

## ***The Interpretation of Discourse-Linked Wh-Phrases by EFL learners***<sup>\*</sup>

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This study investigates the processing of personal pronouns (*he/she*) in English when the possible antecedent is either a discourse-linked *which* N phrase or a non-discourse-linked *who* phrase, using a self-paced sentence processing technique. Data collected from 41 Korean learners of English were analyzed in terms of the reading time for a pronoun following a *wh*-phrase. Learners preferred a d-linked *wh*-phrase (*which* N) rather than a non-d-linked *wh*-phrase (*who*) as the antecedent of a pronoun. This was similar to the results from native speakers of English in Frazier and Clifton's (2002) study, but learners differed from native speakers based on different types of constructions used in the test. A unique result of the embedding effect in which embedded sentences were easier than matrix sentences were observed and implications of second language acquisition theory are discussed based on this result.

**Key words:** discourse-linked *wh*-phrases, pronoun interpretation, *wh*-movement

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## INTRODUCTION

In this study the processing of personal pronouns (*he/she*) by L2 learners of English was investigated by examining their pronoun interpretation in English when the possible antecedent is either a discourse-linked (d-linked) *wh*-phrase such as *which boy*, or a non-d-linked *wh*-phrase such as *who*.

In English, *wh*-phrases can be classified as either d-linked phrases (*which boy*) that imply a set of already familiar boys; or non-d-linked phrases (*who*) that carry no familiar discourse entities (Pesetsky, 1987). Pesetsky (1987) proposed a generalization about *wh*-phrases in English that *which N* phrases are d-linked, whereas *who* is non-d-linked. In discourse, the difference between a *which N* phrase and a *who* phrase is crucial. For example, for a question like *Which boy did you meet?*, the appropriate answers are drawn from a reference set that has been established earlier in the discourse; this set narrows the search space for the *wh*-phrase, thus the reference set for *which boy* is the set of all discourse-relevant boys. No such requirement is imposed on *wh*-phrases like *who*, because the reference set for *who* is all discourse-relevant humans.

Frazer & Clifton (2002) hypothesized that when searching for the antecedent of a pronoun, the processor is checking whether the discourse representation of a *wh*-phrase is a d-linked phrase or a non-d-linked phrase. They asked native speakers of English to interpret the subject pronouns and found through a series of experiments that native English speakers preferentially chose the d-linked *wh*-phrase rather than the non-d-linked *wh*-phrase when they searched for an antecedent for a pronoun; this preference suggests that the d-linked *wh*-phrase is more readily available as an antecedent for a personal pronoun than is an indefinite non-d-linked *wh*-phrase. This difference is accounted for by the hypothesis that, on meeting a d-linked phrase in the input, the processor postulates very quickly a discourse entity as the referent of the phrase, and thus that a d-linked phrase is a much more attractive antecedent for a pronoun than is a non-d-linked *wh*-phrase, in which no such discourse entity is postulated (Frazier & Clifton, 2002; Garnham et al., 1995). Frazier and Clifton (2002) built experimental sentences like (1) and (2). The *wh*-phrases (1a, 2a) are d-linked (*which N*) and the *wh*-phrases (1b, 2b) are non-d-

linked(*who*).

- (1) a. Rick knew which brother Janice sang a song to before he went to bed.  
b. Rick knew who Janice sang a song to before he went to bed.
- (2) a. Which guy did Bradley send a rifle to when he was threatened?  
b. Who did Bradley send a rifle to when he was threatened?

Sentences in (1) contain embedded *wh*-questions and sentences in (2) contain direct *wh*-questions. In each sentence, the subject pronoun *he* can be coreferential with the *wh*-phrase or it can be interpreted as referring to the subject of the matrix clause (*Rick* or *Bradley*). Each sentence was followed by a question with a two-choice answer and the subjects chose between the two choices. For example, (1a, b) were followed by a question *Who went to sleep?* and the two potential answers were *Rick* or *The person Janice sang a song to*. Frazier and Clifton (2002) reported the percentage choice of *wh*-phrases as antecedent and found that the *wh*-phrase was chosen as antecedent of the pronoun more often when the pronoun followed the d-linked phrase (1a, 2a) than when it followed the non-d-linked phrase (1b, 2b). Research done for languages other than English has also argued that pronoun resolution regarding a *wh*-phrase antecedent in Spanish (Carreiras & Gernsbacher, 1992) and Dutch (Frazier et al., 1996) is similar to that in English.

Using the same written questionnaire that Frazier and Clifton (2002) used in their first experiment, Diaconescu and Goodluck (2004) tested L1 Romanian learners of L2 English to see whether the d-linked *wh*-phrase effect is observed in L2 processing or not. Diaconescu and Goodluck (2004) confirmed Frazier & Clifton's results by finding that their advanced learners of English chose the *wh*-phrase as antecedent more frequently in the case of d-linked sentences (1a, 2a) than non-d-linked phrase(1b, 2b). Diaconescu and Goodluck (2004) referred to the tendency in which the pronoun is interpreted as referring to the d-linked *wh*-phrases as the *pronoun attraction effect*.

In the present study, I used a sentence-processing experiment to test for the effect that d-linked versus non-d-linked *wh*-phrases may have on availability of discourse representation when Korean learners of English search for the referent of a pronoun.

I propose that Korean learners of English are sensitive to the pronoun attraction effect, as are native English speakers, in that the d-linked *wh*-phrase is preferred as antecedent of the pronoun rather than the non-d-linked phrase.

## RESEARCH QUESTIONS

The present study is theoretically motivated by Pesetsky's (1987) explanation that *wh*-phrases in English are separated into d-linked phrases such as *which* N and non-d-linked phrases such as *who*, and is empirically based on Frazier and Clifton's (2002) psycholinguistic experiments showing that native English speakers prefer a d-linked phrase over a non-d-linked phrase as the antecedent of a pronoun. I aim to extend Frazier and Clifton's (2002) experiment of the comprehension of d-linked and non-d-linked phrases by native English speakers, this time by observing Korean learners of English. The following questions were formulated.

1. Is the assignment of antecedents to pronouns by L2 learners of English sensitive to the semantic distinction between d-linked phrases and non-d-linked phrases?
2. How are L2 learners of English different from native English speakers in their behaviors during this process?

## THE STUDY

### Participants

Participants were 104 university students (average age, 21 years) in Korea whose proficiency level was upper intermediate; none of them had lived in an English speaking country for more than six months. The students received credits from the English course they were taking at the time of the experiment and all of them were unaware of the purpose of the experiment. Of the 104 students, I analyzed only the

data from 41 students who gave 80% or higher correct answers to the comprehension questions in the experiment. I believe that this criterion ensures that the students tested actually understood the test sentences well enough to be able to resolve the pronoun correctly and to discern the effect of antecedent type based on proper comprehension.

### Materials

The sentences used in the experiment consisted of 24 embedded questions (illustrated in 3) and 24 direct questions (illustrated in 4), 48 sentences in total, in which only the *wh*-phrase were semantically possible as antecedent of the personal pronoun. Both embedded question sentences and direct question sentences were used to investigate the generality of effect based on the construction type, and to guarantee a variety of sentences which make them superficially not alike.

Each sentence was presented as a d-linked *wh*-phrase (+DL) and a non-d-linked *wh*-phrase (-DL) version. Each version had two forms, one with a masculine pronoun and antecedent (+M) and the other with a feminine pronoun and antecedent (-M). Half the items were embedded question sentences and half were direct question sentences. Names used in the sentences were chosen to be of similar length, and the predicate could plausibly refer to both genders. The masculine pronoun and feminine pronoun were each used in two items in (3) and (4).

- (3) Embedded Question ( $\pm$ d-linked, ( $\pm$ DL),  $\pm$  male pronoun condition ( $\pm$ M)):
- a. Julia knew which brother Joan sang a song to ^ before he went to sleep.  
(+DL, +M)
  - b. James knew which sister Josh sang a song to ^ before she went to sleep.  
(+DL, -M)
  - c. Julia knew who Joan sang a song to ^ before he went to sleep. (-DL, +M)
  - d. James knew who Josh sang a song to ^ before she went to sleep. (-DL, -M)

- (4) Direct Question ( $\pm$ d-linked, ( $\pm$ DL),  $\pm$  male pronoun condition ( $\pm$ M)):

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- a. Which priest did Elisa take some food to ^ after he fell down the stairs?  
(+DL, M)
- b. Which nun did Edwin take some food to ^ after she fell down the stairs?  
(+DL, -M)
- c. Who did Elisa take some food to ^ after he fell down the stairs? (-DL, +M)
- d. Who did Edwin take some food to ^ after she fell down the stairs? (-DL, -M)

Two experimental lists were assembled and each list contained 24 experimental items, in which 12 items were embedded questions and 12 were direct questions. Half of the items contained a masculine pronoun and half a feminine pronoun, and half of the items appeared with the *which* N phrase and half with the *who* phrase. The 24 experimental items that each student read were presented with 48 sentences which were experimental items for another study and functioned as fillers for the present study; thus each list included 72 sentences. The sentences were presented in random order.

Each sentence was divided into two segments by the ^ as in (3) and (4). To assure that students paid attention while reading, the sentence was followed by a yes/no question such as “Did Linda sing a song?”; their response was followed by the feedback “Right” when the answer was correct and “Wrong” when the answer was wrong.

### **Procedure and Analyses**

The experiment was conducted using the self-paced sentence processing method. The first segment of each experimental item was presented on the computer screen and the student pressed the space bar to see the second segment. After reading the second segment, the student pressed the space bar, which caused a question to appear with “Yes” answer on the left side of the screen and “No” answer on the right side of the screen. He or she pressed the “Z” key for “Yes” and “?” key for “No” and feedback was presented immediately after the student answered. Data from the 41 students who gave 80% or higher correct answers were analyzed. The reading times of the second segment of each item were used for comparison across

conditions.

## RESULTS AND DISCUSSION

In this section, I will report the results of the experiment of the current study and discuss the pronoun attraction effect for d-linked *wh*-phrases. In addition, I will focus on the learners' behavior pattern, which was different from native speakers based on the observation that the reading times for processing the pronoun following the *wh*-phrase were different between the two constructions (i.e., direct questions vs. embedded questions). I will discuss how this observation affects second language acquisition theory.

Table 1 shows the mean reaction times (RTs) in the second segment (i.e., the subordinate clause containing the pronoun) in each condition. The mean reading times were analyzed using a three-way ANOVA with factors *wh*-interrogative (*who* vs. *which*), sentence structure (embedded vs. direct) and gender (male vs. female) as independent variables. The reading times of the second segment, which is the critical segment, was faster in the +DL condition than in the -DL condition in both embedded and directed questions ( $F(1, 40) = 46.207, p < 0.05$ ). This suggests that, like native English speakers, Korean L2 learners of English also preferred d-linked *wh*-phrases (*which* N) over non-d-linked *wh*-phrases (*who*) as the antecedent of a pronoun. In other words, *the pronoun attraction effect* was significant.

**TABLE 1**  
**Mean RTs of Segment 2 in Embedded and Direct Conditions**

Condition	Pronoun Gender		Mean
	Male	Female	
Embedded-which N (EQ/+DL)	8513	9227	8870
Embedded-who (EQ/-DL)	8887	10109	9498
Direct-which N (DQ/+DL)	11191	10977	11084
Direct-who (DQ/-DL)	14091	13485	13788

The effect of pronoun gender was not significant ( $F(1, 40) = 1.103, n.s.$ ), which means that the gender of a pronoun (*he* vs. *she*) in the second segment did not cause

difference in pronoun reference. This lack of gender effect by L2 learners also resembles findings using native English speakers in Frazier and Clifton's (2002) study.

Although Korean L2 learners of English have shown sensitivity to the pronoun attraction effect of a d-linked phrase as have native English speakers, this study revealed a phenomenon that may be unique to L2 learning. The phenomenon concerned the two kinds of sentence structure (embedded question vs. direct question) used in the experiment. The effect of sentence structure was significant: the second segments of the embedded questions were read faster than those of the direct questions in both the d-linked (+DL) condition ( $F(1, 40) = 32.185, p < 0.05$ ) and the non-d-linked (-DL) condition ( $F(1, 40) = 71.761, p < 0.05$ ).

I propose calling this *the embedding effect*, which explains that the *which* N phrase in the embedded question (5a), for example, is preferred over the *which* N phrase in the direct question (5b) as the antecedent of the pronoun in the second segment (*he*). Similarly, the *who* phrase in the embedded question (5c) is preferred over the *who* phrase in the direct question (5d) as the antecedent of the pronoun.

- (5) a. +DL/EQ: James knew which brother Julia sang a song to ^ before he went to sleep.
- b. +DL/DQ: Which brother did James sing a song to ^ before he went to sleep?
- c. -DL/EQ: James knew who Julia sang a song to ^ before he went to sleep.
- d. -DL/DQ: Who did James sing a song to ^ before he went to sleep?

Because the effect of pronoun gender was not significant, I combined the mean reading times for masculine and feminine pronouns to clarify the embedding effect observed in Korean L2 learners (Fig. 1); for comparison between Korean learners and native English speakers I also include Frazier and Clifton's results<sup>1</sup>.

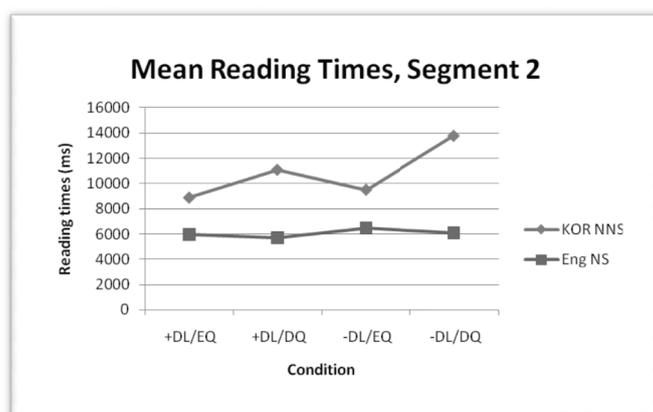
Figure 1 illustrates that Korean L2 learners had longer reading times than did

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<sup>1</sup> The reading times in Frazier and Clifton's (2002) study had been analyzed in millisecond per character, which means that they had to be converted to the reading time per segment for direct comparison with the present study.

native English speakers, which is not surprising because reading speed is expected to be faster in L1 than in L2. More importantly, *the embedding effect* was observed by Korean learners of English because the embedded questions were read faster than the direct questions in both d-linked condition and non-d-linked condition. However, in Frazier and Clifton's study native English speakers did not show the embedding effect. This means that different constructions (embedded vs. direct questions) did not affect their choice of attracting pronouns as antecedents when *wh*-phrases occur in the same d-linking condition.

In sum, native English speakers showed only the pronoun attraction effect by showing that the d-linked phrase was preferred as the antecedent of the pronoun more often than the non-d-linked phrase but they did not show the embedding effect. On the contrary, Korean learners showed both the pronoun attraction effect of a d-linked phrase, and the embedding effect by demonstrating that a *wh*-phrase in the embedded questions is preferred as the antecedent of the pronoun over a *wh*-phrase with the same feature in the direct questions.



**FIGURE 1**  
Mean Reading Times in Segment 2 in Each Question Construction

Why do L2 learners show *the embedding effect* whereas native speakers do not? That is, how can we explain why the second segment (i.e., the subordinate clause)

in (5) was read faster in the embedded question condition than in the direct question condition? First, the number of movement involved in embedded questions and direct questions is different. While embedded questions involve *wh*-movement, direct questions involve both *wh*-movement and subject-verb inversion. Thus, a question type with a higher number of movement would be more difficult to process than a question type with a lower number of movement, which means, for example, that (5b, d), direct questions, will be more difficult than (5a, c), embedded questions, to process by the learners.

Secondly, recency (O'Grady et. al, 2008) between the pronoun and its antecedent seems to be an explanation for that. When looking at (5a, b) for explanation, it is accounted for by hypothesizing that when the processor, on meeting the pronoun *he*, looks for the antecedent, both the subject of the main clause (*James*) and the *wh*-phrase (*which brother*) are candidates as the antecedent. At this moment, the possibility that *which brother* will be coreferred with the pronoun is greater than that for *James*, because a *wh*-phrase is postulated with its discourse entity more than a referent noun. With the *wh*-phrase being favored over the referent noun *James* as the antecedent of the pronoun *he*, the linear distance between the pronoun and possible antecedent (i.e., *which brother*) is closer in the embedded question (5a) than in the direct question (5b) (6 intervening words vs. 7 intervening words). Therefore, the subordinate clause in the embedded question condition was read faster than in the direct question condition. Put slightly differently, pronoun resolution was done faster in the embedded question condition than in the direct question condition, resulting in *the embedding effect*.

Finally, it is also conceivable that the embedding effect observed in Korean learners' behavior may be explained by the idea of "construction-by-construction learning" (Bley-Vroman, 1996, 1997; Kweon & Bley-Vroman, 2011) which hypothesizes that foreign languages are learned by conservative pattern accumulation. For instance, the [subject + *wh*-phrase] pattern in (5a) and [*wh*-phrase + subject] pattern in (5b) are accumulated as different constructions in the interlanguage of L2 learners; hence they show different behavior for the same *wh*-phrase according to its position in the main clause when the processor meets the pronoun in the following subordinate clause and looks for its antecedent. It seems

that Korean learners of English interpreted the [subject + *wh*-phrase] embedded question construction faster than the [*wh*-phrase + subject] directed question construction in looking for the antecedent for the pronoun.

The embedding effect found in Korean learners of English was merely observed for Romanian L1 learners of L2 English in Diaconescu and Goodluck (2004), in which the learners showed a higher percentage choice of *wh*-phrase as antecedent for a pronoun in embedded questions than in direct questions, but the embedding effect was not significant ( $p < 0.08$ ). This further suggests that L2 learners have more difficulty processing direct questions than embedded questions in the search for an antecedent of pronouns, and that this difference applies crosslinguistically. The exact reason why L2 learners do so needs further investigation.

## CONCLUSION AND PEDAGOGICAL IMPLICATIONS

Korean L2 learners of English coreferred the *wh*-phrase as antecedent for a pronoun more preferably when the *wh*-phrase was d-linked than when it was non-d-linked, resembling Frazier and Clifton's (2002) results. This result is consistent with the hypothesis that when the processor postulates a d-linked phrase, it is a much more attractive antecedent for a pronoun than is a non-d-linked phrase.

An interesting and unexpected result was observed in the present study that Korean L2 learners of English preferred a *wh*-phrase in the embedded question rather than a *wh*-phrase in the direct question as the antecedent of a pronoun. This embedding effect shows a different behavior pattern between native speakers and L2 learners. A reasonable conclusion is that native speakers and L2 learners demonstrated, on the one hand, similar behavior at the semantic-discourse level by preferring a d-linked *wh*-phrase as a potential antecedent of a pronoun, but that an L2-specific tendency was observed in which the pronoun was processed differently based on different constructions of question sentence at the superficial level.

Based on the results of the current study that L2 learners are better in embedded questions than in direct questions when *wh*-movement is involved, and in this situation, d-linked *wh*-phrases are easier than non-d-linked *wh*-phrase, some

pedagogical implications can be drawn. Teachers can understand why learners have more difficulties with *Who did James sing a song to?* (-DL/DQ) than *James knew who Julia sing a song to?* (-DL/EQ) and also why *Who did James sing a song to?* (-DL/DQ) is more difficult to the learners than *Which brother did James sing a song to?* (+DL/DQ). Especially, when learners keep making errors with -DL/DQ construction in learners' production, one of the most frequent errors being *\*Who James saw?* instead of saying correctly *Who did James see?*

By being aware of the fact that *wh*-movement and subject-verb inversion involve a double processing load to the learners, teachers can provide more explicit instructions to this particular construction for helping learners to make less errors in their speaking and writing. When an English teacher has knowledge of the fundamental reasons for errors learners make with respect to processing accounts which can broaden their insights of the behaviors of L2 learners for particular constructions, a more efficient instruction is possible based on theoretical understanding and eventually successful language learning may be facilitated.

## THE AUTHOR

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