task has been modified so that the participant and the scripted interlocutor describe pictures that are presented on individual computer screens (e.g., Schoonbaert, Hartsuiker, & Pickering, 2007), which was also the way the present study was carried out.

Considering the fact that syntactic priming is usually observed in spontaneous communication, it should also be examined in settings where interaction is involved. Therefore, scripted interaction tasks were conducted in the present study based on previous L2 studies (e.g., McDonough, 2006; Schoonbaert et al., 2007), in order to reveal some of the cognitive processes of spoken language production of JEFLLs and eventually obtain pedagogical insights.

2. Method

2.1 Participants

The participants consisted of 54 JEFLLs and 17 L1 English speakers, with the data of the latter being used as a baseline. JEFLLs were divided into three levels of English proficiency - i.e., upper, medium, and lower level learners - according to the scores of Versant™ English Test
(Pearson Kirihara K.K.). The numbers, score ranges (20 - 80), mean scores and SDs, as well as the levels of Common European Framework of Reference for Languages (Council of Europe, 2001) of each proficiency group are shown in Table 1:

<table>
<thead>
<tr>
<th>Levels</th>
<th>n</th>
<th>Score Ranges</th>
<th>M (SD)</th>
<th>CEF Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>21</td>
<td>47-70</td>
<td>56.4 (6.2)</td>
<td>B1 or above</td>
</tr>
<tr>
<td>Medium</td>
<td>15</td>
<td>37-44</td>
<td>40.4 (2.3)</td>
<td>A2</td>
</tr>
<tr>
<td>Lower</td>
<td>18</td>
<td>20-35</td>
<td>26.0 (4.0)</td>
<td>A1</td>
</tr>
</tbody>
</table>

2.2 Test Items

A total of 96 pictures, which could be described by eight dative verbs (i.e., give, hand, lend, sell, show, teach, tell, and write), eight transitive verbs (i.e., open, push, watch, clean, find, drink, hit, and read), as well as eight intransitive (i.e., filler) verbs (run, talk, swim, play, sing, cry, walk, and sleep), were picked up from a website (The Japan Foundation Japanese-Language Institute, Urawa, 2011). Then, 64 experimental sentences (i.e., sentences with dative and transitive verbs) and 32 filler sentences were created based on the pictures (see Appendix).

Each verb had four different pictures. Based on the results of the preliminary survey, two pictures out of four, which were considered to be easier to understand (i.e., pictures with clear differences in age and/or sex of each person), were used as a target for the participants’ description. The remaining two pictures were used as a prime for the participants’ judgment of the differences. The verbs were given under each picture in order to make sure the participants used the target verbs, not other verbs with similar meanings, and to prevent them from creating completely different structures (e.g., There are a boy and a girl). The experimenter had a prime sentence under each picture for their description, instead of just a verb, as in the left picture in Figure 4.

Each set consisted of a prime sentence and a target picture which could be described with the same structure as the prime sentence. The following are examples of PO / DO structures:

(3)a. The mother gives the money to the child.
(3)b. The mother gives the child the money.
(3)c. The mother gives the flower to the child.
(3)d. The mother gives the child the flower.

(4) The boy gives the present to the girl.

The first sentence (3)a-d was the prime sentence and the second sentence (4) was the expected description of the target picture. Each prime sentence and target picture contained a verb.
that could appear with the PO or the DO structure. Each prime sentence was either a PO (e.g., [3]a and [3]c) or a DO (e.g., [3]b and [3]d) structure. The verbs in the prime sentences were the same as the verbs in the target pictures, as in the above example, in 16 sets and different in another 16 sets. In addition, (3)a and (3)b induced the response of ‘yes’ and (3)c and (3)d induced the response of ‘no,’ which makes the picture matching task (i.e., the cover task) more plausible, even though the participant and the experimenter had the same pictures in all cases.

Figure 4 is an example of a prime sentence and a target picture:

![Figure 4. Example of a prime sentence and a target picture.](image)

The experimental items were placed into four lists. Each list consisted of four items from each condition with one version of each item appearing in each list. Each test was half-randomized to avoid the order effect, and a total of four tests consisting of 96 pictures were finally created on Microsoft PowerPoint 2010.

2.3 Procedure

The participants sat face to face with a partner (i.e., the experimenter) and performed an interaction task using PC screens on both sides. They were told that the purpose of the experiment was to determine how fast and accurately people can perform a picture matching task where they describe pictures alternatively with their partner and judge if the pictures are the same or different. However, the picture matching task was the cover task designed to minimize the likelihood that the participant would pay attention to the linguistic features of picture description. In all cases, the participant and the experimenter were actually looking at the same pictures, and the participant always had pictures with a verb written under each one, while the experimenter’s pictures had a script with prime sentences used to elicit the participant’s description of the subsequent picture. After four practice trials (two judgment and description items each), the main trials started.

Each trial had the following structure:
1. The experimenter reads aloud a prime sentence (e.g., The mother gives the money to the child) written under the picture. The participant sees the same picture as that of the experimenter, with a verb (e.g., ‘GIVE’) under the picture instead of the prime sentence.
2. The participant says ‘yes’ when he / she thinks the partner’s description (i.e., prime sentence) matches his / her picture and says ‘no’ when he / she thinks the description does not match his / her picture. After the response (i.e., ‘yes’ or ‘no’) of the participant, both sides press the Space key and go to the next slide.
3. The participant describes the picture on the screen so that his / her partner can judge whether or not his / her picture is the same or different.
4. The experimenter says ‘yes’ or ‘no’ randomly, and at the response of the experimenter, both sides press the Space key and go to the next slide.

The procedure of the experiment is illustrated below.

![Procedure of the experiment](image)

**Figure 5.** Procedure of the experiment.

The participants’ responses were IC recorded, transcribed, and scored as priming, alternate, or other responses. The experiment was self-paced and lasted approximately 30 minutes, on average, including a post-experiment questionnaire.

3. Results and Discussion

The responses (dative [PO / DO] and transitive [active / passive] target descriptions, as well as others) were classified as priming (i.e., target descriptions using the same structure as the prime sentence), alternate (i.e., PO [or active] target descriptions for DO [or passive] prime sentences and vice versa), or other (all other target descriptions) groups. Each rate was then analyzed in a three-way analysis of variance (ANOVA) with proficiency levels as a between-participants factor, sentence structures (PO / DO and active / passive prime sentences) and the difference in verbs between the prime sentence and the target picture as within-participants factors (significant level
= .05). Tukey’s HSD post hoc test was used for multiple comparisons (significant level = .05).

3.1 Mean Proportions of Responses of PO / DO Prime Sentences Based on Proficiency Levels and the Difference in Verbs

Table 2 shows the mean proportions of responses and SDs of PO / DO prime sentences based on proficiency levels and the difference in verbs.

Table 2
Mean Proportions of Responses (%) and SDs of PO / DO Prime Sentences Based on Proficiency Levels and the Difference in Verbs

<table>
<thead>
<tr>
<th></th>
<th>Priming</th>
<th>Alternate</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Same</td>
<td>Different</td>
<td>Same</td>
</tr>
<tr>
<td>PO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>77.9 (0.25)</td>
<td>41.2 (0.23)</td>
<td>14.7 (0.22)</td>
</tr>
<tr>
<td>Upper</td>
<td>78.6 (0.28)</td>
<td>72.6 (0.28)</td>
<td>9.5 (0.22)</td>
</tr>
<tr>
<td>Medium</td>
<td>78.3 (0.25)</td>
<td>81.7 (0.20)</td>
<td>3.3 (0.09)</td>
</tr>
<tr>
<td>Lower</td>
<td>54.2 (0.27)</td>
<td>48.6 (0.22)</td>
<td>2.8 (0.08)</td>
</tr>
<tr>
<td>DO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Same</td>
<td>Different</td>
<td>Same</td>
</tr>
<tr>
<td>L1</td>
<td>66.2 (0.35)</td>
<td>55.9 (0.29)</td>
<td>17.6 (0.23)</td>
</tr>
<tr>
<td>Upper</td>
<td>19.0 (0.28)</td>
<td>13.1 (0.22)</td>
<td>69.0 (0.28)</td>
</tr>
<tr>
<td>Medium</td>
<td>8.3 (0.12)</td>
<td>5.0 (0.10)</td>
<td>71.7 (0.30)</td>
</tr>
<tr>
<td>Lower</td>
<td>4.2 (0.10)</td>
<td>6.9 (0.12)</td>
<td>50.0 (0.23)</td>
</tr>
</tbody>
</table>

In the case of priming, the ANOVA obtained significant main effects for proficiency levels, $F(3, 67) = 18.62, p < .001, \eta^2 = .45$, for sentence structures, $F(1, 67) = 133.46, p < .001, \eta^2 = .67$, and for the difference in verbs, $F(1, 67) = 12.52, p < .001, \eta^2 = .16$. Two-factor interactions of proficiency levels and sentences structures, $F(3, 67) = 17.22, p < .001, \eta^2 = .44$, and of proficiency levels and the difference in verbs, $F(3, 67) = 5.94, p < .01, \eta^2 = .21$, were also significant. Three-factor interaction was also significant, $F(3, 67) = 3.35, p < .05, \eta^2 = .13$. The result of multiple comparisons for proficiency levels showed significant differences between all
pairs except upper and medium level learners. The result of multiple comparisons for the interaction of proficiency levels and sentence structures showed significant differences between PO and DO prime sentences for all proficiency groups except L1 English speakers, between PO prime sentences of L1 English speakers and medium level learners, upper level learners and lower level learners, and medium level learners and lower level learners, as well as between DO prime sentences of L1 English speakers and other proficiency groups. The result of multiple comparisons for the interaction of proficiency levels and the difference in verbs also showed significant differences between the same and different verbs of L1 English speakers, between the same verbs of all pairs except upper and medium level learners, as well as between different verbs of lower level learners and other proficiency groups.

In the case of alternate, the ANOVA obtained significant main effects for proficiency levels, $F(3, 67) = 10.90, p < .001$, $\eta_p^2 = .33$, for sentence structures, $F(1, 67) = 104.03, p < .001$, $\eta_p = .61$, and for the difference in verbs, $F(1, 67) = 4.57, p < .05$, $\eta_p = .06$. Two-factor interactions of proficiency levels and sentences structures, $F(3, 67) = 17.79, p < .001$, $\eta_p = .44$, and of sentence structures and the difference in verbs, $F(1, 67) = 5.22, p < .05$, $\eta_p = .07$, were also significant. Three-factor interaction was also significant, $F(3, 67) = 3.66, p < .05$, $\eta_p = .14$. The result of multiple comparisons for proficiency levels showed significant differences between all pairs except L1 English speakers and lower level learners as well as upper and medium level learners. The result of multiple comparisons for the interaction of proficiency levels and sentence structures showed significant differences between PO and DO prime sentences of all proficiency groups except L1 English speakers, between PO prime sentences of L1 English speakers and medium level learners, and L1 English speakers and lower level learners, as well as between DO prime sentences of L1 English speakers and other proficiency groups. The result of multiple comparisons for the interaction of proficiency levels and the difference in verbs showed significant differences between the same and different verbs of L1 English speakers, between the same verbs of L1 English speakers and upper level learners, L1 English speakers and medium level learners, and upper level learners and lower level learners, as well as between different verbs of upper level learners and lower level learners, and medium level learners and lower level learners. The result of multiple comparisons for the interaction of sentence structures and the difference in verbs also showed significant differences between PO and DO prime sentences of the same verbs, and of different verbs, as well as the difference in verbs of PO prime sentences.

In the case of other, the ANOVA obtained significant main effects for proficiency levels, $F(3, 67) = 15.35, \eta_p^2 = .41, p < .001$, and for the difference in verbs, $F(1, 67) = 5.23, p < .05, \eta_p = .07$. Two-factor interaction of proficiency levels and the difference in verbs, $F(3, 67) = 4.36, p < .01, \eta_p = .16$ was also significant. Three-factor interaction was not significant. The result of multiple comparisons for proficiency levels showed significant differences between lower level learners and other proficiency groups. The result of multiple comparisons for the interaction of proficiency levels and the difference in verbs also showed significant differences between the
same and different verbs of L1 English speakers and of upper level learners, between the same verbs of lower level learners and other proficiency groups, as well as between different verbs of lower level learners and other proficiency groups.

L1 English speakers used the same structures as those produced by their partner significantly more than JEFLLs did, unlike the results of previous studies using sentence completion tasks (e.g., Morishita, 2011). This might be because the interaction tasks in the present study required the exchange of information (i.e., meaning) and the construction of syntactic structures at the same time. Such tasks might have put a higher cognitive load on JEFLLs, who lack automaticity in sentence processing, and thus resulted in a reduction in their priming rates. The fact that prime sentences were given in spoken forms rather than written forms - unlike in previous EFL studies - might have also affected the results.

Furthermore, L1 English speakers did not show a significant difference between PO and DO prime sentences both in the case of priming and alternate rates, while JEFLLs, regardless of proficiency levels, had significantly higher priming rates for PO prime sentences than DO prime sentences and significantly higher alternate rates for DO prime sentences than PO prime sentences. The results of priming rates of JEFLLs, combined with those of alternate rates, show that, as a whole, they produced much more PO structures than DO structures. This is inconsistent with the British component of the International Corpus of English (ICE-GB), which shows that PO sentences are numerically more common in written English than spoken English (Gries, 2005). Moreover, although both priming and alternate rates of L1 English speakers and those of lower level learners had no significant difference in the case of PO prime sentences, it does not necessarily mean that they have similar syntactic representations. In fact, priming rates of L1 English speakers showed no significant difference between PO and DO prime sentences, while those of DO prime sentences of lower level learners were way too low, as was also the case with upper and medium level learners. This might be because the learners’ exposure to the target language (i.e., English) per se is very limited, leading to unbalanced input (and corresponding output) of sentence structures.

In addition, L1 English speakers had significantly higher priming rates for the same verbs than different verbs and significantly higher alternate and other rates for different verbs than the same verbs. In contrast, JEFLLs showed no significant difference between the same and different verbs in all cases except other rates of upper level learners. Although the results in cases where L1 English speakers tended to be affected by the verbs are consistent with previous L1 and EFL studies using sentence completion tasks (e.g., Morishita, 2011; Pickering & Branigan, 1998), this was not the case with JEFLLs in the present study. This might be partly because JEFLLs concentrated too much on describing the pictures with the verb given under each of them to implicitly or explicitly pay attention to the difference between the verbs of the prime sentences - which were not written down - and the target pictures. In other words, JEFLLs mainly focused on the construction of syntactic structure (i.e., form), which was not automatized in their case, rather
than on meaning, even in the case of interaction.

L1 English speakers' tendency to use the same structure as the prime sentence when the verb was also the same as the prime sentence might be evidence of the alignment theory, where interlocutors reach a mutual understanding in a situation by aligning their representations at all linguistic levels (Pickering & Garrod, 2004).

3.2 Mean Proportions of Responses of Active / Passive Prime Sentences Based on Proficiency Levels and the Difference in Verbs

Table 3 shows the mean proportions of responses and SDs of active / passive prime sentences based on proficiency levels and the difference in verbs.

<table>
<thead>
<tr>
<th>Active</th>
<th>Priming</th>
<th>Alternate</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Same</td>
<td>Different</td>
<td>Same</td>
</tr>
<tr>
<td>L1</td>
<td>92.6 (0.12)</td>
<td>97.1 (0.08)</td>
<td>5.9 (0.11)</td>
</tr>
<tr>
<td>Upper</td>
<td>91.7 (0.12)</td>
<td>94.0 (0.13)</td>
<td>3.6 (0.09)</td>
</tr>
<tr>
<td>Medium</td>
<td>93.3 (0.18)</td>
<td>98.3 (0.06)</td>
<td>3.3 (0.09)</td>
</tr>
<tr>
<td>Lower</td>
<td>90.3 (0.15)</td>
<td>91.7 (0.12)</td>
<td>0.0 (0.00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passive</th>
<th>Priming</th>
<th>Alternate</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Same</td>
<td>Different</td>
<td>Same</td>
</tr>
<tr>
<td>L1</td>
<td>38.2 (0.34)</td>
<td>5.9 (0.19)</td>
<td>61.8 (0.34)</td>
</tr>
<tr>
<td>Upper</td>
<td>25.0 (0.27)</td>
<td>7.1 (0.18)</td>
<td>75.0 (0.27)</td>
</tr>
<tr>
<td>Medium</td>
<td>23.3 (0.29)</td>
<td>3.3 (0.09)</td>
<td>75.0 (0.30)</td>
</tr>
<tr>
<td>Lower</td>
<td>6.9 (0.19)</td>
<td>0.0 (0.00)</td>
<td>76.4 (0.30)</td>
</tr>
</tbody>
</table>

In the case of priming, the ANOVA obtained significant main effects for proficiency levels, $F(3, 67) = 3.58, p < .05, \eta^2 = .14$, for sentence structures, $F(1, 67) = 1096.64, p < .001, \eta^2 = .94$, and for the difference in verbs, $F(1, 67) = 17.86, p < .001, \eta^2 = .21$. Two-factor interaction of
sentence structures and the difference in verbs was also significant, \( F(1, 67) = 45.83, p < .001, \eta^2 = .41 \). Three-factor interaction was also significant, \( F(3, 67) = 3.11, p < .05, \eta^2 = .12 \). The result of multiple comparisons for proficiency levels showed a significant difference between L1 English speakers and lower level learners. The result of multiple comparisons for the interaction of sentence structures and the difference in verbs showed the significant differences between active and passive prime sentences of the same verbs, active and passive prime sentences of different verbs, and the difference in verbs of passive prime sentences.

In the case of alternate, the ANOVA obtained significant main effects for sentence structures, \( F(1, 67) = 83.29, p < .001, \eta^2 = .93 \), and for the difference in verbs, \( F(1, 67) = 16.06, p < .001, \eta^2 = .19 \). Two-factor interaction of sentence structures and the difference in verbs was also significant, \( F(1, 67) = 36.18, p < .001, \eta^2 = .35 \). Three-factor interaction was not significant. The result of multiple comparisons for the interaction of sentence structures and the difference in verbs showed the significant differences between active and passive prime sentences of the same verbs, active and passive prime sentences of different verbs, and the difference in verbs of passive prime sentences.

In the case of other, the ANOVA obtained a significant main effect for proficiency levels, \( F(3, 67) = 5.67, p < .01, \eta^2 = .20 \). Two-factor interaction of proficiency levels and sentence structures was also significant, \( F(3, 67) = 2.98, p < .05, \eta^2 = .12 \). Three-factor interaction was not significant. The result of multiple comparisons for proficiency levels showed a significant difference between lower level learners and other proficiency groups. The result of multiple comparisons for the interaction of proficiency levels and sentence structures showed the significant differences between active and passive prime sentences of upper level learners, and passive prime sentences of upper and lower level learners.

Priming rates were more than 90% in the case of active prime sentences in all proficiency groups. It was also found, although there was no significant difference, that the higher the proficiency levels were, the more the participants were primed in the case of passive prime sentences. Considering that even priming rates of L1 English speakers were quite unbalanced between active / passive prime sentences, there might be specific conditions where passive sentences can be used. In this sense, each verb should be further examined qualitatively according to grammar rules (e.g., regular vs. irregular verbs), etc.

In addition, overall, priming rates of passive prime sentences were significantly higher when the verbs were the same between prime sentences and target pictures, and vice versa in the case of alternate rates. Therefore, although overall priming rates were much lower in the case of passive prime sentences, the verb in the prime sentence tended to activate the production of the same structure as the prime sentence.

In contrast to the results of the present study, syntactic priming was observed both in the case of active and passive prime sentences in the picture description tasks in Bock (1986). She adds, however, that the participants were rarely primed by passive prime sentences which included
human agents. All active / passive prime sentences except one (i.e., The car hits the man.) included animate agents in the present study (see Appendix), and therefore, the results cannot be directly compared between these two studies.

4. Concluding Remarks and Further Research

The results of the present study are basically consistent with Branigan et al. (2000), who argue that there is a shared level of representation in comprehension and production in the context of interaction. However, syntactic priming was not found in DO prime sentences in the case of JEFLLs and in passive prime sentences in the case of both JEFLLs and L1 English speakers. This means that syntactic priming tended to depend on the types of sentence structures, even in the case of L1 English speakers. However, it is not clear whether these results are due to differences in the task types (i.e., sentence completions vs. picture descriptions) or differences in the communicative situations (i.e., monologues vs. dialogues). Since there are not enough previous studies to compare the results with, more studies should be done in this area.

The fact that JEFLLs had significantly higher priming rates in the case of PO prime sentences than DO prime sentences can be attributed to the limited exposure to the target language (i.e., English) resulting in the unbalanced input and output of such sentence structures. This is also consistent with McDonough (2006), who argues that L2 learners might rely on item-based learning and their DO sentence production would be limited to specific verbs. This is a point which should be also examined in the present study. Another possible explanation is that since infrequent structures tend to display stronger priming effects than more frequent structures (Ferreira & Bock, 2006), PO sentences were produced more than DO sentences, as in the previous EFL studies (e.g., Morishita, 2011). However, since this was not true of active / passive sentences, where infrequent structures (i.e., passive sentences) were primed less than frequent structures (i.e., active sentences), it can be said that such tendency also depends on the types of sentence structures.

Verbs seem to have played an important role in the present study and need further analysis. For instance, some transitive verbs could also be used as intransitive verbs and this might have affected the results. Since passive sentences are generally less affected by syntactic priming, it might be a good idea to carefully select the transitive verbs which frequently appear in passive sentences based on corpus data in follow-up studies.

Even though a majority of the participants felt time pressure, according to the questionnaire conducted at the end of the experiment, the interaction tasks in the present study were tightly controlled and still not really interactive compared to normal conversations. In addition, since the tasks in the present study only used sentences with dative and transitive verbs, which lack versatility, more useful sentences in normal conversations such as interrogative sentences should also be used in future studies.
It might be better to implicitly learn syntactic rules rather than explicitly in EFL settings. By doing so, the learners can obtain not only declarative knowledge but also procedural knowledge of grammar in order to quickly and accurately produce a full sentence for language production. In this sense, syntactic priming can play an important role, where the learners can strategically use their partners’ utterances for their own. Since there are few opportunities for syntactic priming to occur spontaneously in EFL settings, it should be used in the classroom. For instance, communicative activities based on negotiation of meaning (e.g., jigsaw tasks) using syntactic priming could be made use of, where learners gradually create appropriate and advanced interrogative sentences, implicitly scaffolding the prime sentences produced by the scripted interlocutor (i.e., the other learner) to carry out a conversation (e.g., McDonough & Chaikitmongkol, 2010; McDonough & Mackey, 2008). However, empirical research investigating the relationship between syntactic priming and L2 development is so far insufficient to actually justify using syntactic priming for practical purposes. Therefore, further research is definitely desirable in order to obtain effective pedagogies for language production, especially in the case of speaking.

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References


**Appendix: Prime Sentences (‘Yes’ Condition)**

*Sentences With Dative Verbs (PO / DO Structures)*

1. The mother gives the money to the child. / The mother gives the child the money.
2. The mother gives the present to the child. / The mother gives the child the present.
3. The man hands the letter to the woman. / The man hands the woman the letter.
4. The mother hands the umbrella to the boy. / The mother hands the boy the umbrella.
5. The woman lends the money to the friend. / The woman lends the friend the money.
6. The girl lends the eraser to the friend. / The girl lends the friend the eraser.
7. The woman sells the ticket to the man. / The woman sells the man the ticket.
8. The man sells vegetables to the customers. / The man sells the customers vegetables.
9. The man shows the radio to the clerk. / The man shows the man the radio.
10. The man shows the passport to the officer. / The man shows the officer the passport.
11. The man teaches math to the students. / The man teaches the students math.
12. The woman teaches Japanese to the man. / The woman teaches the man Japanese.
13. The man tells something to the woman. / The man tells the woman something.
14. The woman tells the time to the friend. / The woman tells the friend the time.
15. The boy writes the letter to the friend. / The boy writes the friend the letter.
16. The boy writes the letter to the girlfriend. / The boy writes the girlfriend the letter.

*Sentences With Transitive Verbs (Active / Passive Structures)*

1. The girl opens the box. / The box is opened by the girl.
2. The woman opens the window. / The window is opened by the woman.
3. The woman pushes the intercom. / The intercom is pushed by the woman.
4. The man pushes the button. / The button is pushed by the man.
5. The man watches the cherry tree. / The cherry tree is watched by the man.
6. The man watches the movie. / The movie is watched by the man.
7. The man cleans the dishes. / The dishes are cleaned by the man.
8. The woman cleans the room. / The room is cleaned by the woman.
9. The cat finds the mouse. / The mouse is found by the cat.
10. The girl finds the boy. / The boy is found by the girl.
11. The man drinks the beer. / The beer is drunk by the man.
12. The boy drinks the water. / The water is drunk by the boy.
13. The car hits the man. / The man is hit by the car.
14. The boy hits the ball. / The ball is hit by the boy.
15. The man reads the newspaper. / The newspaper is read by the man.
16. The man reads the comic book. / The comic book is read by the man.