

Priming effects in simple sentences with verb bias on Korean EFL learners' proficiency

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Gong, Jeongyeon. 2015. Priming effects in simple sentences with verb bias on Korean EFL learners' proficiency. *SNU Working Papers in English Linguistics and Language 13*, 23-39. The study aims to explore whether there is priming effects in simple sentences with verb bias on Korean EFL learners and find out how the effects of EFL learners react differently along their proficiency. Especially, experiment in this research is set in comprehension because there is temporary ambiguity caused by mismatches in structure expected by verb bias. To investigate the priming effects of those sentences in reading comprehension, prime and target sentences are designed with biases with verbs and with verbs without biases presented by self-paced reading. If priming effect is robust, it will dominate the structure in target despite the neutral property of verbs in target, thus reading comprehension will be speeded up. Also, the proficiency of participants will be reanalyzed to further examine the structural priming at different stages of learning. (Seoul National University)

Keywords: priming effects, structural priming, reading comprehension, temporarily ambiguous, verb bias, bias neutral

1. Introduction

Studies in experimental psychology found out a human behavior of repetition and the phenomenon, priming, was examined in recent couple of decades. Since experiments of Meyer and Schvaneveldt in the early 1970s, research has been booming in different domains of cognitive psychology. The current study was inspired by one of the studies in psycholinguistics, called 'structural priming', introduced by J. Kathryn Bock in 1986. Present research aims to find out if priming effects of specific structure ('structural priming') can facilitate second language learning, as well as how we can relate the priming effect to develop reading comprehension in L2 context. What comes next in this paper would be beneficial if we could have some implications in second

language learning of late learners.

2. Literature Review

According to Hartsuiker and Bernolet (2015), the mesmerizing phenomenon, structural priming, is defined as ‘a tendency for speakers choose a particular syntactic structure after having previously processed a sentence with that the same structure, as opposed to an alternative structure’. When the positive prime occurs, comprehenders tend to repeat previously presented prime, thus the process is speeded up (Wikipedia, https://en.wikipedia.org/wiki/Structural_priming). Thus, we would be able to say ‘structural priming helped researchers to identify the human representations when people produce or comprehend language (Pickering & Ferreira, 2008)’. Particularly, certain types of repetitive behavior were investigated, which may reflect process of learning (Chang, Dell, & Bock, 2006; Pickering & Ferreira, 2008). Among them, about four types of previous studies were mainly concerned about language; mental representation, language production, language comprehension, and language comprehension.

The first type of the structural priming study was to find out mental representation of syntax, or the status of syntactic knowledge during language processing (Miller & Isard, 1963; Pickering & Ferreira 2008). Two points view have presented in the literature. One was that syntactic knowledge is derived from other forms of knowledge (e.g. Bates & MacWhinney, 1982) - *functionalist* according to Pickering & Ferreira, whereas the other one considers syntactic knowledge as independent of other forms of knowledge - *autonomous*. Studies have shown evidence supporting the latter: abstract syntactic form has a large influence on structural priming as sentence production depends on the form (Bates & MacWhinney, 1982; McClelland, St. John & Taraban, 1989), however, we cannot exclude the former because some studies apparently has

shown that there is some other types of knowledge that triggers or affects structural priming (Saffran & Martin; Potter & Lombardi, 1998; Pickering & Ferreira, 2008).

Next type of study is about language production, which is mostly concerned in the literature. There are three major issues from 1970s, showing mixed results. When it comes to mapping to syntax, specifically thematic role distinctions are discussed whether they are irrelevant (Bock & Loebell, 1990; Bock et al., 1992) or not (Griffin & Weinstein-Tull, 2003; Chang et al., 2003; Hare & Goldberg, 1999, Salamoura & Williams, 2007). Another issue of production, speakers' functional level of representation doesn't seem to have evidence supporting the role of structural priming yet. In contrast, there is evidence of structural priming in syntactic level. Consistent results were found in studies of syntactic knowledge that structural priming influences the choice among (Branigan et al., 2006; Fox Tree & Meijer, 1999) and ordering (Desmet & Declercq, 2006; Scheepers, 2003) of phrase structural rules or similar representations, and syntactic knowledge is representationally independent of lexical knowledge (Pickering & Ferreira, 2008).

Other studies are related to language comprehension. Although production has been the major domain of study, priming from comprehension to production, or priming within comprehension have addressed in many recent studies (Pickering & Ferreira, 2008). The reason why there has been little evidence for priming of comprehension is that we don't make important choices while reading but we do when we in production. Understanding structural ambiguities is extremely rare case of making such difficult choices. As in the garden-path effect of Frazier & Rayner (1982), structural priming in comprehension is largely limited to cases where there is considerable ambiguity and where it is difficult to recover from misanalysis. Latest experimental studies of direct assessment of structural priming - e.g. ERPs (event-related potentials) by Ledoux et al., (2007) and visual paradigm (Tanenhaus et al., 1995) - have shown additional evidence of priming within

comprehension thanks to the online technology.

Third studies of priming are related to language learning. The characteristics of structural priming – tacit, incidental, and automatic (Bock et al., 1992)- fit well with the implicit learning view. Experience with the relationships among linguistic and language-related representations automatically strengthens the knowledge of those relationships, leading to priming. Its independent characteristics of explicit memory (Bock et al. 1992), normal priming effects from anterograde amnesic patients (Ferreira et al., 2005), greater structural priming of relatively less produced structures (Hartsuiker & Kolk, 1998b; Hartsuiker et al., 1999; Hartsuiker & Westenberg, 2000; Scheepers, 2003), and large-scale simulation studies (Chang, 2002; Chang et al. 2006; Chang et al., 2000). Also, longevity of the priming was the topic relevant to implicit learning, however, results of research were not consistent whether it is long lived or short lived although recent studies provide evidence of longevity of priming effect and this could be suggestive implication on language learning (Bock & Griffin, 2000; Chang et al., 2006; Kaschak et al., 2006; Kaschak, 2007; Kaschak & Borreggine, 2008; Hartsuiker & Bernolet, 2015). Interesting findings of experiments with the short lived effects seemed to be caused by lexical repetition from prime to target sentence (Branigan et al., 1999), whereas there were no repetition in those with the long lived effects (Bock & Griffin 2000). At least, structural priming effects have partial implicit learning effect (Pickering & Ferreira, 2008).

Priming effects in L2 have been the other issue in previous studies. One them was the lexical representation and processing of bilinguals. Some researchers have shown shared representation of syntax (Bernolet et al., 2013; Hartsuiker & Bernolet, 2015), and the differences of L2 comprehension of bilinguals by proficiency were also shown from Kroll & Stewart's study (1994). According to them, less proficient bilinguals use more mediation of conceptual model in using language knowledge and they have language specific representation (this could item specific:

Bernolet et al. 2013), and more proficient bilinguals have shared language representation and conceptual model is less mediated for them. Still, researchers have not yet reached agreement that to what extent the language representations of the two languages are shared or the representations are different. It is because the same patterns of priming between constructions occurred within L2 and within L1 (Pickering & Ferreira) in following studies; Schoonbaert et al. (2007), Branigan et al. (2000), McDonough (2006). It is possible that degrees of shared representations are greater for proficient bilinguals, and they have the advantage of economy to strategically use their well-established L1 knowledge and this was supported in cross-linguistic priming experimental studies (Loebell and Bock, 2003; Meijer and Fox Tree, 2003; Hartsuiker et al., 2004; Pickering & Ferreira, 2008). In addition to proficiency, typological relationship between languages seems to affect cross-linguistic priming. Languages examined are -English, French, German, Dutch, Spanish, and Greek- typologically close, which we could infer the effects of cross-linguistic priming from the proximity. If the two languages of bilinguals are distant, analogous structures might occur, or not at all (Christianson & Ferreira, 2005, Pickering & Ferreira, 2008).

We explored different dimensions of structural priming, and it became a tool extensively used in psycholinguistic research. In it, latest findings support that priming plays vital role in learning. Hartsuiker and Stewart (2015) noted that the role of priming is activated by relatively permanent, error-driven, and abstract adjustment, and limited amount of trials, such a reading novel structure, is sufficient to change learners' behaviour. With this in assumption, present study will explore priming effects in comprehension, and how it works with Korean-English bilinguals (Korean EFL learners) when their L2 proficiency is different. Also, ambiguous structure should display more prominent priming effects during comprehension, the L2 learners' reading comprehension will be examined. Fluency also offers the facilitatory effects of priming on

comprehension. If fluency can be considered as reducing the time or resources needed to determine the structure or meaning of an utterance, priming of comprehension may also have a comparable effect (Arai et al. 2007; Pickering & Traxler, 2008; Pickering & Ferreira, 2008).

3. Methods

Literature suggests there are good reasons to have a closer look at ambiguous structure. Various structures with ambiguity – reduced relative clauses (Tooley et al., 2009), prepositional object and double object structure (Tooley & Bock 2014; Hartsuiker & Bernolet, 2015) when priming effect is tested. Unlike previous experiments, present study adopts Wilson and Garnsey (2009)’s simple structures with verb bias, namely, temporarily ambiguous sentences, specifically those with tendency to be used with direct object bias or clause bias. Their experiment on native speakers had pioneering method of using simple structures with verb bias, therefore there was no requirement of reanalysis and evidence of individual word influence in the earliest stages of sentence comprehension (Wilson & Garnsey, 2009). Analyzing only clause bias and DO bias rather including other bias is because the two tendencies in transitive verbs account for most part of the verbs in the norming test of Garnsey et al. (1997).

To test the comprehension, participants will execute self-paced reading by moving window paradigm with Linger software. Words will be presented in monitor after they press space bar, and they will turn in to dashes as they press space bar to read next word. The moving window paradigm masks the words readers already have seen, thus will be more beneficial to measure where ambiguity arise and where resolution of the ambiguity occurs.

3.1 Participants

Fifteen Korean EFL learners in Seoul National University are participating in the in the experiments. Each will be paid KRW 5,000 for about 20 minute experiment.

3.2 Materials

Prior to the experiment, a norming test was executed to decide the verbs in target sentences are bias neutral, and to collect plausible sentences with the verbs. Eight native speakers of English from Canada, the U.S, and the U.K. participated in the test. Subjects of the norming tests were given 24 cloze tasks to complete sentences with subjects and verbs already provided. The tasks were presented and collected by Google Forms, but it was unfortunate that the results were sadly not fruitful. Only six verbs were barely close to being neutral out of 24 verbs – doubt, report, comment, promise, point, estimate, which are from eight cases for each sentence completion of simple structure, but only 3 cases had different patterns from the rest five cases). Luckily, Michael replied to my request and his co-author Susan (2009) sent me 100 verbs with category of the rate of biases. Those were from their norming study in 1997, with 108 native speakers of English. They wrote sentence continuations for proper name + verb fragments and the continuations were hand coded into three categories – direct objects, *that* clauses, and other types of sentence continuations. Twelve verbs from the list were selected to be bias neutral because the rate of DO (direct object) bias and the SC (subject clause) bias were similar. Those verbs are summarized in the Table 1 below.

Table 1. Verbs from Susan Garnsey and Michael Wilson's norming study of 100 verbs

Verb	DO Bias	SC Bias
announced	0.50	0.49
declared	0.45	0.51
demanded	0.49	0.29
doubted	0.42	0.56
feared	0.41	0.48
guaranteed	0.46	0.50
knew	0.50	0.46
mentioned	0.43	0.54
noted	0.57	0.41
noticed	0.65	0.35
predicted	0.48	0.52
sensed	0.54	0.44

12 sets of sentences are presented in the experiment, which consist of 48 sentences in total. Each set has two prime sentences, two fillers, and one target sentence. Prime and target sentences are adopted from Wilson & Garnsey (2009). Among the sets, half of the structure included clause bias verbs in prime sentences, and the other half had direct object bias verbs in prime sentences. And in the target sentence in each set, the same structure as prime sentence with the bias neutral verb was included. And 24 filler sentences in total were adopted from Arai et al. (2007) since the sentences are proved to be plausible and grammatical. The sentences in two types of direct object bias verbs are as in the followings.

- ① DO-bias items with the bias neutral verbs (in the half of the sets)
 Prime: The talented photographer **accepted** (DO bias verb) the money (ambiguity) could (disambiguating) not be spent yet (disambiguating region).

Target: The talented photographer **declared (bias neutral verb)**
the mistake might not have been caught.

Participants will have ambiguity after reading *the money* in prime sentence above because they would expect it to be the direct object of *accepted* but it found out to be the subject of *could not be spent*. The response will be delayed while they're figuring out the structure. If the priming effect exists, the target sentence should be read faster regardless fillers in the middle.

② Clause-bias items with the bias neutral verbs (in the other half)

Prime: The ticket agent **admitted** (clause bias verb) the mistake might not have been caught

Target: The ticket agent **believed (bias neutral verb)** the mistake might not have been caught.

Likewise, *admitted* in the prime above has a tendency to be used as the verb in subject clause, but ambiguity arise when they read the VP after - *might not have been caught*, and the target sentence would be read faster if there is priming effect.

3.3 Procedure

In the beginning of the experiment, participants are asked to answer questionnaire about their scores of standardized English proficiency tests widely measured in Korea - TOEIC, TOEFL, and TEPS.

When the questionnaire is complete, participants will do self-paced reading with moving window reading paradigm with temporary ambiguous sentences. There will be instructions how to control their reading pace, and a short trial will be given to make them comfortable with the settings, and they will be notified that there will be

comprehension check-up questions during the experiment to promote careful response and to make sure the assumptions of the study – participants comprehend what they are reading- and the time measured is based on the assumption.

12 sets of 48 sentences are presented and each set will be presented in following order; one prime sentence, two fillers, and one target sentence. Comprehension questions (yes or no questions) from previous study Wilson and Garnsey (2009) will be shown after each set of sentences are shown.

After the experiment, the reading time by each word in the sentence will be measured from Linger software. The word- based reading time at the second VP will be added to disambiguating region and to total reading time of each sentence. The data will be coded by subject, and the type of verb bias and the reading time of disambiguating region at prime and the similar region in the target sentence, as is described in the Table 2.

To find out whether there is the difference between participants according to proficiency, their proficiency will be divided into three groups- low, intermediate, and high. The statistical analysis of Falout et al. (2009) has grouped 900 university students in Tokyo into three levels of proficiency as – low: below 355, middle: 360-625, high: above 630. However, the schematic has to be reconsidered in present study because relatively higher test scores are expected from students who are in one of the most recognized university in Korea. Thus the scores collected from participants are divided in to three groups as high – above 768(TEPS)/ 900(TOEIC)/ 105(TOEFL), intermediate 556 – 768(TEPS)/ 700-900(TOEIC)/ 80-105(TOEFL), and low below 556(TEPS)/ below 700(TOEIC)/below 80(TOEFL) according to the conversion table of the official website of TEPS.

Within subject analysis for participants will be conducted along the proficiency (low/intermediate/advanced) for the two types of verb items. Because there are two independent variables – proficiency, and verb bias, two-way ANOVA will be used on this purpose. The difference between

reading time of prime and target will be calculated by subtracting reading time at disambiguating region of target from that of prime. And the mean of the reading time difference will be coded by verb bias and proficiency.

If there is a statistically significant interaction in ANOVA, reporting main effect can be misleading. So, a post hoc test will be conducted to report simple main effects. This would involve mean difference of reading time from prime to target at disambiguating region at each proficiency level, and proficiency level for each verb bias. We cannot run this in SPSS, but the Tukey post hoc test results for the different levels of proficiency will be conducted. If the mean difference is significant at .05 level, we could see the statistically confident at the difference between all the three levels of proficiency ($p < .05$).

4. Conclusions

The focus of this study was on the priming effect of comprehending temporary ambiguous sentences – simple structures with verb bias in reading. The ambiguous structure was investigated to understand priming in comprehension based on the previous studies on comprehension with priming. If specific structure were selected by the verb is mismatched with expectation, the verb bias would be robust thus delay in resolving ambiguity. Based on considerable ambiguity, we will be able to observe the priming of comprehension. Successful results from present study should be able to provide evidence of priming effect on reading comprehension with Korean-English bilinguals whose L1 is not typologically close to L2. Still, more participants are required to make sure there is priming effect on the simple structure with verb bias, and further investigation on diverse population according to the level proficiency would be necessary to measure the exact relationship between the degree L2 priming effect and proficiency.

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Appendix

Prime (1a~6a with DO bias verbs, 7a~12a with clause bias verbs)

- 1a. The talented photographer accepted the money might be legally obtained.
- 2a. The primary suspect established the alibi did not reflect the truth
- 3a. The art critic wrote the interview did not go very well.
- 4a. The lab technician proposed the idea might worth another try.
- 5a. The new mayor advocated the strategy required more funds from industry.
- 6a. The French explorers discovered the treasure could cost them their lives.
- 7a. The district attorney argued he point might be impossible to avoid.
- 8a. The job applicant believed the interviewer considered all of her answers.
- 9a. The shrewd salesman figured the prices could be going up soon.
- 10a. The bank guard confessed the robbery began late in the evening.
- 11a. The class president assumed the burden caused frustration for his parents.
- 12a. The teaching assistant hinted the solution could not be found easily.

Target (with bias neutral verbs)

- 1d. The basketball star announced the contract included a few limiting clauses.
- 2d. The schoolboard declared the policy could prevent cheating by students.
- 3d. The popular novelist doubted the essay changed the minds of many.
- 4d. The city planners demanded the strategy should not include land sales.
- 5d. The concerned priest feared the belief might not be morally justified.
- 6d. The new owners guaranteed the house did not flood very easily.
- 7d. The office manager knew the problem could affect each person there.
- 8d. The naïve child noticed the fable might not really be true.
- 9d. The union leader mentioned the raise could mean more than money.
- 10d. The reading instructor noted the lesson stated its point very clearly.
- 11d. The observant detective sensed the situation might soon get worse again.
- 12d. The film director predicted the scene might make the actors famous.

Filler (from Arai et al., 2007)

- 1b. The schoolgirl will show the teacher the drawing.
- 1c. The nanny will give the child the chocolate.
- 2b. The skier will lend the novice the equipment.
- 2c. The farmer will loan the student the jeep.
- 3b. The friend will send the newlyweds the telegram.
- 3c. The shopkeeper will post the customer the goods.
- 4b. The vampire will hand the maid the spoon.
- 4c. The thief will sell the man the watch.
- 5b. The surveyor will mail the residents the questionnaire.
- 5c. The director will offer the actor the biscuits.
- 6b. The landlord will offer the guest the motorboat.
- 6c. The diva will forward the bellboy the note.
- 7b. The celebrity will show the interviewer the necklace.
- 7c. The footballer will give the actress the gift.
- 8b. The hunter will rent the criminal the gun.
- 8c. The librarian will forward the researcher the journal.
- 9b. The assassin will send the dictator the parcel.
- 9c. The professor will post the model the banknote.
- 10b. The astronaut will hand the cheerleader the rose.

- 10c. The chemist will sell the junkie the drug.
- 11b. The inmate will mail the judge the present.
- 12b. The officer will offer the investor the whiskey.
- 12c. The bodybuilder will rent the runner the chain-saw.

Comprehension Questions

- 1. Was the photographer offered money?
- 2. Did the alibi reflect the truth?
- 3. Was the art critic writing about the interviewer?
- 4. Did the technician work in a lab?
- 5. Was the mayor new at the job?
- 6. Were the explorers Scottish?
- 7. Was there a problem in the office?
- 8. Did someone tell the naïve child a joke?
- 9. Was the salesman concerned about prices?
- 10. Was the instructor teaching reading?
- 11. Were the parents of the class president frustrated?
- 12. Were the actors starring in a play?