

Structural Priming Effects on EFL Production of Passive Structures

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Received 10 November 2011; accepted 24 January 2012

Abstract

This study investigates the role structural priming plays in production of passive structures among Iranian EFL learners. In order to answer the research question, which asked whether structural priming effects result in an increase in the production of the target structure (i.e., passive structures), 60 Iranian EFL learners participated in the study. After taking the placement test, they were divided into four experimental and control groups, namely Experimental High-Proficiency, Experimental Mid-Proficiency, Control High-Proficiency, and Control Mid-Proficiency. Participants then took part in picture description sessions the results of which were subjected to a 2 x 2 analysis of variance. The results of the experiment showed that priming resulted in increased production of the target structure in question by experimental groups as compared with production by control groups. In addition, the results indicated that EFL level of proficiency made a significant difference in production of the target structures. It is believed that structural priming can be employed as an alternative technique for presenting certain grammatical structures.

Keywords: Structural priming, language production, passive structure, Iranian EFL learners

The tendency to produce or repeat a recently produced or heard structure, technically called structural priming, (Bock, 1986) is the phenomenon by which processing of an utterance is facilitated by processing of another one which shares the same underlying syntactic structure (Branigan, 2007). Structural priming has created fruitful areas of research in studies with children (e.g., Fisher, 2002; Garrod & Clark, 1993; Tomasello, 2000), aphasiacs (e.g., Saffran & Martin, 1997), bilinguals (e.g., Bernolet, Hartsuiker, & Pickering, 2007; Schoonbaert, Hartsuiker, & Pickering, 2007), and last but not least, second/foreign language learners (e.g., Ameri-Golestan, 2010; Gries & Wulff, 2005; Kim & McDonough, 2008; McDonough, 2006).

Bock (1986) reported the first study which specifically used structural priming to investigate the processing and representation of language structures. In her study, speakers repeated prime sentences (transitive and dative structures) and afterwards described target pictures which were semantically unrelated to the prime sentences. The results showed that speakers tended to use an active description of the target picture after an active prime structure and a passive description after a passive prime structure. The same effect was observed with dative sentences. Pickering and Ferreira (2008) pointed out that the results of Bock's (1986) study reveal that priming happens automatically and is not related to specific communication purposes or prime-target relationships (Levelt & Kelter, 1982), or discourse factors such as register (Weiner & Labov, 1983).

Bock's (1986) initial finding encouraged several researchers to investigate the nature of the phenomenon and its linguistic implications more in depth. Branigan, Pickering, Liversedge, Stewart, and Urbach (1995) concluded that structural priming can occur within production,

within comprehension, and between comprehension and production. Within production, uttering particular syntactic forms might affect the production of subsequent utterances. For example, if a prime is produced that contains a double-object structure (*The rock star sold an undercover agent some cocaine*), it increases the probability of participants producing a target with the same structure (*The girl handed the man a paintbrush*); and the same will happen with alternative structures such as prepositional objects. Within comprehension, Branigan et al. found priming with locally ambiguous sentences. For example, readers process an "early closure" sentence (*While the woman was eating the creamy soup went cold*) faster if it is encountered after another "early closure" sentence, and a "late closure" sentence (*While the woman was eating the creamy soup the pudding went cold*) is read faster immediately after reading another "late closure" sentence (Branigan et al.). With regard to the "comprehension-to-production" priming, Branigan et al. also found produced sentences are often structurally similar to recently heard utterances. For example, when shopkeepers were asked *At what time does your shop close?*, they answered *At five o'clock* more frequently than *Five o'clock*, while the question *What time does your shop close?* was followed by *Five o'clock* more often than *At five o'clock*. They pointed out that a process which is common to both comprehension and production might be the source of priming, although the nature of that source is unclear.

Pickering and Ferreira (2008) reviewed several studies which used structural priming and concluded that they provide evidence for autonomous syntax. They argued that the production of a sentence depends largely on an abstract syntactic form which can be defined in terms of parts of speech and phrasal constituents and they believe that it is this abstract syntactic structure that influences structural priming.

Other studies have addressed the question of durability of structural priming. These studies have dealt with the question of whether priming is long lasting and results in implicit learning, or decays over time (Bock & Griffin, 2000; Branigan, Pickering, & Cleland, 1999; Levelt & Kelter, 1982; Wheeldon & Smith, 2003). Seger (1994) defined implicit learning as involving knowledge which is not accessible to consciousness; it is characterized by being, to some extent, complex and abstract; it happens incidentally as some tasks are being performed, and finally, it is preserved in cases of amnesia (Bock & Griffin, 2000). Bock and Griffin (2000) believed that these four characteristics can be attributed to structural priming as well.

Conflicting results have emerged from this body of research with respect to the duration of the priming effects, however. On the one hand, results from certain studies suggest that structural priming effects in language production are quite short-lived (Branigan et al., 1999). Although these authors found structural priming in written production, they could not find any evidence that it persisted over time. This rapid decay was observed when other structures intervened between the prime and target. They found reliable priming occurred mostly in situations when the target immediately followed the prime. In other words, the priming effects on an initial written completion task were not carried over to subsequent completion tasks – priming effects decayed over time for the written completion experiments.

Bock and Griffin (2000), on the other hand, concluded that priming does result in implicit learning. The authors argued that the defining characteristics of implicit learning applied to structural priming as well - in terms of the automatic non-deliberative character of the structural representation, its abstractness, and its persistence over time. To investigate the question of persistence to see whether structural priming leads to implicit learning, they ran two experiments (Experiment 1: priming over short lags, that is, two intervening sentences; and Experiment 2: priming over longer lags, that is, 10 intervening sentences) where they found priming effects regardless of lag duration. Specifically their results showed that structural priming can persist over short and long filled intervals despite the production of

other utterances during these intervals, which suggests that structural priming is not easily disrupted by general interference from other events (see also Bock & Kroch, 1989; Hartsuiker & Kolk, 1998; Weiner & Labov, 1983 for studies of persistence of priming).

Bock and Griffin (2000) pointed out that, although lexical repetition enhances structural repetition, it is not essential for it. The reason is that there are two different factors at work here. First, the activation of specific words in memory supports the subsequent activation of a recently used structure, creating structural repetition. Second, given that sentences are generated from non-verbal message representation, a particular message form would be associated with a particular set of procedures for its formulation which, if followed again, would result in structural priming.

An important question to consider at this stage is what is meant by "learning." Bock and Griffin (2000) interpreted their results as "learning to talk" rather than "learning language." They pointed out that the results obtained from the two studies suggested that structural priming occurs within a system specialized for learning how to produce word sequences. They believed that structural priming should be viewed as a 'dynamic vestige' of the process of learning in order to perform language, something they called learning to talk (pp. 188-189). In their view, this learning to talk includes learning procedures (cognitive skills) in order to formulate and produce sentences more efficiently, and such procedures will undergo fine-tuning in language production.

Bock and Griffin's (2000) emphasis on the impact of structural priming on learning to produce has profound implications for the field of L2 acquisition. The fact that they interpreted facilitatory effects of structural priming as a form of procedural acquisition, of "learning to talk," as opposed to an increase in the activation of procedures that are already part of the repertoire means that this effect could be exploited by language teachers as a pedagogical technique.

This study, in line with previous research in the field, is intended to focus on passive structures in the production of Persian-speaking learners of English as a foreign language (EFL). Therefore, the research question of the study can be formulated as follows: Do structurally-primed passive structures in a second language lead to an increase in subsequently producing such structures in the foreign language? In order to answer the research question, the following experiment was conducted.

Methodology

Participants

Participants of the study were 60 Iranian EFL learners studying English at Gooyesh Language Institute. The participants were selected from among a larger 120-participant sample after taking Allen's (1992) placement test. In order to group participants, the following procedure was followed. The 30 participants who got the highest proficiency scores were placed in the High-proficiency groups, that is, those participants who scored 178-165 (out of 200 which is the maximum possible score in the placement test). In order to eliminate the Low-proficiency participants, the 30 participants who got the lowest scores (less than 120) were excluded. Of the remaining 60 participants, the 30 who were in the middle of the list were placed in the Mid-proficiency groups, that is, those participants who scored 130-120. This was done in order to make sure that the High-proficiency and Mid-proficiency groups were significantly different from each other. The same participants took part in the two experiments described below.

Participants of the study were, then, placed in four groups with respect to proficiency and treatment, namely Experimental High-proficiency (EHP), Experimental Mid-proficiency (EMP), Control High-proficiency (CHP), and Control Mid-proficiency (CMP) (N = 15 in

each group). No low-proficiency group was assigned, because such participants would not have been able to perform the task. The rationale for designing a control group was to provide the baseline.

In order to ensure the comparability of the Experimental and Control groups, two independent samples *t*-tests were conducted comparing proficiency scores. The results of the *t*-test comparing the EHP ($M = 165.74$, $SD = 6.01$) and CHP ($M = 163.33$, $SD = 5.89$) showed no significant difference in proficiency, $t(28) = 1.18$, $p = .15$. The results of the *t*-test comparing the EMP ($M = 124.85$, $SD = 5.38$) and CMP ($M = 127.05$, $SD = 5.09$) also showed no significant difference in proficiency scores, $t(28) = 0.42$, $p = .42$.

Materials

There were two sets of 35 pictures, one set for the researcher and one for the participants. The critical or experimental pictures ($N = 20$) depicted a scene where somebody was involved in a conversation with someone else asking or talking about something using passive structures. For example, a wife is talking with her husband about when his leg was broken, and another one wants to see whether the phone has been fixed, or someone is asking a friend whether his car has been painted, or a student is asking his teacher if the exam papers have been corrected, etc. This sentence was made apparent by means of a balloon so that the participants knew they were supposed to use this sentence. (See the appendix for an example of an experimental picture).

All participants saw the same set of pictures, but the researcher's set was different for the Control and Experimental groups. The researcher's pictures for the Experimental groups provided the researcher with the opportunity to produce a prime. For the Control group, the researcher described a picture that did not require passive structures and, therefore, lacked a priming sentence.

In addition to the experimental pictures, there were 15 filler pictures that served to hide the purpose of the study. Like the experimental pictures, the fillers depicted a scene where people were seen to be involved in some sort of conversation. For example, someone is giving direction to another, or a police officer was talking to a driver about driving fast, etc. Similarly, the sentences used in conversations in both the experimental and filler pictures were made apparent by means of balloons. For the filler pictures and unlike the experimental ones, the researcher would not repeat the sentence in the balloon; however, participants had been asked to describe the picture and always repeat the sentence in the balloon.

Procedure

The participants met with the researcher in individually held sessions. The experiment took place in a quiet room and the participants were given enough time in order to describe the pictures. Each session lasted between 25 and 35 minutes. First, the researcher explained the procedure to participants and after he had made sure that the participants got familiar with the procedure, the experiment started. In order to make sure that participants became completely familiar with picture description, some trial pictures were described before the main part of the experiment started. Furthermore, in order to hide the purpose of the research, the researcher mentioned that he was interested in the type of sentences that people would use to describe a variety of situations.

First, the researcher described a picture and, after he was done with his description, the participant had to look through his set of pictures and choose the one he thought best matched the situation just described by the researcher and describe it. For example, if the researcher described a picture in which a manager was asking whether a letter was sent, the participant could choose a picture of an office where someone was asking his coworker whether an email had been sent.

The researcher and participants would continue in this way until they had described all the pictures (both experimental and filler). The experimental and filler pictures were mixed in a semi-random arrangement, making sure that no two experimental or even similar structures were placed one after the other.

For the experimental pictures, the researcher either described the pictures including an instance of passive structure (with the Experimental groups), or described the picture but did not produce any instance of the target structure (with the Control groups). For example, for the Experimental group, the researcher would say: “Here we see a garage. The man is asking the mechanic whether his car has been fixed.” For the Control group, on the other hand, the researcher would say: “Here we see a garage. The man is talking with the mechanic about fixing his car.”

It should be emphasized that all participants’ pictures had a balloon containing the sentence the interlocutors were uttering which participants were instructed to report.

Scoring

In order to facilitate the scoring procedure, a checklist was prepared. When participants produced the same structure as the prime in their description, the sentence was scored, that is, it was coded as “Passive structures.” These were sentences which were passivized using be or get. Other types of responses were coded as “Other” and not scored.

For each participant, a mean score was obtained for the whole session which was the sum of all the instances in which they had described a picture using the target structure. The maximum possible score was 20.

Results

The means for EHP, EMP, CHP, and CMP were 15.38 ($SD = 2.18$), 14.89 ($SD = 2.10$), 6.74 ($SD = 1.97$), and 5.45 ($SD = 1.43$) for EHP, EMP, CHP, and CMP, respectively.

To address the research question, which asked about the occurrence of structural priming in L2, the data were analyzed using a 2 x 2 analysis of variance with score as the dependent variable and group (Experimental and Control) and proficiency (High and Mid) as independent variables. Table 1 presents the results of the 2 x 2 analysis of variance.

Table 1. *Results of 2 x 2 between-subjects ANOVA for priming*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1863.33	3	621.11	110.92	.000
Intercept	6716.11	1	6716.11	1199.44	.000
Group	1833.61	1	1833.61	299.87	.000
Proficiency	27.61	1	27.61	4.13	.03
Group * Proficiency	2.11	1	2.11	.498	.62
Error	425.55	56	5.59		
Total	9005.00	60			
Corrected Total	2288.88	59			

As can be seen in the table, there was a statistically significant main effect of group $F(1, 56) = 299.87, p < .01$ with Experimental groups being associated with significantly higher scores ($M = 14.21, SD = 2.53$) than Control groups ($M = 4.07, SD = 2.39$). Furthermore, a significant main effect was found for proficiency, $F(1, 56) = 4.13, p < .05$, indicating that more proficient participants had significantly higher scores ($M = 10.25, SD = 5.86$) than did less proficient ones ($M = 7.71, SD = 6.13$). The interaction between group and proficiency, however, was not statistically significant, $F(1, 56) = 0.498, p = .62$.

In sum, the results answer the research question, whether priming results in increased production of passive structures. In fact, the participants of the study, Iranian EFL learners, produced more passive structures when primed for this structure.

Discussion

Structural priming phenomena have been investigated from very different perspectives in the psycholinguistic literature on both first and second language acquisition. In addition to language production (Bock, 1986), structural priming has been researched with respect to issues such as first and second language comprehension, language processing, the mental representation of language among native speakers (Branigan, 2007), bilinguals (Bernolet, et al. 2007), and second language learners (Gries & Wulff, 2005; Kim & McDonough, 2008), and last but not least the impact of structural priming on retention or learning (Bock & Griffin, 2000). In this study, the question of whether structural priming would be found in a foreign language was investigated taking into account a particular target structure (passive structures). Based on personal and classroom observation, this structure seems to be underrepresented in the production of Persian learners of English and can, therefore, be a suitable alternative to test the potential benefits of structural priming in L2 acquisition.

The research question asked about the impact of structural priming on the production of passive structures among Iranian EFL learners. The results obtained from the experiment showed that those participants who had been primed for the target structure did produce more of the target structure than those who had not. This indicates that priming was effective even though it was conducted in a foreign language and even though it concerned a structure apparently difficult for the learners, judging by the low production of the Control group.

These results support previous research on structural priming among second/foreign language learners, especially Kim and McDonough (2008), who showed the impact of structural priming on Korean speaking L2 learners of English production of passive structure. Similarly, they found that, regardless of proficiency level, their participants could be primed to use passive sentences in picture description.

The very reliable boost to the production of passive structures, which tend to be underrepresented in Persian speakers' production of English, fits the "*inverse-preference effects*" argument (Pickering & Ferreira, 2008), according to which in any production contexts, structures that are less favored by participants/speakers seem to exhibit higher syntactic or structural priming. These effects might be because of the way speakers process prime structures, or the way they process target structures (see also Hartsuiker & Kolk, 1998; Hartsuiker, Kolk, & Huiskamp, 1999; Scheepers, 2003). The present results show that the same applies to priming studies in second/foreign language acquisition research.

Further Research

Further research can follow in two directions. From a more pedagogical point of view, structural priming can have a very practical use in the classroom. For example, in order to introduce grammar points, the teacher can prime the structure and then expect students to use

that particular structure in their language production. This could be particularly helpful with structures that are less favored by the learners' first language. In Persian, for example, in addition to passive structures, tag questions, indirect questions, and causatives seem to be among the less favored structures for EFL learners. These are, therefore, suitable for further investigation on structural priming and, possibly, for improvement of learning outcomes.

Structural priming can be used to have theoretical implications to various fields of inquiry. For example, one line of research can investigate cross-linguistic syntactic integration (De Bot, 1992; Ullman, 2001), that is, to what extent the two languages of a bilingual are separate. It should be possible to address this question using a structural priming paradigm by looking at whether bilinguals or second/foreign language learners can be primed by structures in one of their languages, and expect the target structure to be produced in the other language. If so, it would mean learners are making use of the same mechanisms to process the two languages (see Hartsuiker, Pickering, & Veltkamp, 2004 for an investigation of the same issue among Spanish-English bilinguals). Furthermore, the role of proficiency in priming effects is a potentially interesting area of research in that it could help determine to what extent new structures can be "acquired" through priming. Finally, the role structural priming plays in the implicit learning of particular structures is another promising line of inquiry using structural priming methodology, which can shed more light on mental processes involved in learning a second/foreign language.

Acknowledgements

The author wishes to thank Prof. Kathryn Bock, Prof. Holly Branigan, Prof. Martin Pickering, and Prof. Robert Hartsuiker for their helpful comments on different parts of this manuscript.

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