INTERPRETATION AND PROCESSING OF OVERT PRONOUNS IN KOREAN, ENGLISH AND L2-ACQUISITION

BY

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DISSERTATION

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ABSTRACT

This dissertation investigates pronoun interpretation and processing of two languages (Korean and English), as well as in the second language (L2) acquisition of English by Korean speakers, with a focus on possible first language (L1) transfer. Using offline tasks and eye-tracking measures, the dissertation seeks answers to three primary research questions (RQs): 1) How are overt pronouns in Korean interpreted? 2) How are overt pronouns in Korean processed? 3) How do the properties of overt pronouns in Korean affect Korean-speaking English-learners' interpretation and processing of English pronouns?

Experiment 1 examined RQ 1 by testing the interpretation of Korean sentences including the overt 3rd person pronoun *kunye* 'she/her' in Korean, using two offline tasks. The focus was on whether the bound variable readings as well as the coreferential readings are available with *kunye* by testing different antecedent types – referential antecedents (names) and quantificational antecedents (*every* NP) – and whether and how *kunye* can take a clause-mate antecedent violating Principle B (Pr B) of Binding Theory (Chomsky, 1981). The results showed that Korean native speakers allowed *kunye* construed as the referential antecedent regardless of whether the antecedent was in the same local domain with the pronoun or not. However, Korean native speakers showed asymmetrical judgments with *kunye* construed as the quantificational antecedent: they rejected *kunye* when it took the local quantificational antecedent while they allowed it when it took the long-distance (LD) quantificational antecedent. These results suggest two things. One is that both bound variable and coreferential readings are available with *kunye* and the bound variable reading of *kunye* is constrained by Pr B. The other is that the instances of Pr B violation can also be found robustly due to the availability of coreferential readings and the

suspension of the rule specifying the context where the coreferential readings can surface over the bound variable readings (Rule I, proposed in Grodzinsky & Reinhart, 1993).

RQ 2 was addressed in Experiments 3 and 4 by examining whether and how Pr B is applied during the processing of the overt 3rd person pronoun in Korean, using eye-movement monitoring techniques while reading. More specifically, we tested if Korean speakers consider only the antecedents that are compatible with Pr B (i.e., LD antecedents) or they consider all the potential antecedents including the ones that are incompatible with Pr B (i.e., local antecedents) during the antecedent search process, by manipulating gender congruence between the pronoun and either of the two potential antecedents. We also tested if their processing pattern differs depending on the antecedent types (referential vs. quantificational). The results revealed the delayed gender incongruence effects with both antecedents, which indicates that both LD and local antecedents were activated during later stages of pronoun processing in Korean. The results also showed that there was no difference between the two antecedent types, which is unexpected. No ready explanation is present for why both antecedents are considered during parsing even with the bound variable reading of the overt pronoun (i.e., the pronoun with the quantificational antecedent), and hence future research should be conducted to follow up on this.

Experiments 2, 5 and 6 addressed RQ 3 by testing how Korean-speaking learners of English interpret and process English pronouns and by comparing their performance with English native speakers' performance and with their own performance in corresponding Korean tasks from Experiments 1, 3 and 4. In Experiment 2, the native speakers exhibited categorical judgments with pronouns as locally bound antecedents vs. LD bound antecedents, regardless of whether they were referential or quantificational, which suggests that their interpretation of the pronouns obeyed Pr B. However, the L2 learners' responses were not consistent with Pr B: they

overaccepted the English pronoun with the local referential antecedent, as they did with *kunye* in Experiment 1. Based on this similarity, it was suggested that their primary use of the coreferential reading in Korean may be at work and hence affect their interpretation of English pronouns. Experiment 5 also provided suggestive evidence that the pronoun processing pattern in Korean may influence their pronoun processing pattern in English when the antecedent was the referential NP. It was based on the similarity of L2 learners' processing patterns in English as well in Korean such that the L2 learners activated both LD and local antecedents in the antecedent retrieval process. Their pattern was different from that of English native speakers who established the dependency between the pronoun and the LD antecedents immediately after encountering the pronoun and considered the local antecedents too at later stages of parsing. Interestingly, in Experiment 6, no such parallelism of L2 learners' processing patterns in English and in Korean was found when the antecedents were quantificational. Instead, their processing pattern was parallel to that of English native speakers, who applied Pr B early in their processing and considered only the LD antecedents subsequently. The lack of suggestive evidence for the L1-transfer effect with the quantificational antecedents may be attributed to the different role of Pr B with referential vs. quantificational antecedents or the unresolved puzzle regarding the processing of Korean overt pronouns with quantificational antecedents.

Taken together, these results indicate that coreferential reading of the overt pronoun in Korean is readily available due to the suspension of Rule I and it influences not only how the Korean overt pronoun is processed real-time but also how Korean-speaking learners of English interpret and process English pronouns. Implications are discussed in relation to the role of the L1 in L2 acquisition/processing, as well as the status of the overt 3rd person pronoun in Korean and the general sentence processing model available to a head-final language.

To My Family

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CHAPTER 1: INTRODUCTION

1.1. Goals of this dissertation

A crucial part of language comprehension is the successful resolution of anaphoric expressions. One of the anaphoric expressions that is frequently used in our daily conversation is pronouns. Pronoun resolution normally takes place without conscious effort or awareness, yet the processes behind it are far from straightforward. This is because a pronoun, on its own, carries minimal information and does not have a fixed interpretation; pronouns are understood in relation to other elements of a text or discourse. For example, the pronouns *he* and *her* in (1) are understood in relation to *John* and *Mary*.

(1) John saw Mary while doing grocery shopping at Aldi, and he waved at her.

A pronoun requires an antecedent, another expression that allows it to be interpreted. *John* and *Mary* fulfill this role in (1). The relationship between a pronoun and an antecedent is not restricted to single sentences. An antecedent can occur in the same sentence, the previous sentence or even further back in the text or discourse. Some pronouns do not have an overt pronoun in the text or discourse at all. This tends to occur when the pronoun refers to something or someone that can easily be understood from the context. Therefore, the pronoun plays an important role in establishing discourse coherence and many linguists have studied the use of pronoun to discover constraints on pronoun interpretation. Some constraints are related to discourse organization (e.g., Ariel, 1990; Givón, 1983; Gordon & Hendrick, 1998), but others are imposed by the structure of individual sentences (e.g., Chomsky, 1981, 1986; Pollard & Sag, 1994; Reinhart, 1983; Reuland, 2001, 2011). This dissertation aims to further our understanding

of the constraints on pronouns in intra-sentential level, focusing on the object pronoun uses (i.e., *her* in (1)). This objective is achieved by investigating the pronouns in Korean that may have distinct properties from the pronouns in a well-studied language (i.e., English).

Different types of Korean reflexives have been widely investigated and the findings of the studies have been used to make implications on how they can be accounted for by the universal principles that account for the distribution of anaphors (Kang, 1988; Yang, 1985, among others). However, there has been little research on Korean pronouns, especially the overt pronouns (*ku/kunye* 'he, him/she, her'). The reason for that is partly because the overt 3rd person pronouns are not very commonly used especially in oral discourse in Korean (Y. J. Kim, 1997). Given that they are being used relatively frequently in written discourse, however, their behavior should be investigated. Therefore, this study aimed to definitively establish the interpretation of Korean overt pronouns using experimental methodology. Investigating this issue will advance our understanding of the full anaphoric inventory of Korean, which can further contribute to linguistic theory accounting for the distribution of pronouns: if Korean pronouns behave differently than pronouns in more commonly studied languages, such as English, then it is necessary to modify linguistic theories to account for these cross-linguistic differences.

In addition to contribute to the syntactic approaches constraining the relationship between the pronoun and the intra-sentential antecedent, this dissertation aims to explore the role of the syntactic constraints during real-time pronoun resolution. The way in which pronoun resolution unfolds over time is not fully understood, but research in this area has uncovered certain aspects of the process. Like other aspects of sentence processing, pronoun processing takes place incrementally. Even though the search process begins rapidly upon encountering the pronoun, pronoun processing can be a lengthy process because it includes activation of potential

antecedents, evaluation of them and integration of the most appropriate antecedent as the meaning of the pronoun. With regard to the role of syntactic constraints during the search process, there are mainly two arguments. Some researchers have claimed that processing is faithful to structural restrictions such as those captured in Binding Theory from the beginning of the search (e.g., Nicol & Swinney, 1989). Others have claimed that potential antecedents which are ruled out by structural constraints nonetheless affect processing, because the parser also pays attention to a potential antecedent's features such as gender and number (e.g., Badecker & Straub, 2002). Between the two, the accumulated evidence on English pronoun processing provides supports for the early application of structural restrictions during the antecedent search process. However, since the prior research has tested only English and have not looked at a language such as Korean where structural constraints can be easily violated (Choi, 2013; Im, 1998), it is unclear whether the first model can account for pronoun processing crosslinguistically. Therefore, this dissertation aims to contribute to this body of research by extending the investigation of how pronouns are processed in Korean, where the structural constraints may not operate same way as in English.

The pronouns can sometimes be misinterpreted among speakers especially speakers with different linguistic backgrounds, resulting in potential break-down of communication. This is because their interpretations are under-determined and dependent on context. Nevertheless, research on second language (L2) acquisition have reported conflicting findings about L2 learners' pronoun interpretation at the sentence level when they tested L2 learners' judgments on whether *her* in the sentence like (2) can take *Susan* as its antecedent.

(2) Mary said that Susan likes her.

Some studies have shown that adult L2-English learners have little difficulty with the pronoun *her*, correctly disallowing the clause-mate antecedent *Susan* (Patterson, Trompelt, & Felser, 2014; White, 1998), whereas others have found that the clause-mate antecedent are incorrectly allowed (Lee & Schachter, 1997; Kim, Montrul, & Yoon, 2015). There must be a reason for such contrasting findings, but it has not been investigated systematically in the literature. Research on L2 acquisition has proposed different sources for the non-nativelike performance. One of them is the pre-existing knowledge of the grammar of another language. Since the acquisition of L2 starts with their native language (L1) grammar acquired earlier in life, influence from L1 grammar is expected in L2 acquisition. Many models of L2 acquisition have argued for the role of L1-transfer both in the initial state (e.g., Schwarts & Sprouse, 1996), and in the end state grammar of near-native L2 speakers (e.g., Sorace, 2000, 2006). Interestingly, the residual L1 effects among advanced L2 learners were usually reported for grammatical aspects involving the interface between syntax and other domains (the interface hypothesis, Sorace, 2011). Pronoun resolution is at the interface between syntax and semantics/pragmatics (Huang, 2004), and thus there is reason to expect the L1 to play a role in L2-English pronoun resolution even with advanced learners. Therefore, this dissertation examines the L1-transfer effect in the domain of pronoun interpretation. Also, based on the previous findings that the L1 effect is attested in L2-processing studies of online comprehension (Dussias, 2003; Juffs, 2005; Papadopoulou, 2005), whether the L1 affects L2-learners' processing of pronouns was tested. The investigation of this issue will further our understanding of the role of L1 in L2 acquisition and processing.

In the rest of this chapter, I will discuss characteristics of L2 acquisition and processing in general, focusing on the differences from L1 acquisition and processing. Since a large part of this dissertation focuses on how pronouns are interpreted by L2 learners, it is important to understand what factors are known to influence L2 acquisition and processing, and how L2 acquisition and processing differs from L1 acquisition and processing. I turn to this next.

1.2. General background in L2 acquisition and processing

Adult second language acquisition is different from children's first language acquisition in many ways. One obvious difference between them is in ultimate attainment. L2 learners hardly ever achieve nativelike proficiency in their L2 no matter how much exposure they have had to the L2. Many studies in the field of Second Language Acquisition (SLA) attempt to answer the question of why L2 learners fail to reach ultimate attainment. In order to answer the question, the differences between L1 acquisition and L2 acquisition have to be discussed.

One most obvious difference is the age of acquisition. L2 learners learn a new language as an adult while L1 acquisition occurs to a child. Based on this difference, researchers have proposed that (second) language acquisition is constrained by a critical period (e.g., Lenneberg, 1967). In other words, there is a maturationally limited time window which privileges language acquisition. According to this view, adult L2 learners cannot achieve nativelike competence because they begin to learn L2 after they pass this critical period (DeKeyser, 2000; Johnson & Newport, 1989; McDonald, 2000). However, studies have begun to show that the age effects do not apply equally to all linguistic domains, but certain components of linguistic knowledge are more subject to the age effects than the others (e.g., Hopp, 2007; Paradis, 2004). The debate is

still ongoing but many researchers agree on the fact that phonology is more prone to the age effects than other linguistic domains (e.g., syntax, semantics).

Related to the age effects, the nature of the learning mechanism is also discussed in the literature as another difference between L1 and L2 acquisition. Children learn their native language implicitly by being exposed to the input while adult L2 learners typically learn their L2 explicitly through instruction. Based on this difference, research has been carried out to compare the implicit and the explicit learning conditions for adult L2 learners. Interestingly, adults show an advantage for explicit learning over implicit learning (DeKeyser, 1995; N. Ellis, 1993; Norris & Ortega, 2000; VanPatten & Oikkenon, 1996). Although this dissertation does not concern the implicit/explicit distinction in L2 acquisition, the distinction relates to this dissertation. I used two types of tasks in this dissertation. One was an eye-movement monitoring task, which is an implicit task where participants' knowledge is tested in an indirect way by recording their eye movements while reading sentences. The other tasks were offline judgment tasks where their grammatical knowledge is more explicitly assessed by asking participants' judgments on given sentences. The goal of using these tasks was not to investigate the two types of knowledge but to understand L2 learners' linguistic representations thoroughly, therefore I leave the issue of the implicit/explicit distinction aside in this dissertation.

One last difference between L1 and L2 acquisition that is frequently discussed in the L2 literature is that adult L2 learners have already mastered one language. Based on this difference, many researchers have discussed the role of L1 in L2 acquisition. There is ample evidence that properties of L1 influence L2 acquisition across the course of L2 development (e.g., Odlin, 2003; Sablakova, 2003; White, 2003). For example, L2 learners whose first language is typologically similar and hence has similar linguistic properties to the L2 have higher chance of attaining

nativelike grammatical representations in the L2 (e.g., Coppieters, 1987; Schwartz & Sprouse, 1996; Sorace, 1993). Despite the fact that a large number of studies have been conducted to examine the effects of the L1 in L2 acquisition, there are some questions that we do not have definitive answers for. One of them is whether the advanced L2 learners are still susceptible to L1 transfer effects. Studies have reported that cross-linguistic influence is at work at the L2 end state especially when the target structure is at the interface of two linguistic domains such as syntax-semantics and syntax-pragmatics (see *the interface hypothesis* in Sorace & Filiaci, 2006 and Sorace, 2011).

While all of the above factors – age, nature of the learning mechanisms, L1 – are important, this dissertation chooses to focus primarily on the role of L1. Specifically, this dissertation aims to address the issue of L1 transfer effect at the L2 end state grammar in the domain of L2 pronoun acquisition, which is known to be at the interface of syntax and semantics/pragmatics. The typical design for testing L1 transfer effect is to have two L1 groups that differ in the relevant way. This dissertation, however, adopts a non-typical design for testing L1 influence. There is only one L1 group, instead of two. Even though there is only one L1 group, it is still possible to make a claim about L1 transfer, because their L1 and L2 are tested and finding similar patterns in their performance of both L1 and L2 would provide strong evidence that it is transfer.

Similar issues have been discussed in L2 processing literature. The primary question is whether L2 processing is qualitatively different from L1 processing (e.g., Clahsen &Felser, 2006; Dekydtspotter, Schwartz & Sprouse, 2006; Frenck-Mestre, 2002). This question further motivates researchers to come up with the potential source of differences between L1 and L2 processing. Many variables that can affect L2 processing are proposed in previous studies, but

three most frequently discussed ones are L1 effects, L2 proficiency levels, and working memory. While effects of L2 proficiency and working memory capacity are relatively prevalently attested (see Hahne & Friederici, 2001 and Indefrey, 2006 for L2 proficiency effects and Dussias & Pinar, 2010 and Felser & Roberts, 2007 for working memory effects), there is less conclusive evidence for the influence of L1 processing strategies on L2 parsing. Some studies have reported the effects of L1 on L2 in L2 processing (e.g., Chen et al., 2007; Jiang, 2004; Tokowicz & MacWhinney, 2005) but others have found no effect (e.g., Felser et al., 2003; Williams, 2006). This dissertation aims to contribute to this issue, by testing L2 learners' L1 and L2 processing patterns and seeing if the learners exhibit the same processing preferences in their L1 as in their L2, differing from the native speakers of the L2, which would suggest L1 effects in L2 processing.

1.3. Organization of this dissertation

This dissertation is organized as follows. Chapter 2 lays out the theoretical background on pronoun binding. It also presents a description of Korean pronouns, processing literature on pronouns, and pronoun acquisition/processing in L2-English. Chapter 3 describes the procedures of the experiments conducted in this dissertation along with the specific research questions and the participants for the experiments. Chapter 4 presents the materials and the predictions of the two offline experiments (Experiments 1 and 2). It also reports the results of the two experiments and discusses the implication of the results in relation to the status of the overt 3rd person pronoun in Korean and the L1-trasfer effect in L2-English pronoun interpretation. Chapter 5 outlines the details of the methods and the predictions of the online experiments (Experiments 3, 4, 5 and 6). The results of the experiments are provided as well in Chapter 5 together with the

discussion of the results in terms of the role of Principle B during real-time language processing in Korean and the role of L1 in L2-English pronoun processing. Finally, Chapter 6 summarizes the findings of this dissertation and the relevant discussion regarding the findings. The limitations of the study and future direction are also included in Chapter 6.

CHAPTER 2: THEORIES ABOUT PRONOUNS, PRONOUN PROCESSING AND L2-PRONOUN ACQUISITION/PROCESSING

This chapter presents the theories and properties of pronouns in general as well as Korean overt pronouns. It also presents pronoun processing models focusing on the role of Principle B during parsing. The chapter concludes by introducing L2-English pronoun acquisition and processing.

2.1. Theoretical approaches to pronouns

Successful pronoun resolution involves the identification of a correct antecedent from the surrounding discourse, and it is often the case that more than one potential antecedent is available. However, there are strong restrictions on the selection of antecedents that occur within the same sentence as a pronoun. One of these restrictions is known as Principle B (Pr B) of the classical Binding Theory (BT, Chomsky, 1981). This constraint prevents a pronoun from referring to an antecedent in its local binding domain. In other words, pronouns may not have a c-commanding coindexed antecedent within the same clause or DP (the governing category). For instance, the pronoun *her* in (1) cannot refer to *Megan*:

(1) Mrs. Johnson said that Megan painted her.

Chomsky's BT which assumes that licensing a pronoun can be achieved entirely structurally, however, has been challenged in several different theoretical approaches, particularly by researchers who have claimed that pragmatic principles must also play a role

(Pollard & Sag, 1994; Reinhart, 1983; Reuland, 2001, 2011, among others). Reinhart (1983)[1], as one of such attempts, proposes that a distinction is needed between **variable binding** and **coreference**, two ways in which a pronoun[2] can be linked to an antecedent. **Variable binding** is a semantic operation that takes place under certain structural restrictions, one of which is Pr B, and a bound variable interpretation is obtained by the pronoun being bound on its accessible antecedent (2). **Coreference**, on the other hand, is free from such structural constraints but is guided by extrastructural cues such as pragmatic or contextual cues, and its reading is obtained by picking out the same entity as another NP (2) in the discourse. While the two modes are not easily distinguished when a pronoun is anaphoric to a referential NP, only the bound variable reading can obtain when a pronoun is dependent on a quantificational NP (QP) such as *no girl* (2) or a *wh*-phrase such as *which man* (2), since either the QP or the *wh*-phrase does not refer. There are diagnostics that can distinguish the two modes of interpretation available to pronouns other than by limiting the antecedent type as a QP or a *wh*-phrase, and they will be further discussed in the following section.

(2) a. Mary$_i$ thinks that she$_i$ is a genius.

a'. For x, such that x is Mary and x thinks that x is a genius. (bound variable reading)

a''. For x, such that x is Mary and x thinks that Mary is genius. (coreferential reading)

b. No girl$_i$ thinks that she$_i$ is a genius.

c. Which girl$_i$ thinks that she$_i$ is a genius?

[1] Reinhart's approach is developed in subsequent work, and also forms an important part in Reinhart and Reuland (1993). It is also incorporated into Reuland's later work on binding (Reuland, 2001, 2011).

[2] The term bound pronouns are used in this dissertation for the syntactically bound pronouns which refer back to an antecedent (NP) mentioned within the sentence.

It seems that in many cases, the distinction between the two modes of pronoun interpretation is not needed because Chomsky's Pr B, which does not distinguish the two, could capture the distribution of pronouns in general. However, it is necessary to impose such a distinction because occasional violations of Pr B, seemingly caused by the existence of the two interpretational status, have been noted. In particular, children allow pronouns with clause-mate antecedents, but only if the antecedent is a referential NP (3) (Chien & Wexler, 1990, among many others). When the antecedent is a QP, where only a bound variable reading is available, children correctly rejected the pronouns bound by local antecedents.

(3) a. (Why do you think nobody painted Mary?) Mary painted her.

b. (Why do you think nobody painted themselves?) *Every girl$_i$ painted her$_i$.

This asymmetry has been suggested to be explained by the fact that Pr B interacts with more pragmatic information which may not be available to young children, or that children's more limited processing resources may reduce their ability to consider multiple sources of information in parallel (e.g., Thornton & Wexler, 1999; Reinhart, 2006). While this asymmetry has been attested in a large number of studies, more recent works have raised the question that it can be explained by methodological flaws (Conroy, Takahashi, Lidz, & Phillips, 2009; Elbourne, 2005). While their results showed that children perform better than is often assumed in the literature when tested in more carefully controlled experiments, children still made some errors by considering inaccessible antecedents for pronouns. Violation of Pr B like (3) is sometimes observed even among adults (Reinhart & Reuland, 1993; Buring, 2005). If both children and adults interpret the pronouns through coreference in (3), and if coreference, unlike the bound

variable interpretation, is not constrained by BT (Pr B), the occasional violations of Pr B makes sense. Nonetheless, it is still unclear why such coreferential readings licensed in the discourse, bypassing grammars, are not frequently allowed. In order to account for that, Grodzinsky & Reinhart (1993) proposed Rule I[3].

(4) Rule I: Intrasentential Coreference

NP A cannot corefer with NP B if replacing A with C, C a variable A-bound by B, yields an indistinguishable interpretation (Grodzinsky & Reinhart, 1993: 79)

Rule I specifies the context where coreferential interpretation of pronouns can be obtained. According to this rule, clause-mate antecedents are not possible for pronouns in general, because priority is given to syntax (yielding bound variable reading of pronouns) over discourse (yielding coreferential reading of pronouns) when encoding the dependency. In other words, a pronoun gets interpreted as a bound variable in general, and thus a pronoun is subject to Pr B, disallowing a local antecedent. However, when some kind of meaning difference is associated with the pronoun interpretation, a coreferential reading can obtain and in such a reading, a pronoun can take a clause-mate antecedent overriding syntactic constraints.

2.2. Properties of bound variable readings of pronouns

Theoretical researchers have suggested several diagnostics that can distinguish bound variable reading from coreferential reading (e.g.,Büring, 2005; Grodzinsky & Reinhart, 1993; Heim,

[3] The rule governing this coreference relation has been referred to as Principle P by Wexler and Chien (1985).

1982; Reinhart, 1983). In this section, I introduce them, and explain how the bound variable reading is intended in this dissertation.

The first diagnostic is based on the availability of taking a QP or a *wh*-phrase as its antecedent. As discussed in the previous section, if the antecedent of the pronoun is a QP or a *wh*-phrase, the pronoun is assumed to have a bound variable interpretation. It is because the antecedent cannot refer to one entity but its reference varies depending on which entities are encompassed. Therefore, as shown in (2) repeated here as (5) for convenience, the pronoun in (5) cannot be interpreted to have a coreferential reading because the antecedent for *she* is a QP *no girl*.

(5) a. Mary$_i$ thinks that she$_i$ is a genius.

b. No girl$_i$ thinks that she$_i$ is a genius.

Second diagnostic is a configurational one. For a pronoun to have a bound variable construal, an antecedent must be in the position where it c-commands the pronoun (Evans, 1980). Non-c-commanding NP can be the antecedent of the pronoun, but the mechanism that licenses the relationship between the pronoun and the antecedent is coreference assignment not variable binding. Such a contrast is well illustrated in the following example.

(6) a. The photographers [that the cyclist$_i$ posed for] still had pictures of him$_i$.

b. The photographers [that every cyclist$_{*i}$ posed for] still had pictures of him$_i$.

In (6), the NP *the cyclist* can serve as an antecedent for the pronoun him while the QP *every cyclist* which appear in the same position as the NP in (6b) cannot. This indicates that an antecedent that appears in a non-c-commanding position cannot establish binding relation with a pronoun but coreference relation can be established.

Third diagnostic is based on the strict vs. sloppy identity in contexts of VP ellipsis (Cole, Hermon & Huang, 2001; Reinhart, 1983). In the elliptical VP in (7), the pronoun *his* can mean *John* or *Bill*. The former (*his = John's*, (7)) is called the **strict identity** reading, and the latter (*his = Bill's*, (7)) is called the **sloppy identity** reading. Reinhart (1983), following earlier researchers, takes the sloppy identity to arise through variable binding and the strict identity to arise through coreference.

(7) John hates his brother, and Bill does (Bill hates his brother) too.

a. John hates John's brother, and Bill hates John's brother too. (strict identity reading)

b. John hates John's brother, and Bill hates Bill's brother too. (sloppy identity reading)

Fourth diagnostic is related to whether the split antecedents are possible. Consider the following sentence:

(8) a. John_i told Mary_j to order for both of them_{i+j}.

b. *?John_i told Mary_j about themselves_{i+j}.

As shown in (8), reflexives do not admit split antecedents whereas pronouns do. Given that reflexives can be construed only as a bound variable, inability to take split antecedents of reflexives seems to suggest that split antecedents are only possible with the coreference. The properties that can distinguish the two readings are summarized in Table 2.1.

Table 2.1. Properties of bound variable pronouns and coreferential pronouns

BOUND VARIABLE PRONOUNS		COREFERENTIAL PRONOUNS
Yes	QP antecedent	No
Yes	c-commanding antecedent	No
Sloppy reading	strict vs. sloppy reading	Strict reading
No	split antecedent	Yes

2.3. Pronouns in Korean

In this section, properties of Korean pronouns, focusing on those for overt 3rd person pronouns, are described. Korean has a different pronominal system from that of English, although its distribution is known to be subject to the non-locality constraint (i.e., Principle B). In English, as a non-*pro*-drop language, pronouns must be overtly expressed as shown in (9) below. If pronouns are phonologically null (*pro*) as in (9), it is not acceptable.

(9) a. John$_i$ believes that he$_i$ is intelligent.[4]

b. *John believes that pro is intelligent.

[4] In this sentence, *he* can refer back to someone not mentioned in the sentence as well as *John* which is the matrix subject. However, since the main concern of this study does not include how pronouns build a relationship with a discourse antecedent, the possibility of taking a discourse antecedent in pronoun interpretation would not be discussed.

On the other hand, in a *pro*-drop language, it is possible to have phonologically null pronouns. Typical example of such languages are Romance languages such as Spanish and Italian, and in those languages, both null pronouns and overt pronouns are allowed to appear in a subject position as in (10). Korean is also a *pro*-drop language (or argument drop language), and hence it has both null and overt pronouns. One difference from the Romance-style *pro*-drop languages (or null subject languages) is that it allows more extensive use of null arguments in both subject (10) and object positions (10)[5].

(10) a. Juan$_i$ cree que [*pro*$_i$/ él$_i$ es inteligente] (Spanish; Montalbetti, 1984)

Juan$_i$ believes that *pro*$_i$/ he$_i$ is intelligent

'Juan$_i$ believes that he$_i$ is intelligent.'

b. John$_i$-un [*pro*$_i$/ ku$_i$-ka ttokttokhata]-ko mitnunta. (Korean)

John$_i$-TOP *pro*$_i$/ he$_i$-NOM intelligent-COMP believe

'John$_i$ believes that he$_i$ is intelligent.'

c. John$_i$-un [Paul$_j$-i *pro*$_{i/*j}$/ ku$_{i/?j}$-lul towacwulkela]-ko mitnunta. (Korean)

John$_i$-TOP Paul$_j$-NOM *pro*$_{i/*j}$/ him$_{i/?j}$-ACC help-will-COMP believe

'John$_i$ believes that Paul$_j$ will help him$_{i/*j}$.'

In (10) and (10), the overt subject pronoun can refer to the matrix subject *Juan*/*John*. Like the overt counterpart, the null pronoun can also be referential with the matrix subject.

[5] There is a debate on the status of null argument in object position in East Asian languages. Huang (1984, 1989), for example, has argued that a null object is a variable bound by a null topic operator not *pro* as opposed to a null subject which is classified as *pro*. On the contrary, other researchers have suggested that a null argument is a pronominal, regardless of whether it occurs as a subject or an object based on the observation (e.g., Cole, 1987; Hoji, 1998; Hong, 1986; Zushi, 2003). Following the latter analysis, null objects in Korean will be assumed as *pro*.

Similarly, in (10), the overt object pronoun can refer to the matrix subject. Therefore, it appears that the overt and null pronouns can be used interchangeably[6]. However, if we consider the following example, it becomes clear that the distributions of the two are not in free variation.

(11) a. Nadie$_i$ cree [que *pro*$_i$/ él$_{*i}$ es inteligente]. (Spanish)

Nobody$_i$ believes that *pro*$_i$/ he$_{*i}$ is intelligent.

'Nobody$_i$ believes that he$_i$ is intelligent.'

b. Motwu$_i$-ka [*pro*$_i$/ ku$_{*i}$-ka ttokttokhata]-ko mitnunta. (Korean)

Everyone$_i$-NOM *pro*$_i$/ he$_{*i}$-NOM intelligent-COMP believe

'Everyone$_i$ believes that he$_i$ is intelligent.'

(11) shows that an overt pronoun cannot take a quantificational NP as its antecedent. In other words, a bound variable interpretation of an overt pronoun is not induced. In order to capture such an interpretive contrast between the two pronouns in *pro*-drop languages, Montalbetti (1984) proposed the Overt Pronoun Constraint (OPC), which states that overt pronouns in *pro*-drop languages disallow a bound variable interpretation in situations where null pronouns are available. Many studies have examined whether this phenomenon is observed in different types of *pro*-drop languages (e.g., Gurel, 2003; Kanno, 1997; Lozano, 2003) and claimed that it is found in any *pro*-drop languages, regardless of the language family they belong to (White, 2003). Korean, as one of the *pro*-drop languages, overt pronouns are claimed not to allow a bound variable interpretation. However, the status of the OPC in Korean has been a

[6] A certain discourse-driven meaning difference between the two pronouns would be observed, though, such that null pronouns are used to refer to 'topic' while overt pronouns are used to show 'comparison' or 'focus' (Lozano, 2003).

matter of debate (Kang, 1988; Lee, 2001, among others). Some researchers claim that the overt pronoun *ku* 'he/him' (and its feminine counterpart *kunye* 'she/her') can be construed as a variable bound by the quantificational antecedents (Kang, 1988; Noguchi, 1997; Koak, 2008) while others argue against it (Hong, 1985; Choe, 1998; Kang, 2000). This means that there is a lack of consensus on whether the OPC holds true in Korean. Until recently, little attempt has been made to resolve this issue.

K. M. Kim and Han (2016), as an attempt to clarify the true nature of Korean overt 3rd person pronoun, have conducted experiments, and provided evidence suggesting for the presence of between-speaker variation regarding the interpretative status of *ku*. Using a Truth Value Judgment Task with stories, they tested if Korean speakers are willing to accept *ku* in a subject position bound by a QP (*motwu* 'everyone') and found out that Korean speakers accept the bound variable reading of *ku* about 50%. Further analysis on their results indicated that 50% acceptance was due to the bimodal distribution of participants' performance. Based on that, they concluded that inter-speaker variation may exist with regard to the availability of a bound variable construal of *ku*. Their study is meaningful in that they tried to explore the current status of *ku* by testing linguistically naïve Korean speakers using experimental methodology, but it has some limitations because 1) only *ku* 'he/him' (masculine form) was used in the experimental sentences, and 2) only its interpretation in the subject position was targeted.

One thing to note in their study is that they pointed out the co-existence of two types of *ku*. Moreover, they claimed that the inter-speaker variation regarding the availability of the bound variable reading of *ku* may be attributed to this co-existence of the two different grammars of *ku*, following the *two-grammar hypothesis* by Han, Lidz and Musolino (2007). According to Han et al., when the primary linguistic data that child learners of a given language are exposed to

is compatible with (at least) two competing grammars, along with the lack of relevant input data that would assist them to choose between the two, they have to choose one grammar at random. Therefore, some learners may acquire one grammar and others may acquire another, thus resulting in the presence of two groups of speakers having different grammars in the given language community.

K. M. Kim and Han (2016) argued that the status of the pronominal *ku* can be explained by the hypothesis proposed in Han et al. (2007). The pronominal *ku* is homophonous with the demonstrative *ku* 'that', which forms a part of the Korean tripartite demonstrative system[7]. Therefore, the input data regarding *ku* exposed to the child native speakers of Korean would be compatible with two competing grammars, the pronominal *ku* and the demonstrative *ku* combined with a DP. The relevant input to assist them to choose one grammar over the other is insufficient, and consequentially some may end up acquiring the pronominal *ku* and others may acquire the demonstrative *ku*. Due to the presence of the two groups with different grammars regarding *ku*, some would allow the bound variable reading (those with the pronominal *ku*) and others would not allow it (those with the demonstrative *ku*).

Although their claim seems reasonable, it is not clear if there are indeed two populations with different grammars. One way to assess their claim, although it would not completely resolve the issue, is to use a feminine pronoun form *kunye* 'she/her'[8] because at least it is not

[7] The tripartite demonstrative system in Korean is like the following:

a. *i chak* 'this book'
b. *ku chak* 'that book'
c. *ce chak* 'that book over there'

The demonstrative *ku* can refer to an object close to hearer or invisible (but known) to both hearer and speaker while *i* 'this' and *ce* 'that over there' refer to an object close to speaker and an object distant from both hearer and speaker, respectively. (Sohn, 1999).

[8] Gender information is encoded in Korean overt 3rd person pronouns (*ku* 'he', *kunye* 'she'). Historically, *ku* was first used as a gender-neutral form. *Kunye* was later coined by those writers who used *ku* as a masculine pronoun and

homophonous to the demonstrative *ku* and thus the comprehenders may not be confused with it. Hence, *kunye* 'she/her' instead of *ku* 'he/him' was used in the current study. Another limitation of their study is that they tested *ku* only in the subject position. As discussed earlier, null/overt alternation can appear in the object position too in Korean, and it has been claimed that the OPC effect may be found in the object position in Korean (see Song, 2013). Therefore, we need to see how overt pronouns are interpreted in the object position in addition to those in the subject position for a more complete and accurate picture capturing the interpretation available to Korean overt 3rd person pronouns, and this was examined in the current study.

In addition to the properties discussed above, the applicability of Pr B to Korean pronouns need to be discussed for the purpose of this study. In the literature, it is assumed that Korean overt pronouns abide by Pr B. However, some studies have found examples where pronouns can sometimes take a clause-mate antecedent especially if appropriate contextual cues are given (Choi, 2013; Im, 1988, 1998; E. H. Kim, 2014; E. H. Kim, 2015). For example, in Kim (2014), I provided experimental data showing that the pronoun *ku*/*kunye* co-indexed with a local antecedent is accepted with a story which establishes the locally bound interpretation for the pronoun (45.4% of acceptance). Also, in another study which mainly investigated reflexive and pronoun interpretation inside picture noun phrases, I showed that Korean speakers often accept pronouns with the local antecedent. It was not as robust as the pronouns bound by the non-local antecedents, but the acceptance rate was high enough not to be ignored as the performance error (32.7% of acceptance). While it is implied in those studies that the pattern found with Korean overt pronouns do not seem to be strictly constrained by Pr B, why such a pattern was observed was not systematically tested. It may be due to the suspension of Rule I in Korean. As noted

thus needed a corresponding feminine form (An, 2008). Because of that, we can still find the usage of *ku* as a gender-neutral form sometimes, but *kunye* is never used as such.

earlier, even in English, local antecedents are allowed for pronouns through coreference as long as Rule I is satisfied, but since those situations where the bound variable reading and the coreferential reading are not identical are rare, locally bound pronouns are not frequently observed. If overt pronouns in Korean are not (or tend not to be) used as bound variables, perhaps Rule I applies vacuously. It is because there is no bound variable interpretation to be ruled out for pronouns. If that is the case, the local coreferential interpretation, which can obtain by bypassing grammar, surfaces more easily in Korean. If we are on the right track, we can expect that such Pr B violations will be attested only with referential clause-mate NP antecedents, and not quantificational ones. Therefore, the present study set out to test this prediction by investigating how native speakers of Korean interpret pronouns with different types of antecedents that appear in configurations where Pr B is (apparently) violated, using various experimental methodologies.

2.4. Principle B in sentence processing

In this section, I review how the role of Pr B has been captured in pronoun processing models in previous literature. While theoretical linguistics is concerned with the correct formulation of restrictions on a pronoun's reference, psycholinguistic research has a different concern such as the role of linguistic constraints in memory retrieval processes in the course of real-time comprehension. Because pronoun processing normally involves the identification of a suitable referent, a key question in processing research is whether the real-time search for a referent is constrained by structural constraints such as Pr B. Psycholinguistic research in this area gives a rather mixed picture, with evidence both for and against a restricted search by the BT having been found (see Nicol & Swinney, 2003; Sturt, 2013 for reviews). While existing accounts differ

on many aspects, one critical point of contention among them concerns whether and how structural constraints impact the initial antecedent-retrieval processes. Some have argued that only structurally accessible potential antecedents are considered during the early processing stages (e.g., Nicol & Swinney, 1989; Clifton, Kennison, & Albrecht, 1997; Clifton, Frazier, & Deevy, 1999; Patterson et al., 2014), while others have claimed that structurally inaccessible antecedents can be retrieved initially if they carry matching features with the pronoun (e.g., Badecker & Straub, 2002; Kennison, 2003; Runner, Sussman, & Tanenhaus, 2006).

2.4.1. Pr B as an initial constraint on antecedent search

One of the most well-known studies on the role of Pr B in bound pronoun processing is Nicol and Swinney (1989) [9]. Using the cross-modal priming technique[10], they have assessed the reactivation of structurally accessible and inaccessible antecedents of a pronoun, and they claim that the search for antecedents is structurally licensed. An example of the material from their study is given below:

(12) The boxer told the skier [that the doctor for the team would blame him for the recent injury].

In (12), *doctor* is an inaccessible antecedent for the pronoun *him* because it is excluded by Pr B, whereas both *boxer* and *skier* are accessible antecedents. Their results showed

[9] They tested various anaphoric elements including *wh*-traces, NP-traces, reflexives, pronouns, and PRO as the basis of their hypothesis, but for the purpose of this study, their findings related to pronouns will only be discussed.
[10] In a cross-modal priming, participants listen to sentences while looking at a screen, and at particular points in the sentence a word is presented on a screen. Participants have to make a decision regarding the word that they see (i.e., lexical decision task). (VanPatten & Jegerski, 2010)

significant priming effect for *boxer* and *skier*, but no such effect was found for *doctor*. That is, participants responded faster to words semantically related to *boxer* or *skier* than words that were unrelated while they failed to show such pattern with the words semantically related/unrelated to *doctor*. Based on the results, they have concluded that Pr B constrain the reactivation of candidate antecedents limited to the accessible ones.

Further evidence that inaccessible antecedents are ruled out immediately and therefore do not affect the processing of a pronoun comes from the studies conducted by Clifton and colleagues. Using a self-paced reading technique, Clifton, Kennison and Albrecht (1997) compared reading times for the sentences like (13), where one had a pronoun matched in terms of number feature to a locally present NP (*him – supervisor*) and the other had a pronoun mismatched in number to a local NP (*him – supervisors*). They found that the number mismatch does not impact reading times in conditions with an object pronoun while it does impact reading times in conditions with a possessive pronoun, for which the subject is a structurally accessible antecedent. In another self-paced reading study where the gender of the inaccessible antecedent was manipulated as shown in (13), they failed to find evidence of the inaccessible antecedent's gender affecting pronoun processing (Clifton, Frazier, & Deevy, 1999). That is, their results showed no statistical significant reading time difference when the embedded subject was a gender-matched NP *Bill* in comparison with when the embedded subject was a gender-mismatched NP *Betsy*.

(13) a. The [supervisor/ supervisors] paid [him/ his assistant] yesterday to finish typing the manuscript.

b. John thinks that [Bill/ Betsy] owes him another chance to solve the problem.

More recently, the effects of gender match between pronouns and accessible/inaccessible antecedents have been examined using a more time-sensitive measure like an eye-movement monitoring during reading paradigm (Chow, Lewis, & Phillips, 2014; Patterson et al., 2014). Replicating earlier findings, their results showed that reading times were disrupted by the gender mismatch with an accessible antecedent, but not by the gender features of an inaccessible antecedent.

The findings from the above-mentioned studies are used to support Nicol and Swinney's (1989) hypothesis that binding conditions are applied before candidate antecedents are evaluated, ensuring that no inaccessible antecedents are considered. This hypothesis is often referred to as the *binding as initial filter* (BAIF) hypothesis. The idea behind BAIF is that grammatical constraints take priority over other types of cues being used during parsing.

2.4.2. Pr B as a defeasible constraint on antecedent search

There is a slightly different version of the BAIF hypothesis discussed in literature. The hypothesis, which I will refer to as *binding as defeasible filter* (BADF) hypothesis, was suggested by Sturt (2003), a study on the timing of binding conditions for reflexives using an eye-tracker. While his study concerns reflexives rather than pronouns, I discuss it here because of its relevance in terms of the binding conditions and the processing hypothesis. Sturt (2003) manipulated the stereotypical gender match between reflexives and accessible and inaccessible antecedents. In the first experiment the sentence types provided in (14) were used.

(14) a. Accessible match/inaccessible match

Jonathan was pretty worried at the City Hospital. He remembered that the surgeon had pricked himself with a used syringe needle. There should be an investigation soon.

b. Accessible match/inaccessible mismatch

Jennifer was pretty worried at the City Hospital. She remembered that the surgeon had pricked himself with a used syringe needle. There should be an investigation soon.

c. Accessible mismatch/inaccessible match

Jennifer was pretty worried at the City Hospital. She remembered that the surgeon had pricked herself with a used syringe needle. There should be an investigation soon.

d. Accessible mismatch/inaccessible mismatch

Jonathan was pretty worried at the City Hospital. He remembered that the surgeon had pricked herself with a used syringe needle. There should be an investigation soon.

Sturt (2003) expected that there would be an effect of the stereotypical gender of the accessible antecedent, with disruption when there was a mismatch between the antecedent's stereotypical gender and the gender of the reflexive. Moreover, he was particularly interested in finding out whether the gender of the inaccessible antecedent would affect the processing of the reflexive, and if so, at what point. The results showed a clear accessible mismatch effect in the expected direction: participants' reading times increased when, for example, they had to link the female reflexive *herself* to the stereotypically male, accessible antecedent *surgeon*. This effect was shown in very early measures (first-fixation times and first-pass times) on the reflexive

itself. There was no reliable effect of the inaccessible antecedent in these early measures. However, interestingly, there was a reliable effect of the inaccessible antecedent mismatched in gender with the reflexive in a later measure (rereading times).

He accounted for such results in terms of bonding and resolution (Garrod & Terras, 2000). The bonding stage is a process where a link between an anaphoric element and a potential antecedent is made; lexical information is important at this point. In resolution, the links made in the bonding stage are evaluated, with the possible involvement of contextual information. Extending this model specifically to reflexives, Sturt suggests that the bonding stage is triggered when the reflexive is encountered: potential antecedents are activated at this stage. In the resolution phase, the link between the reflexive and the candidate antecedents is evaluated and integrated into the interpretation of the sentence. He suggests that the bonding stage not only involves lexical information but is also constrained by syntactic considerations, so that only antecedents that are accessible in terms of the BT are considered. Inaccessible antecedents, on the other hand, could be considered at the resolution phase. Based on such interpretation, he proposed that binding constraints may act as an early but defeasible filter during the resolution of reflexives, such that inaccessible antecedents could play a role in later processing stages. His proposal can be categorized as a variant of the BAIF hypothesis, which limits the use of structural constraints to earlier stages of processing.

2.4.3. Evidence for parallel constraints

Not all studies provide supporting evidence for the BAIF and the BADF hypotheses. Badecker and Straub (2002) report three experiments where they found effects of inaccessible locally present antecedents. In sentences like (15), which always contained a grammatically accessible

antecedent for the pronoun, they found that reading times following the pronoun were longer when the locally present inaccessible NP matched the gender of the pronoun than when it mismatched the pronoun, which they call it a 'multiple match' effect. They reasoned that the interference effect could only have arisen if the local subject NP was considered as an antecedent for the pronoun.

(15) [John/Jane] thought that [Bill/ Beth] owed him another chance to solve the problem.

Their study has been criticized, however, due to their experimental design (Phillips, Wagers & Lau, 2011). They used a probe recognition task in contrast to many of the other studies examining the online effects of Pr B. The probe recognition task requires participants to judge whether the probe words appeared in the preceding sentence, and hence it does not encourage participants to properly comprehend the sentence. Moreover, in their experiment, they included only small number of comprehension questions related to the pronoun interpretation. Therefore, their findings provide little indication on how participants interpret or process pronouns.

Further evidence of interference from a matching inaccessible antecedent comes from Kennison (2003), a self-paced reading study, with comprehension questions following the sentences rather than a probe task. While the experimental items were similar to those in Clifton et al. (1997) which have the number and gender manipulation of the antecedent, the results were contradictory. Unlike Clifton and colleagues, Kennison found an influence from a number matching inaccessible antecedent. Although it is not clear why contradictory results were yielded in Kennison (2003), her results do work against the BAIF hypothesis, which predicts no effect of

an inaccessible antecedent at any point. Clackson, Felser and Clahsen (2011) also provided evidence that the inaccessible antecedent is not immediately excluded from consideration during pronoun parsing. Using a visual world paradigm, they examined adult participants' eye gaze patterns while listening to the sentences containing pronouns with accessible and inaccessible antecedents with the manipulation of gender. The eye gaze patterns revealed that participants experienced interference form a gender-matching but structurally inaccessible antecedent after encountering a pronoun.

In sum, there are some studies which demonstrate that inaccessible antecedents can have an effect on the processing of a pronoun. The evidence fits into the hypothesis claimed by Badecker and Straub (2002), that multiple constraints in parallel affect the search for an antecedent. This is explained by Badecker and Straub in terms of activation: multiple cues contribute in parallel, positively or negatively, to an antecedent's activation. For an inaccessible antecedent, a binding constraint might contribute negatively to activation in comparison to an accessible antecedent while gender or number feature match with the pronoun may contribute positively, leading to interference from a matching but inaccessible antecedent during processing. This is why their hypothesis is also called *feature-match hypothesis*.

Although the accumulated evidence presented above demonstrates that it is unclear whether Pr B could affect the antecedent search process during parsing, most evidence points to the active involvement of it. By adopting similar design used in one of the previous studies (Patterson et al., 2014; Sturt, 2003), what evidence can be found with the processing of Korean overt pronoun was explored in this dissertation. The results contribute to the debate on whether and how Pr B can be applied to the overt pronouns in Korean in the final interpretation as well as in its processing.

2.5. Pronoun acquisition and processing in L2-English

A well-established finding in L1 language acquisition research is that children's acquisition of pronouns is delayed in comparison with their acquisition of reflexives in languages like English (e.g., Chien & Wexler, 1990; Clackson et al., 2011; Grodzinsky & Reinhart, 1993; Koster, 1993; Thorton & Wexler, 1999). To be more specific, children are able to comprehend that a reflexive must take a local antecedent in accordance with Principle A of the Binding Theory by the age of three, but they remain less accurate with that a pronoun cannot take a local antecedent allowing a non-adultlike interpretation of the pronoun equivalent to the one with the reflexive. This phenomenon is known as Delay of Principle B Effect (DPBE). In order to explain the DPBE, two accounts have been proposed, although it is not limited to these two – the pragmatic account (e.g., Thorton & Wexler, 1999) and the processing account (e.g., Reinhart, 2006).

Wexler and colleagues proposed that it is caused by children's immature development of relevant pragmatic knowledge (e.g., Principle P). In other words, children do know Principle B, but not the accompanying pragmatic principle that specifies the contexts where the accidental coreference can be accepted and hence the local binding of a pronoun is indeed acceptable. Their lack of understanding on the contexts where a coreferential reading is available makes them to overly accept a local antecedent for the pronoun in general. Reinhart (2006) also admits that children possess syntactic knowledge required for the interpretation of pronouns. However, her account is different from Wexler's in that the source of variation in her account is children's limited ability to complete reference-set computation. Reference-set computation is an operation that is performed by the parser to choose between multiple interpretations generated by the grammar. This assumes the increased processing costs because the most appropriate

interpretation can be selected after considering all the possible interpretations made available to the construction. When adults encountering a sentence like *Mama Bear is washing her*, the following steps will take place while calculating the correct interpretation of it. For that sentence, the grammar (Pr B) disallows the bound variable interpretation. Nevertheless, reference-set computation requires that a bound variable derivation is constructed and its interpretation is compared with the coreferential interpretation. Because the two interpretations are indistinguishable, the coreferential interpretation is not allowed due to Rule I. Consequently, the sentence is rejected or *her* is interpreted to be linked to a discourse antecedent that's not mentioned in the sentence. Children, unlike adults, may be unable to perform this operation as their working memory is limited, and end up arbitrarily choosing between the two interpretations, which gives rise to more acceptance of coreferential reading. Other strategies are conceivable as well and are used with other marked forms requiring reference-set computation, such as contrastive stress. Only when children have developed sufficient working memory capacity they will be able to complete the reference-set computation and disallow the coreferential interpretation of pronouns.

Compared to the L1 acquisition research, studies exploring pronoun acquisition in L2 are quite scarce, and moreover, those studies have shown divergent results in relation to adult L2 learners' knowledge of possible antecedents for pronouns. Some studies have revealed that adult L2 learners have the same comprehension difficulty reported in L1 literature with the pronoun interpretation in L2 (Finer & Broselow, 1986; Lee & Schachter, 1997), whereas other studies have found that the pronoun binding is unproblematic in L2 acquisition (Slabakova, White, & Guzzo, 2017; White, 1998). Finer and Broselow (1986), for example, investigated if L2 learners' interpretation of pronouns is constrained by Principle B in their pilot study testing L1-Korean

L2-English speakers' interpretation of English reflexives. They observed that Korean L2 learners of English were inaccurate by incorrectly accepting local antecedents for pronouns. While their results cannot be strong evidence exhibiting L2 learners' difficulty in the acquisition of Principle B due to their small sample size, the results from Lee and Schachter (1997) can. Lee and Schachter (1997) tested knowledge of Principle A and B in Korean-speaking L2 learners of English with various age range (from 6-year-old children to adults) using a Truth Value Judgment Task similar to the one developed by Chien and Wexler (1990). They found that different age groups performed differently, but among them the adult learners struggled the most to show nativelike interpretation of the pronoun. By contrast, White (1998) found evidence against L2 learners having problems in nativelike pronoun interpretation. She conducted a study investigating Japanese-speaking and French-speaking L2 English learners' performance on English pronoun binding, and found that the L2 learners in her study were generally as accurate as the native speakers. Likewise, Slabakova, White and Guzzo (2017) showed that French-speaking and Spanish-speaking advanced learners of English patterned with native speakers in that they could accurately reject the pronoun *him* bound by the referential antecedent (about 95%) and the quantificational antecedent (about 95%). In their study, however, the intermediate learners showed the pattern parallel to L1 findings, meaning that their accuracy was higher with quantificational antecedent (about 85%) than with referential antecedent (about 75%).

Similar divergence has been found with the studies that investigated whether (or when) binding constraints are applied during online L2 processing. E. Kim, Montrul and Yoon (2015) examined how L1-Korean L2-English learners interpret English reflexives and pronouns in various syntactic contexts using a visual world paradigm eye-tracking experiment. They replicated earlier findings that the adult L2 learners' performance on pronoun interpretation was

not nativelike unlike their performance on reflexive interpretation. Based on their findings, they claimed that pronouns are difficult to process for non-native speakers due to increased processing costs. On the contrary, the opposite – no difference between native and non-native pronoun processing – has been reported in Patterson et al. (2014) which examined and compared the time-course resolution of anaphoric pronouns during native and non-native language comprehension. They found that both native speakers of English and German-speaking learners of English showed the similar timing of applying Principle B during their pronoun resolution and concluded that non-native speakers can show nativelike sensitivity to the use of Principle B during L2 processing.

With regard to the contradictory findings of the studies discussed above, one thing needs to be noted. That is, difficulty with pronoun binding in L2 has been observed only in studies where participants have Korean as their native language. This raises the question of what would be a role of their L1 in the pronoun interpretation in the target language. In previous L2 research, many studies have examined whether, and in what ways, the learners' L1 has an impact on the acquisition and knowledge of L2. Such research ranged from explaining the initial state of L2 acquisition (e.g., Schwartz & Sprouse, 1996) to the impact the L1 can have on ultimate attainment among near-native L2 speakers (e.g., Birdsong & Molis, 2001). More recently, researchers have begun to explore whether L2 learners transfer strategies from their L1 during on-line processing in the L2 (Papadopoulou, 2005). To my knowledge, however, the possibility of transferring strategies from their L1 has not been addressed in any other previous studies, which have investigated the acquisition of English pronouns by Korean speaking learners of English. Given that L1 transfer could be one of the reasons for the L2 learners' non-nativelike performance with pronoun interpretation, this possibility has to be systematically tested.

Therefore, whether properties of Korean pronouns can influence Korean-speaking L2 English learners' interpretation of English pronouns was assessed by adopting both offline and online measures in this dissertation.

The series of experiments in this dissertation were conducted to fill the gaps addressed in the literature. The detailed explanation about the experiments will be provided in the next chapters.

CHAPTER 3: EXPERIMENTAL PROCEDURE

This chapter introduces research questions of the present dissertation, outline of six experiments conducted and the overall experimental procedure with the details about stimulus norming and participants who took part in the experiments.

3.1. Research questions and hypotheses

Based on the gaps found in previous studies, the present dissertation addressed three issues: 1) the status of overt 3rd person pronouns in Korean, by investigating their interpretations and how Pr B and/or Rule I operate in Korean, 2) the role of Pr B during processing of overt 3rd person pronouns in Korean, and 3) the role of the knowledge of Korean overt pronouns in the interpretation and processing of pronouns for L1-Korean L2-Engilsh learners.

The specific research questions of this study are presented below. Research questions (1) and (2) are about the interpretation and distribution of overt pronouns in Korean. Research question (3) is about Korean overt pronoun processing, and (4) is about possible L1 transfer in L1-Korean L2-Engilsh acquisition/processing of English pronouns.

(1) Do Korean overt pronouns disallow bound variable readings?

(2) Is Korean overt pronoun interpretation constrained by Principle B and/or by Rule I?

(3) How does Principle B operate during overt pronoun processing in Korean?

(4) Do the properties of Korean overt pronouns affect pronoun interpretation/processing in English?

Based on these research questions, following hypotheses were created:

H1a. Korean overt pronouns will allow both bound variable and coreferential readings, but Rule I will not apply.

H1b. Korean overt pronouns will disallow bound variable readings, and Rule I will be irrelevant.

H2. Principle B will constrain the antecedent search process of an overt pronoun in Korean, but Principle B-incompatible antecedents will be available additionally at all stages of processing.

H3. L1-Korean L2-English learners will transfer the properties of Korean overt pronouns onto English pronouns.

H4. L1-Korean L2-English learners will transfer their processing preferences of overt pronouns from Korean to English.

The two contrasting hypotheses, H1a and H1b, were tested in Experiment 1 using two offline tasks in Korean, and H2 was tested in Experiments 3 and 4 using an online task where participants' eye movements were monitored while reading Korean sentences. Experiment 2 tested H3 using two offline tasks in English, and Experiments 5 and 6 tested H4 using an online task where participants were asked to read English sentences for comprehension. The outline of each experiment is presented in Table 3.1.

Table 3.1. Outline of the present dissertation

Experiment	Hypothesis	Test Language	Task Type
1	H1	Korean	Offline tasks
2	H3	English	Offline tasks

Table 3.1. cont'd

Experiment	**Hypothesis**	**Test Language**	**Task Type**
3&4	H2	Korean	Online task
5&6	H4	English	Online task

3.2. Stimulus norming

In previous literature regarding the interpretation of Korean anaphors, it has been noted that the verb can introduce a bias in favor of local or long-distance (LD) interpretation (Choi & Kim, 2007; Han & Storoshenko, 2012; Kim, Kim, & Yoon, 2013). Under the assumption that the verb bias can also affect overt pronoun interpretation in Korean, a norming study was conducted to exclude such an effect in the format of an Acceptability Judgment Task (AJT), and only the verbs that were considered to be neutral verbs (i.e., no bias towards local or LD interpretation) were used in the experimental items. Mono-clausal sentences such as (5) were used to test the verb bias. It was assumed that if the verb has a bias towards local interpretation, the sentences like (5), where a reflexive *cakicasin* appears in the object position, are rated as highly acceptable and the variant with the name, as in (5) are rated low. On the other hand, if the verb has a bias towards LD interpretation, the sentences like (5), where a different name appears in the object position, are scored high in the AJT and the ones with *cakicasin* as in (5) are rated low. A total of 95 verbs were tested for norming. Sixteen native speakers of Korean, who did not participate in the main task but had comparable linguistic and biographical profiles as the subjects for the main task, were given 190 mono-clausal sentences and were asked to rate the acceptability of the given sentences. The two instances of the same verb – one with a reflexive *cakicasin* as in (5) and the other with a proper name as in (5) – were presented in a different block, intermixed with other sentences to reduce the possibility of acceptability of one sentence affecting the response to the other. Participants were asked to rate the sentence on a 5-point Likert scale, where 1 indicates that the sentence is not acceptable or not natural at all and 5 means that the sentence is very

acceptable and very natural. It was assumed that if the both instances of the verb were scored high similarly, that verb is assumed not inherently reflexive or anti-reflexive.

(5) Korean

a. Hyeswu-ka cakicasin-ul thashayss-ta.

Hyeswu-NOM self-ACC blamed

'Hyeswu blamed self (=Hyeswu).'

b. Hyeswu-ka Jinhee-lul thashayss-ta.

Hyeswu-NOM Jinhee-ACC blamed

'Hyeswu blamed Jinhee.'

(6) English

a. Sarah sketched herself.

b. Sarah sketched Emma.

English verbs were also tested to native speakers of English and those considered to be neutral verbs were used in the experimental items. As in the norming of Korean verbs, the same verb was used twice, one with a reflexive *himself*/*herself* as in (6) and the other with a proper name as in (6), but they presented far from each other in a different block hoping that participants' judgments on one did not affect the other. Ten native speakers of English who also did not take part in the main study were asked to rate 114 mono-clausal sentences on a 5-point Likert scale, where again 1 indicates low acceptability and 5 indicates high acceptability.

Among the 95 Korean verbs, there were 21 verbs for which the score of the two sentences was over 4. The rest of the verbs (74 out of 95 verbs) had ratings below 4 on at least one sentence type. This means that the verbs were inherently biased for either local or LD interpretations. For English verbs, 23 out of 72 scored over 4 in the two sentence types. The verbs with no bias towards local or LD interpretations were used as the embedded verb in the target items in the main tasks. Due to the limited number of verbs, we ended up repeating some verbs in the target items. The list of the Korean and English verbs used in the target items in Experiment 1 and 2 is provided in Appendix. The verbs used in the main tasks were assumed not inherently biased for either local or LD interpretations. Therefore, if any bias in the interpretation in the main task emerges, it can be concluded that they arise from the inherent lexical properties of the pronoun.

3.3. Participants for the main study

Two groups of participants were recruited for the experiments. Korean-speaking L2 learners of English between the ages of 18 and 40 were recruited for all the experiments; native speakers (NSs) of English between the ages of 18 and 40 were recruited for Exps 2, 5, and 6. Thus, the learners completed experiments testing knowledge both of their L1, Korean (Exps 1, 3, and 4) and of their L2, English (Exps 2, 5, and 6). This design allowed us to assess the individual variability that may exist with respect to the availability of the bound variable construal of Korean overt pronouns. If the inter-speaker variation does exist, we expect it to affect learners' performance in English as well as in Korean. Therefore, it was necessary to have the same participants complete all the tasks.

All participants had either normal to corrected-to-normal vision. A total of 50 L1-Korean L2-English learners and 57 native speakers of English were recruited mostly from

undergraduate/graduate student pool at the University of Illinois. However, 12 of L1-Korean L2-English learners were excluded from the data analysis because they did not participate in the two sessions of the experiments. In other words, data from 38 L2 participants was analyzed because we excluded the participants who took part in the experiments testing Korean only or English only. For the native speakers of English, 5 participants were excluded from the data analysis since they were heritage speakers of Korean. According to the language background questionnaire, most L2 participants began to learn English early (mean age of first English instruction = 8.05), primarily through public education in Korea. Many of L2 learners came to the US as an adult (mean age of arrival = 18.13). Only five participants reported that they have moved to the US at earlier ages: one reported that he was 8, two reported that their age was 10, and the other two reported that they were 12. L2 learners' English proficiency was assessed using a cloze test (adapted from American Kernel Lessons: Advanced Students' Book, by O'Neil, Cornelius, and Washburn (1991), see Ionin & Montrul, 2010); proficiency was modeled as a continuous variable in our mixed effects analyses to see if the L2 learners' performance varies based on their distinct English proficiency level. Table 3.2 summarizes the results of the language questionnaire and the cloze test.

Table 3.2. Summary of language background questionnaire and cloze test

	L2		NS	
	Mean (SD)	Range	Mean (SD)	Range
Male; Female	25; 25	NA	28; 29	NA
Age	25.96 (4.77)	18-38	19.98 (2.43)	18-29
Age of arrival	18.13 (7.71)	8-31	NA	NA
Length of stay (year)	6.71 (3.70)	0.5-19.5	19.98 (2.43)	18-29
Age of first English instruction	8.05 (3.06)	4-9	NA	NA
Cloze test scores	34.71 (2.39)	28-40	37.68 (1.51)	32-40

3.4. Overall procedure

For the learners, data was collected in two separate sessions. Before their first visit, the L2 learners were given a link where they filled out the language background questionnaire and the proficiency cloze test. During the first session, half of the participants completed the reading tasks of Experiments 3 and 4, and the two offline tasks of Experiment 1 (that is, all the Korean experiments), in that order; during the second session, they completed the reading tasks of Experiments 5 and 6 and the two offline tasks of Experiment 2 (that is, all the English experiments), in that order. For the other half of the learners, the order of the two sessions was reversed, in order to control for any priming effects from one language to the other. At least two weeks elapsed between the two testing sessions. The native speakers of English participated in only one session, during which they completed the reading tasks of Experiments 5 and 6 and the offline tasks of Experiment 2, as well as the background questionnaire. Their data was used as a baseline for comparison with L2-English learners.

CHAPTER 4: INTERPRETATIONS OF OVERT PRONOUNS IN KOREAN AND ENGLISH

The objectives of Experiments 1 and 2 are the following: 1) to examine how overt pronouns in Korean are interpreted, and 2) to examine whether the properties of Korean overt pronouns can affect how Korean-speaking learners of English interpret English pronouns.

Overt pronouns in Korean (*ku* 'he/him' and *kunye* 'she/her') have been assumed to be subject to Pr B (Principle B) of BT (Binding Theory). However, some studies have shown that *ku* or *kunye* can sometimes be construed with a local antecedent, violating Pr B, especially when appropriate contextual cues are given (Choi, 2013; Im, 1998). Prior studies have not provided a definitive account of this finding. Therefore, the current study aims to find an explanation for this behavior of overt pronouns in Korean within Reinhart's framework. According to Reinhart (1983), two modes of interpretation are available with a bound pronoun – one via variable binding and the other via coreference assignment. The bound variable reading is obtained by being referentially dependent on its antecedent and is subject to Pr B, but the coreferential reading is obtained by picking out the same entity as another NP in the discourse and is not necessarily subject to Pr B.

To make a distinction between the two readings, Reinhart proposes Rule I as in (1) which specifies the contexts where the coreferential reading cannot obtain.

(1) a. Rule I: Intrasentential Coreference

NP A cannot corefer with NP B if replacing A with C, C a variable A-bound by B, yields an indistinguishable interpretation

b. (Why do you think nobody painted Mary?) MARY$_1$ painted her$_1$.

In Reinhart's account, a bound pronoun gets interpreted as a bound variable in general. Nevertheless, pronouns can take a local antecedent through coreference when the readings are distinguishable from the bound variable readings as in (1) when *Mary* is in FOCUS which motivates distinct pragmatic meaning to arise with the coreferential reading. Thus, apparent violations of Pr B, which are sometimes observed among adults (Pollard & Sag, 1992; Reinhart & Reuland, 1993), can be explained. In this framework, there may be two ways to account for the availability of local antecedents for Korean overt pronouns. The first possibility for apparent Pr B violation in Korean is to attribute it to the suspension of Rule I in Korean. Local antecedents are sometimes allowed for pronouns even in English through coreference as long as Rule I is obeyed. Since situations where the bound variable reading and the coreferential reading can be distinguished are rare, pronouns coreferential with local NPs are not common in English. If Rule I is inoperative, though, we can expect more instances of pronouns taking local antecedents licensed through coreference. This may be the case in Korean.

Alternatively, the apparent Pr B violation in Korean may be attributed to the unavailability of the bound variable reading of overt pronouns in Korean. Overt pronouns in Korean have been argued to disallow bound variable readings based on the data showing *ku* or *kunye* cannot take a QP antecedent, which is one of the diagnostics for the bound variable reading (Kang, 1988; Noguchi, 1997; Koak, 2008). If this is correct, the instances of apparent Pr B violation can be explained, since Korean overt pronouns allow coreferential readings only and the coreferential reading is not restricted structurally, unlike the bound variable reading. Therefore, these two possibilities were tested in Experiment 1 by comparing Korean native

speakers' interpretations of overt pronouns with referential and quantificational antecedents in varying binding distance. If the first possibility is correct, we will find that long-distance readings of the pronoun are allowed with both referential and quantificational antecedents. Additionally, we will find that the local referential antecedents are allowed but the local quantificational antecedents are not because of the operation of Pr B. On the other hand, if the bound variable readings are unavailable with Korean overt pronouns, we will find that referential antecedents are allowed, but quantificational antecedents are not, regardless of whether they are in the same local domain with the pronoun or not.

In Experiment 2, L1-Korean L2-English learners' interpretation of English pronouns was examined. Prior studies on pronoun acquisition in L2-English have divergent findings. Some studies have found that adult L2 learners sometimes have difficulty in rejecting pronouns with local antecedents (Finer & Broselow, 1986; Lee & Schachter, 1997; Kim, Montrul, & Yoon, 2015), while others have shown that pronoun binding is unproblematic in L2 acquisition (Slabakova, White, & Guzzo, 2017; White, 1998). Given that the difficulty with pronoun binding in L2-english has been observed only in studies where participants have Korean as their native language, it is possible that the properties of Korean pronouns may affect the acquisition of English pronouns by Korean-speaking learners of English. Therefore, this possibility was tested in Experiment 2 where L1-transfer effect was addressed on the basis of a single L1-group (L1-Korean), instead of comparing two different L1 groups. This may be a limitation of the current study, and thus this will be considered in future research. If there is an effect from Korean, L1-Korean L2-English learners' interpretation of English pronouns will be similar to their interpretation of Korean overt pronouns but different from the interpretation of native speakers of English.

4.1. Experiment 1: Korean offline tasks

Experiment 1 was designed to test the two contrasting hypotheses – H1a and H1b – and explore the status of the overt 3rd person pronouns in Korean by focusing on how Pr B and/or Rule I operate in Korean.

H1a. Korean pronouns allow both bound variable and coreferential readings, but Rule I does not apply.

H1b. Korean pronouns disallow bound variable readings, and Rule I is irrelevant.

The experiment tested the availability of bound variable construal of the overt 3rd person pronoun *kunye*, 'she/her' using two offline tasks – Truth Value Judgment Task and Sentence Interpretation Task. It was also tested if an apparent violation of Pr B is allowed robustly with *kunye*. The tasks for Experiment 1 were administered after the participants completed the task for Experiments 3 and 4, as described in Chapter 3 (See Chapter 3 for more detailed description about the overall experimental procedure and the participants).

4.1.1. Truth Value Judgment Task: Methods, Results and Discussion

The purpose of this task was to find an explanation for the apparent violation of Pr B with overt pronouns in Korean by investigating Korean speakers' interpretation of overt pronouns with various types of antecedents in varying binding distance. Results of this task can imply whether the bound variable readings are available with Korean overt pronouns and how their distribution can be explained under Reinhart's framework.

4.1.1.1.Materials

A Truth Value Judgment Task (TVJT – Crain & Thornton, 1998) was employed. In this task, participants were asked to read a short story and judge whether the target sentence that follows it is TRUE or FALSE. Each target sentence contained a proper name or a quantificational NP (*enu* 'every' NP) as a matrix or an embedded subject and an overt pronoun *kunye* 'she/her' as an embedded object. Each context (story) established a bias towards an interpretation of *kunye* construed either as the embedded subject (yielding a local interpretation) or the matrix subject (yielding a LD interpretation). Hence, two within-subject factors with two levels were crossed – a) type of the antecedent: referential NPs (names) vs. quantificational NPs, and b) type of context/story: local (clause-mate) binding interpretation vs. non-local (LD) binding interpretation. All of the target sentences were bi-clausal, and the verbs that were normed to have no bias towards local or LD interpretation were used as embedded verbs, and two verbs - *malhayssta* 'said' and *tulessta* 'heard' – were used as matrix verbs. An example token set of the experimental items is given in Table 4.1, and the indexing expressed in the target sentences indicates which NP is targeted for the antecedent of the pronoun. All the materials were given in Korean and Korean female names were used. A response of TRUE from the participants indicates that the reading indicated in the story is allowed by the grammar; a response of FALSE indicates that it is not allowed or is at least strongly dispreferred (Ionin, 2010). For example, for (A), a response of TRUE would indicate that *kunye* is allowed to take a local referential antecedent, while a response of FALSE would indicate that the local binding interpretation of *kunye* is not available or strongly dispreferred.

Table 4.1. Example token set for Korean TVJT

	antecedent = Referential NP	antecedent = Quantificational NP
sentence true with local (embedded subject) antecedent	A. 주리, 수민 그리고 미란이는 지혜와 같은 학교에 다닌다. 세 명의 친구들은 지혜가 너무 잘난체가 심해서 지혜를 별로 좋아하지 않았다. 지혜는 항상 자기가 최고라고 생각했고 그것에 대해 나머지 세 명은 고깝게 여겼다. 지혜 또한 그런 그 세 명을 별로라고 생각하고 있었다. 하루는 그들의 선생님이 그 세 명에게 왜 그들이 지혜를 좋아하지 않는지 물었고 그들은 선생님께 이유를 설명했다. (Juri, Sumin kuliko Miran-i-nun Jihye-wa kathun hakkyo-ey taninta. sey myenguy chinkwutul-un Jihye-ka nemwu calnancheyka simhayse Jihye-lul pyello cohahaci anhassta. Jihye-nun hangsang caki-ka choyko-lako sayngkakhayssko kukesey tayhay nameci sey myeng-un kokkapkey yekyessta. Jihye ttohan kulen ku sey myeng-ul pyellola-ko sayngkakha-ko issessta. halwunun kutuluy sensayngnim-i ku sey myengeykey way kutul-i Jihye-lul cohahaci anhnunci mwulessko kutul-un sensayngnim-kkey iyu-lul selmyenghayssta.) 'Juri, Sumin and Miran go to the same school as Jihye. They don't like Jihye because they think she is too confident about herself. She always considers herself to be a great person, which they don't agree with at all. And Jihye has a rather poor opinion of the other girls, which doesn't help. One day, their teacher asked why the three girls don't like her and they explained why.'	B. 주리, 수민 그리고 미란이는 지혜와 같은 학교에 다닌다. 지혜는 그 세 명이 너무 잘난체가 심해서 그들을 별로 좋아하지 않았다. 그 세 명은 항상 남들에게 자기 자랑을 하기 바빴고 그것에 대해 지혜는 좋지 않게 생각했다. 게다가 그 세 명은 지혜를 깔보는 이야기를 하고 다녔고 그게 지혜는 좋일리가 없었다. 하루는 지혜 선생님이 지혜를 불러 왜 그들을 좋아하지 않는지 물었고 지혜는 선생님께 그 이유를 설명했다. (Juri, Sumin kuliko Miran-i-nun Jihye-wa kathun hakkyo-ey taninta. Jihye-nun ku sey myeng-i nemwu calnancheyka simhayse kutul-ul pyello cohahaci anhassta. ku sey myeng-un hangsang namtul-eykey caki calang-ul haki pappassko kukesey tayhay Jihye-nun cohci anhkey sayngkakhayssta. keytaka ku sey myeng-un Jihye-lul kkalponun iyakilul hako tanyessko kukey Jihye-nun cohillika epsessta. halwunun Jihye sensayngnim-i Jihye-lul pwulle way kutul-ul cohahaci anhnunci mwulessko Jihye-nun sensayngnim-kkey ku iyulul selmyenghayssta.) 'Juri, Sumin and Miran go to the same school as Jihye. Jihye doesn't like them because she thinks that they are too confident about themselves. Each one of them always tells their friends how great they are, which Jihye never agrees with. And on top of that, the girls don't think much of Jihye, they don't even speak to her. One day, Jihye's teacher asked why she doesn't like them and she explained why.'

Table 4.1. cont'd

	어느 소녀나 [**지혜 1**가 **그녀 1**를 대단하게 여겼다]고 말했다. (Enu sonye-na [**Jihye1**-ka **kunye1**-lul taytanhakey yekiessta]-ko malhayssta.) 'Every girl said that Jihye1 thought highly of **her1**.'	지혜가 [**어느 소녀 2**나 **그녀 2**를 대단하게 여겼다]고 말했다. (Jihye-ka [**enu sonye2**-na **kunye2**-lul taytanhakey yekiessta]-ko malhayssta.) 'Jihye said that **every girl2** thought highly of **her2**.'
sentence true with LD (matrix subject) antecedent	C.주리, 수민 그리고 미란이는 지혜와 같은 학교에 다닌다. 세 명의 친구들은 지혜가 최고라고 생각해 지혜를 따랐다. 하루는 그 세 명이 각각 왜 그들이 지혜를 최고라 여기는지 지혜에게 얘기했고 그러는 와중에 본인들의 자존감이 낮은 것도 인정했다. 그 날 오후, 지혜는 집에 돌아와 엄마에게 그 세 명에게서 들은 이야기를 해주었다. (Juri, Sumin kuliko Miran-i-nun Jihye-wa kathun hakkyo-ey taninta. sey myenguy chinkwutul-un Jihye-ka choykolako sayngkakhay Jihye-lul ttalassta. halwunun ku sey myeng-i kakkak way kutul-i cihyey-lul choykola yekinunci Jihye-eykey yaykihayssko kulenun wacwungey ponintuluy caconkam-i nacun kesto incenghayssta. ku nal ohwu, Jihye-nun cipey tolawa emma-eykey ku sey myeng-eykeyse tulun iyaki-lul haycwuessta.) 'Juri, Sumin and Miran go to the same school as Jihye. They like Jihye because they think that she is great. One day, each one of them told her why they like her. And they also admitted to having low self-esteem: they have more faith in Jihye's abilities than in their own! Later that day, when Jihye came back home, she told her mom what she heard from the three girls.'	D.주리, 수민 그리고 미란이는 지혜와 같은 학교에 다닌다. 지혜는 그 세 명이 최고라고 생각해서 그들을 모두 좋아했다. 지혜는 자존감이 낮은편이어서 자신보다 그 세 명이 훨씬 나은 사람이라고 굳게 믿고 있었다. 하루는 지혜가 그 세 명에게 왜 자기가 그들을 좋아하는지 말해주었다. 그 날 오후, 그 세 명은 집에 돌아가 각자의 엄마에게 지혜로부터 들은 이야기를 해주었다. (Juri, Sumin kuliko Miran-i-nun Jihye-wa kathun hakkyo-ey taninta. Jihye-nun ku sey myeng-i choykolako sayngkakhayse kutul-ul motwu cohahayssta. Jihye-nun caconkam-i nacunphyeniese casinpota ku sey myeng-i hwelssin naun salamilako kwutkey mitko issessta. halwunun Jihye-ka ku sey myeng-eykey way caki-ka kutul-ul cohahanunci malhaycwuessta. ku nal ohwu, ku sey myeng-un cipey tolaka kakcauy emma-eykey Jihye-lopwuthe tulun iyakilul haycwuessta.) 'Juri, Sumin and Miran go to the same school as Jihye. Jihye likes all of them very much because she thinks that they are great. Jihye has low self-esteem, and she has a much better opinion of these three girls than she does of her own abilities. One day, Jihye told the girls why she likes them. Later that day, when they came back home, they told their moms what they heard from Jihye.'

Table 4.1. cont'd

	지혜 1가 [어느 소녀나 **그녀 1**를 대단하게 여겼다]고 말했다. **(Jihye1**-ka [enu sonye-na **kunye1**-lul taytanhakey yekiessta]-ko malhayssta.) '**Jihye1** said that every girl thought highly of **her1**.'	**어느 소녀 2**나 [지혜가 **그녀 2**를 대단하게 여겼다]고 말했다. **(Enu sonye2**-na [Jihye-ka **kunye2**-lul taytanhakey yekiessta]-ko malhayssta.) **'Every girl2** said that Jihye thought highly of **her2**.'

There were 64 items per list which include 16 target items, 4 items per condition, and 48 filler items. The target items were distributed across four different list in Latin square design and were intermixed with the filler items in a randomized order. The fillers were the same for all lists and they consisted of various constructions containing quantifiers, negation, etc. The items that could test the OPC effect in subject position were included as filler items as well, in order to check if overt pronouns do not take quantificational antecedents at all. A reflexive *caki*[11] 'self' and a null pronoun *pro*, which are known to be construed as a bound variable (Storoshenko, 2008; Cho, 2010), were not included in the filler items to prevent that the interpretation speakers assign to them affects their judgments of *kunye*. Participants were randomly assigned to one of the lists.

4.1.1.2.Predictions

If H1a is correct, then both bound variable and coreferential readings will be allowed (due to lack of Rule I), but only the former will be subject to Pr B. Thus, in the TVJT, pronouns will be predicted to allow LD readings with both referential and quantificational antecedents (C, D in Table 4.1), but for local construals, referential antecedents (A) but not local QP antecedents (B) are predicted to be possible.

[11] *Caki* is one of the reflexive forms available in Korean. It prefers to take its antecedent outside of the local domain and hence it is known as a long-distance anaphor (LDA).

If H1b is correct, different results are predicted. The conditions where pronouns take quantificational antecedents should be disallowed, regardless of local vs. LD construals. (B) and (D) are predicted to be judged as FALSE. With referential antecedents, participants will allow both (A) and (C) because the coreferential interpretation can be obtained with appropriate pragmatic/contextual cues (the preceding story in this case) bypassing Pr B. The specific predictions based on each hypothesis are summarized below:

Table 4.2. Predictions for Korean TVJT

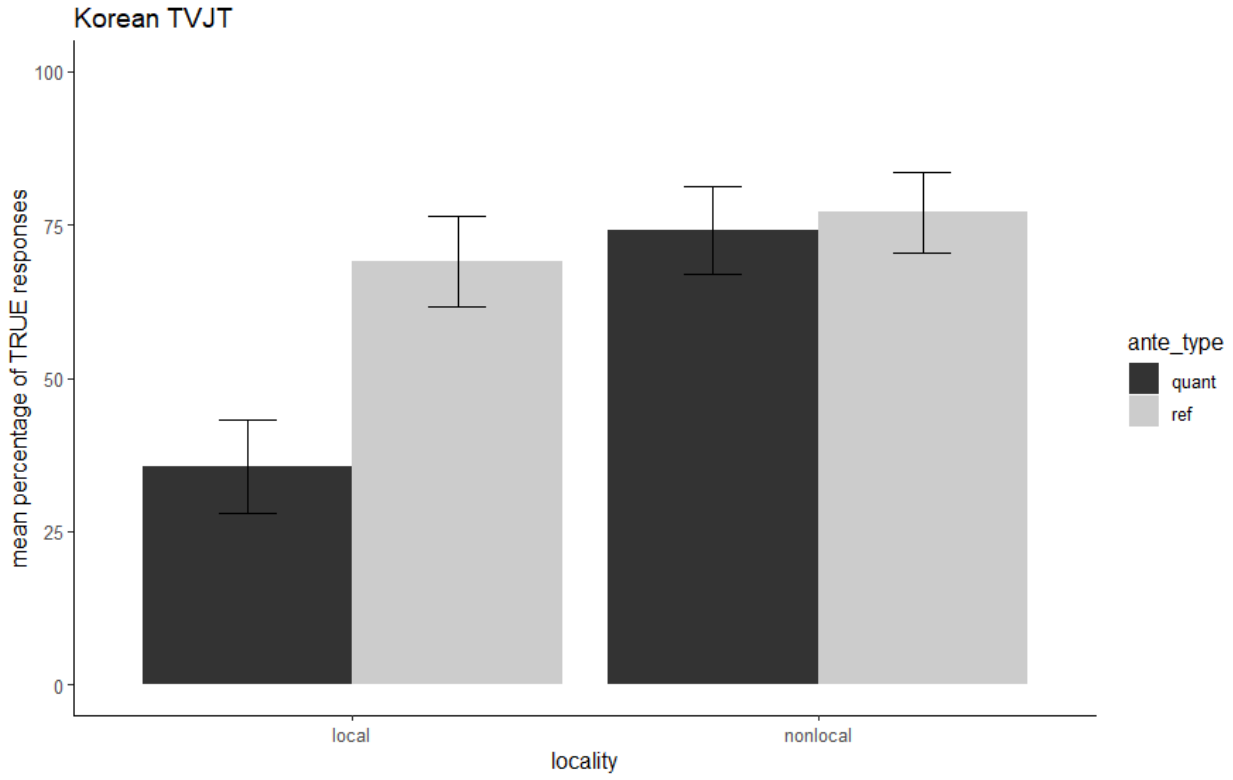
Hypothesis		**antecedent = Referential NP**	**antecedent = Quantificational NP**
H1a	**Local antecedent**	A. TRUE	B. FALSE
	LD antecedent	C. TRUE	D. TRUE
H1b	**Local antecedent**	A. TRUE	B. FALSE
	LD antecedent	C. TRUE	D. FALSE

4.1.1.3.Results and Discussion

The mean accuracy rates of the non-target items were calculated first to make sure that the participants did not make random guesses. The rates were high (98.89%), suggesting that participants were paying attention to the task while completing it. However, there was one participant whose accuracy rates were low as 50%, and hence that participant was excluded from the analysis of the data.

The participants' responses were analyzed in the following way – a score of 1 was assigned to TRUE responses while 0 was assigned to FALSE responses and their responses were averaged to calculate mean acceptance scores. Figure 4.1 shows the mean percentage of TRUE responses for each condition.

Figure 4.1. Mean percentage of TRUE responses for each condition in Korean TVJT



Descriptively, when the context makes the local binding interpretation TRUE, participants accepted *kunye* with a referential antecedent 69.08% while they accepted *kunye* with a quantificational antecedent 35.53%. In the conditions where the context makes the LD binding interpretation TRUE, participants allowed the interpretation of *kunye* with a referential antecedent 77.02% but the interpretation of *kunye* with a quantificational antecedent was accepted 74.13%. The descriptive data shows that both referential and quantificational antecedents are allowed for the overt pronoun, *kunye*, when it is bound long-distance, although the acceptance scores are not at ceiling as predicted. However, in the case of the local binding interpretation of *kunye*, an asymmetry between referential and quantificational antecedents is observed: referential antecedents are more likely to be allowed than quantificational antecedents.

Unlike our predictions made under the two contrasting hypotheses, the condition where *kunye* is construed as a locally present quantification antecedent is accepted about 36%. If *kunye* is a pronoun like English pronoun, *him/her*, the local binding interpretation would be rejected, due to Pr B. The finding that it is allowed to some degree in Korean indicates that *kunye* may be a different element from a pronoun.

For statistical analysis, data were fitted to a mixed-effects logistic regression model to further analyze the participants' responses as a function of ANTE.TYPE (antecedent type) and LOCALITY (locality)[12], with SUBJECT and ITEM as random effects. Table 4.3 summarizes the estimates of the statistical model for L1-Korean L2-English learners' performance on Korean overt pronoun, *kunye*. In the model, a main effect of ANTE.TYPE was found to be significant ($z = 5.96$, $p < .001$), meaning that participants are more likely to accept *kunye* having a referential antecedent than a quantificational antecedent. The model also reveals a significant main effect of LOCALITY ($z = 5.63$, $p < .001$), indicating that participants are more likely to allow *kunye* construed as a LD antecedent than as a local antecedent. The interaction between the two factors, ANTE.TYPE and LOCALITY was found to be significant ($z = -3.69$, $p < .001$). This suggests that participants are more likely to accept *kunye* with a local referential antecedent than with a local quantificational antecedent while their acceptance of *kunye* is not affected by the type of antecedent if the antecedents appear outside the local domain. Pairwise comparison analysis of the mean acceptance scores using emmeans package reveals that *kunye* with referential antecedents are more likely to be accepted than *kunye* with quantificational antecedents when the story demonstrates local binding interpretation ($z = -5.96$, $p < .001$) while such statistical significant difference is not found with the story establishing LD binding interpretation. The

[12] The type of context/story manipulated in this task was coded as the factor LOCALITY.

analysis also reveals that with quantificational antecedents, *kunye* is allowed more when it is bound LD than when it is bound locally (z = -5.63, p < .001), but with referential antecedents, no such difference is found. Taken together, the statistical results show that both local and LD interpretation of *kunye* is allowed with referential antecedents while with quantificational antecedents, the LD interpretation of *kunye* is allowed but the local interpretation is not allowed so much as the LD one.

Table 4.3. Fixed effects from the mixed effects logistic regression model performed on responses from Korean TVJT

	Estimate	**SE**	**z-value**	***p*-value**
Intercept	-0.72	0.26	-2.74	0.006**
Antecedent type (referential)	1.70	0.29	5.96	< .001***
Locality (LD)	1.84	0.33	5.63	< .001***
Antecedent type * Locality	-1.47	0.40	-3.69	< .001***

The findings that there is an asymmetry in the acceptance of *kunye* with a quantificational antecedent when the binding distance varies indicates that the bound variable construal of *kunye* is available, and when *kunye* gets a bound variable reading, the local antecedent is not easily allowed, which means Pr B, which constrains bound variable interpretations only, may be operative for the overt pronouns in Korean. The referential antecedent results, however, do not show the asymmetry between the local and the LD binding interpretation of *kunye*: both local and LD readings of *kunye* are allowed to a similar degree.

Taken together, these results point in favor of H1a, which holds that pronouns construed with local antecedents in Korean are possible due to Rule I not operating in the language, since we know that Pr B operates in Korean from the quantificational results. However, there are a few things that need further discussion. First is that an acceptance of a LD reading with quantificational antecedents was rarely at ceiling, and the same thing holds for both local and LD

readings with referential antecedents. It is not clear why such results are obtained, but it may be due to the fact that *kunye* is not frequently used in colloquial speech. The infrequent use of *kunye* in daily conversation could have affected the participants' judgments of the sentences. That is, participants may have a general tendency to disallow the sentences including *kunye* due to their infrequent use and this may be the source of their degraded judgments. If there were items testing other anaphors more frequently used like a reflexive *caki* 'self' or a null pronoun *pro*, we may be able to see if this is correct by comparing the results of them to the results of *kunye*. However, with no such comparison, we cannot find out if this is a valid explanation.

Second is that the mean acceptance percentage of the local binding interpretation of *kunye* with a quantificational antecedent is not very low (about 30%). The current results of *kunye* with quantificational antecedents are interpreted to mean that *kunye* can get a bound variable reading and when it does, it is subject to Pr B. This interpretation makes sense if we consider the current mean acceptance percentage of the local binding of *kunye* with a quantificational antecedent is due to the participants' errors, but the number seems to be a little too big to claim that. Another reasonable way to interpret the results is to re-consider the status of *kunye*. The status of *ku* ('he/him', but also a distal demonstrative) and *kunye* ('she/her') has been debated in the field for decades. If *kunye* is not a pronoun unlike our assumption, there may be a way to account for the acceptance of the local reading of *kunye* with a quantificational antecedent, which will be further discussed in detail in 4.3. The summary of the results of Korean TVJT is given in 4.1.3 where I revisit the relevant hypotheses in light of the findings.

4.1.2. Sentence Interpretation Task: Methods, Results and Discussion

Results of the TVJT showed that both bound variable and coreferential readings are allowed with the overt pronoun in Korean. However, it is not clear whether the overt pronouns can be construed as bound variables even when the antecedents were referential NPs. In order to find an answer to this, an additional task was employed based on the strict vs. sloppy reading diagnostic to examine the availability of bound variable vs. coreferential readings to pronouns. If sloppy readings are allowed with the referential NPs, that would indicate that the overt pronouns with the referential antecedents can have the bound variable readings. This means that simply the possibility of sloppy reading would suffice to establish the conclusion. Therefore, the overall patterns of the results were reported for this task to show the tendency of their choice for the bound variable vs. coreferential readings to the pronouns.

4.1.2.1.Materials

Along with the TVJT, there was a Sentence Interpretation Task (SIT – modified from J.-H. Kim & Yoon, 2009), where participants were asked to choose the most appropriate reading of the experimental sentences. Experimental items were constructed with two antecedents of varying distance (local vs. LD). The sample token set is presented in Table 4.4.

Table 4.4. Example token set for Korean SIT

Local antecedent	**LD antecedent**
A. 준호는 [지혜가 그녀를 칭찬했다]고 들었다. (Junho-nun [Jihye-ka kunye-lul chingchanhayssta]-ko tulessta.) 'Junho heard that [Jihye praised her].' 준호는 [주리도 그랬다]고 들었다. (Junho-nun [Juri-to kulayssta]-ko tulessta.) 'Junho heard that [Juri did so too].'	B. 지혜는 [준호가 그녀를 칭찬했다]고 들었다. (Jihye-nun [Junho-ka kunye-lul chingchanhayssta]-ko tulessta.) 'Jihye heard that [Junho praised her].' 주리도 [준호가 그랬다]고 들었다. (Juri-to [Junho-ka kulayssta]-ko tulessta.) 'Juri heard that [Junho did so too].'
RESPONSE OPTIONS[13] **1. Strict reading** 준호는 지혜와 주리가 지혜를 칭찬했다고 들었다. (Junho-nun Jihye-wa Juri-ka Jihye-lul chingchanhayssta-ko tulessta.) 'Junho heard that both Jihye and Juri praised Jihye.'	RESPONSE OPTIONS **1. Strict reading** 지혜와 주리는 준호가 지혜를 칭찬했다고 들었다. (Jihye-wa Juri-nun Junho-ka Jihye-lul chingchanhayssta-ko tulessta.) 'Both Jihye and Juri heard that Junho praised Jihye.'
2. Sloppy reading 준호는 지혜가 지혜를 칭찬하고 주리가 주리를 칭찬했다고 들었다. (Junho-nun Jihye-ka Jihye-lul chingchanha-ko Juri-ka Juri-lul chingchanhayssta-ko tulessta.) 'Junho heard that Jihye praised Jihye and Juri praised Juri.'	**2. Sloppy reading** 지혜는 준호가 지혜를 칭찬했다고 들었고 주리는 준호가 주리를 칭찬했다고 들었다. (Jihye-nun Junho-ka Jihye-lul chingchanhayssta-ko tulessko Juri-nun Junho-ka Juri-lul chingchanhayssta-ko tulessta.) 'Jihye heard that Junho praised Jihye and Juri heard that Junho praised Juri.'
3. External antecedent reading 준호는 지혜와 주리가 어떤 여자를 칭찬했다고 들었다. (Junho-nun Jihye-wa Juri-ka etten yeca-lul chingchanhaysstako tulessta.) 'Junho heard that both Jihye and Juri praised some other girl.'	**3. External antecedent reading** 지혜와 주리는 준호가 어떤 여자를 칭찬했다고 들었다. (Jihye-wa Juri-nun Junho-ka etten yeca-lul chingchanhayssta-ko tulessta.) 'Both Jihye and Juri heard that Junho praised some other girl.'
4. None of the above	**4. None of the above**

[13] The labels *strict reading* and *sloppy reading* in Table 2 are given for convenience, and are not part of test instrument.

Each item consisted of a sentence pair, where the first sentence contained *kunye* in the embedded object position, and a gender-matched antecedent as either the embedded subject (A in Table 4.4) or the matrix subject (B in Table 4.4); the second sentence contained a VP pro-form (*kulayssta* 'did so'). Participants were asked to choose the best interpretation, out of three, for the sentence pair, or else to choose 'none of the above' if none of the interpretations work. The choice of the response corresponding to the *strict reading* (1 in Table 4.4) indicates they preferred the coreferential reading to the others. The choice corresponding to the *sloppy reading* (2 in Table 4.4) indicates the bound variable reading was preferred to the others. The choice of an *external antecedent* (3 in Table 4.4) would suggest that participants prefer *kunye* to be construed as an external antecedent rather than *kunye* to co-refer to the sentence-internal antecedent, *Jihye*; this reading, like the *strict reading*, would also be derived through the coreference assignment mechanism licensed in pragmatics. There is evidence that Korean speakers prefer to have a sentence-external antecedent for an overt pronoun even when no such antecedent is mentioned in the context (H. Kim, 2008). If participants do not allow local antecedents for *kunye*, then the *external antecedent* reading would be the only possibility in category A. Two lists were used, with items counterbalanced across lists using a Latin square design; each list contained 12 experimental items (6 per condition) plus 18 filler items, in a random order.

4.1.2.2.Predictions

If both bound variable and coreferential readings are available with *kunye* as in H1a, pronouns with local referential antecedents (A in Table 4.4) would be allowed to have the strict reading or the external antecedent reading, whereas pronouns with LD referential antecedents (B in Table

4.4) would allow these readings and also sloppy reading. Here is the reasoning about the prediction.

Even if *kunye* can have bound variable interpretation, *kunye* in (A) cannot have the sloppy reading because Pr B is at work when the bound variable reading is established between the pronoun and the antecedent. Accordingly, if participants try to make sense of the sentences, they will have to find a possible antecedent for the pronoun either by licensing *kunye* via coreference (selecting the strict reading for the answer) or by picking out a discourse antecedent which is not mentioned in the given sentences (selecting the external reading). It is not clear whether there will be any preference in their choice between the two readings. For *kunye* in (B) which has an antecedent outside of the local domain, there is no problem with Pr B and hence the sloppy reading along with the other two readings made available via coreference will be allowed.

However, if the bound variable construal is unavailable with *kunye* as in H1b, the only possible way to interpret it is by assigning a coreferential reading. Hence, either the strict reading or the external reading is expected to be the most appropriate answer for both conditions (A and B) based on the similar reasoning discussed earlier. A summary of the predictions for Korean SIT is presented in Table 4.5.

Table 4.5. Predictions for Korean SIT

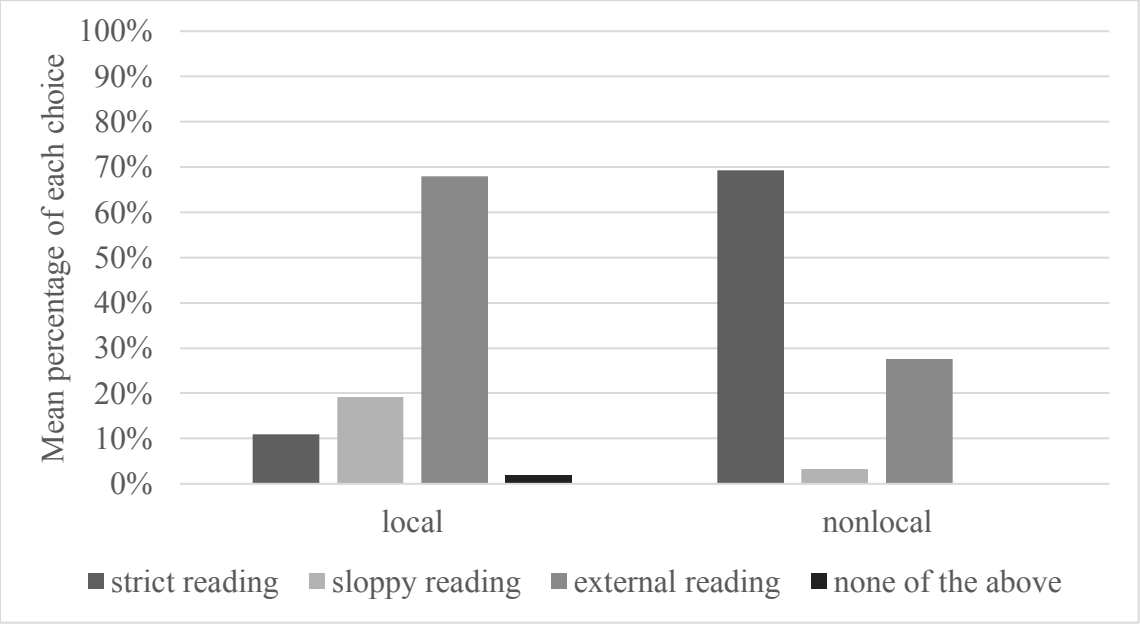
Hypothesis	Local antecedent	LD antecedent
H1a	A. strict or external reading	B. strict, external or sloppy reading
H1b	A. strict or external reading	B. strict or external reading

4.1.2.3.Results and Discussion

Participants' choice of reading in the SIT is summarized in Figure 4.2. As discussed earlier, the goal of this task is to see if an overt pronoun is construed as a bound variable when it takes a

referential NP as its antecedent. Therefore, only the descriptive results of this task were reported to check participants' preferred way of interpreting the overt pronoun with the referential antecedent.

Figure 4.2. Choice of reading for each condition in Korean SIT



When *kunye* takes a LD antecedent, the strict reading was chosen as the most appropriate interpretation of the elided VP, followed by the external reading and the sloppy reading (mean percentage of each choice: strict reading = 69.23%, sloppy reading = 3.21%, external reading 27.56%, none of the above = 0%). This finding suggests that the LD-bound *kunye* is most likely to be interpreted using a coreferential assignment mechanism. However, this does not mean that the bound variable reading is disallowed. Instead, the coreferential reading is preferred to the bound variable reading when interpreting *kunye* in the context of VP ellipsis. If participants interpreted *kunye* primarily using a variable binding mechanism, the sloppy reading would be

chosen as the most appropriate interpretation or at least the percentages of the sloppy reading choice would be more than those of the strict reading.

When *kunye* is presented with a local antecedent, as predicted, the most probable interpretation of the elided VP was the external reading where participants assumed a discourse antecedent (mean percentage of each choice: strict reading = 10.90%, sloppy reading = 19.23%, external reading = 67.95%, none of the above = 1.92%). This shows that Korean speakers can easily posit a discourse antecedent and interpret *kunye* as referring to it via coreference mechanism even though the discourse is not given. This also shows that Korean speakers prefer the external reading to the strict reading in such contexts, although the coreference assignment makes the two readings available. It may be attributed to the fact that it is easier for Korean speakers to assume an unmentioned discourse antecedent, which does not violate any grammatical constraints, than to pick out a local antecedent that is grammatically out due to Pr B. One thing to note is that there was about 20% choice of the sloppy reading as the answer, unlike the prediction. The choice of the sloppy reading indicates that the participants assigned a bound variable reading, which is subject to Pr B, to *kunye*. Given that the antecedent carrying the matching gender feature was provided in the local domain only in the task, there is no way to interpret such results. However, if we reconsider the status of *kunye*, the choice of the sloppy reading may be accounted for. That is, the participants might not have parsed *kunye* as a pronoun *her* but a different form, and hence Pr B was not actually violated. This possibility will be further discussed in 4.3 with the results of Korean TVJT. In the next section, the findings of Korean SIT are summarized, and the relevant hypotheses are discussed.

4.1.3. Summary of the results of Korean TVJT and SIT

Results of TVJT show that participants were statistically more likely to accept sentences in which *kunye* took an LD antecedent than when it took a local antecedent. There was a statistical trend for participants to accept *kunye* with a local referential antecedent than with a local quantificational antecedent, whereas there was no quantificational/referential asymmetry for LD antecedents. The finding that only the LD interpretation of *kunye* is allowed with a quantificational antecedent suggests that the bound variable construal of *kunye* is available, and subject to Pr B. The availability of both local and LD referential antecedents for *kunye* is in line with Rule I not operating in Korean. Therefore, the results are fully consistent with H1a but not with H1b. There were a couple of unexpected findings – 1) the acceptance rates rarely went above 80% for any condition, and 2) *kunye* with a local quantificational antecedent was not entirely rejected (acceptance was about 30%). I attributed these to 1) the infrequent use of *kunye* in colloquial speech and 2) the status of *kunye*, and I will come back to more detailed discussion about them in 4.3.

Results of SIT reveal that coreferential reading is primary and preferred to the bound variable reading when *kunye* takes a LD antecedent because participants chose the strict reading as the most appropriate interpretation and the sloppy reading was chosen as the dominant reading only by a minority of speakers. When *kunye* was presented with a local antecedent, the external antecedent reading was chosen as the most common reading. This suggests that Korean speakers use the coreference assignment primarily to license *kunye* with a local antecedent and they prefer postulating a discourse antecedent to having a grammar-internal, potentially Pr B-violating, antecedent (i.e., local antecedent). Taken together, the results of SIT indicate that the coreferential reading is primary but the bound variable reading is still available when licensing

kunye, which supports H1a and is also able to account for the robust acceptance of *kunye* with a local referential antecedent in the TVJT. One unexpected finding was that the bound variable reading was allowed in the local condition. This may be due to the participants' analysis of *kunye* as *ku yeca* 'that woman', which will be discussed further with the results of TVJT in 4.3. Table 4.6 presents a summary of the predominant answers of the conditions tested in the two tasks and which hypothesis between the two competing ones are supported.

Table 4.6. Summary of the results of Korean TVJT and Korean SIT

Task		**Local antecedent**	**LD antecedent**	**Supporting hypothesis**
TVJT	Referential NP	TRUE	TRUE	H1a
	Quantificational NP	FALSE	TRUE	
SIT		External reading	Strict reading	H1a

4.2. Experiment 2: English offline tasks

Experiment 2, where the same offline tasks were used but the language of testing was English, was designed to test H3.

H3. L1-Korean L2-English learners will transfer the properties of Korean overt pronouns onto English pronouns.

In Experiment 2, L1-Korean L2-English learners' interpretation of English pronouns was compared with English native speakers' interpretation and the role of the knowledge of Korean overt pronouns in the interpretation of English pronouns was examined. The two tasks for Experiment 2 were administered after the participants completed Experiments 5 and 6. The overall procedure and the participants are described in Chapter 3.

4.2.1. Truth Value Judgment Task: Methods, Results and Discussion

The purpose of this task was to examine L1-Korean L2-English learners' interpretation of English pronouns with various types of antecedents in varying binding distance and explore the possible reason for the difficulty if there is any. Results of this task can contribute to the debate about the L2 learners' difficulty of having nativelike interpretation of English pronouns and how the difficulty can be explained.

4.2.1.1.Materials

As in Experiment 1, in a TVJT, each target sentence contained a proper name or a quantificational NP (*every* NP) and they occupied a matrix subject position or an embedded subject position. Each story established a context to yield an interpretation of a pronoun in favor of a local antecedent or a LD antecedent. Accordingly, two independent variables were crossed – a) type of antecedent – referential (name) vs. quantificational; b) type of context – local (clause-mate) binding interpretation vs. LD binding interpretation. An example token set is given in Table 4.7, and the indexing specified in the target sentences indicates which NP was considered as the target antecedent of the pronoun. Since all the test materials were given in English, English names were used.

Table 4.7. Example token set for English TVJT

	antecedent = Referential NP	**antecedent = Quantificational NP**
sentence true with local (embedded subject) antecedent	A. Sally, Megan and Tiffany go to the same school as Jessica. They don't like Jessica because they think she is too confident about herself. She always considers herself to be a great person, which they don't agree with at all. And Jessica has a rather poor opinion of the other girls, which doesn't help. One day, their teacher asked why the three girls don't like her and they explained why.	B. Sally, Megan and Tiffany go to the same school as Jessica. Jessica doesn't like them because she thinks that they are too confident about themselves. Each one of them always tells their friends how great they are, which Jessica never agrees with. And on top of that, the girls don't think much of Jessica, they don't even speak to her. One day, Jessica's teacher asked why she doesn't like them and she explained why.
	Every girl said that [**Jessica** $_1$ thought highly of **her**$_1$].	Jessica said that [**every girl**$_2$ thought highly of **her**$_2$].
sentence true with LD (matrix subject) antecedent	C. Sally, Megan and Tiffany go to the same school as Jessica. They like Jessica because they think that she is great. One day, each one of them told her why they like her. And they also admitted to having low self-esteem: they have more faith in Jessica's abilities than in their own! Later that day, when Jessica came back home, she told her mom what she heard from the three girls.	D. Sally, Megan and Tiffany go to the same school as Jessica. Jessica likes all of them very much because she thinks that they are great. Jessica has low self-esteem, and she has a much better opinion of these three girls than she does of her own abilities. One day, Jessica told the girls why she likes them. Later that day, when they came back home, they told their moms what they heard from Jessica.
	Jessica $_1$ said that [every girl thought highly of **her**$_1$].	**Every girl**$_2$ said that [Jessica thought highly of **her**$_2$].

As in the Korean TJVT, TRUE responses were assumed to indicate participants' acceptance of the intended reading of the test sentence. For instance, for (A), where the story established the interpretation of *her* as *Jessica* in the test sentence, participants' TRUE responses would indicate that they accept such reading while their FALSE responses would indicate they reject it. Unlike the Korean TVJT, both masculine and feminine forms of the pronoun (him/her) were used. Sixty four items per list, which include 16 target and 48 non-target items were

distributed across four lists in Latin square design, and presented in a randomized order. As in the Korean TVJT, various constructions including quantifiers, negation, etc. were used for the non-target filler items, and they remain the same for the different lists.

4.2.1.2.Predictions

For native speakers of English, participants will judge judge (C) and (D) as TRUE because the antecedents in both (C) and (D) are accessible ones that are located outside the local domain based on Pr B. On the contrary, they will judge (A) and (B) as FALSE because both of them violate Pr B. For L2 learners of English, if there is cross-linguistic influence from their knowledge on Korean overt pronoun such that coreferential reading is more readily available, they will (mis)interpret English pronouns by overaccepting (A) (but not (B)) compared to native speakers of English. With (C) and (D), L2 learners' performance will be similar to those of native speakers of English. The overacceptance of (A) will be more likely to be observed with lower proficiency level learners. The summary of the predictions is presented in Table 4.8.

Table 4.8. Predictions for English TVJT

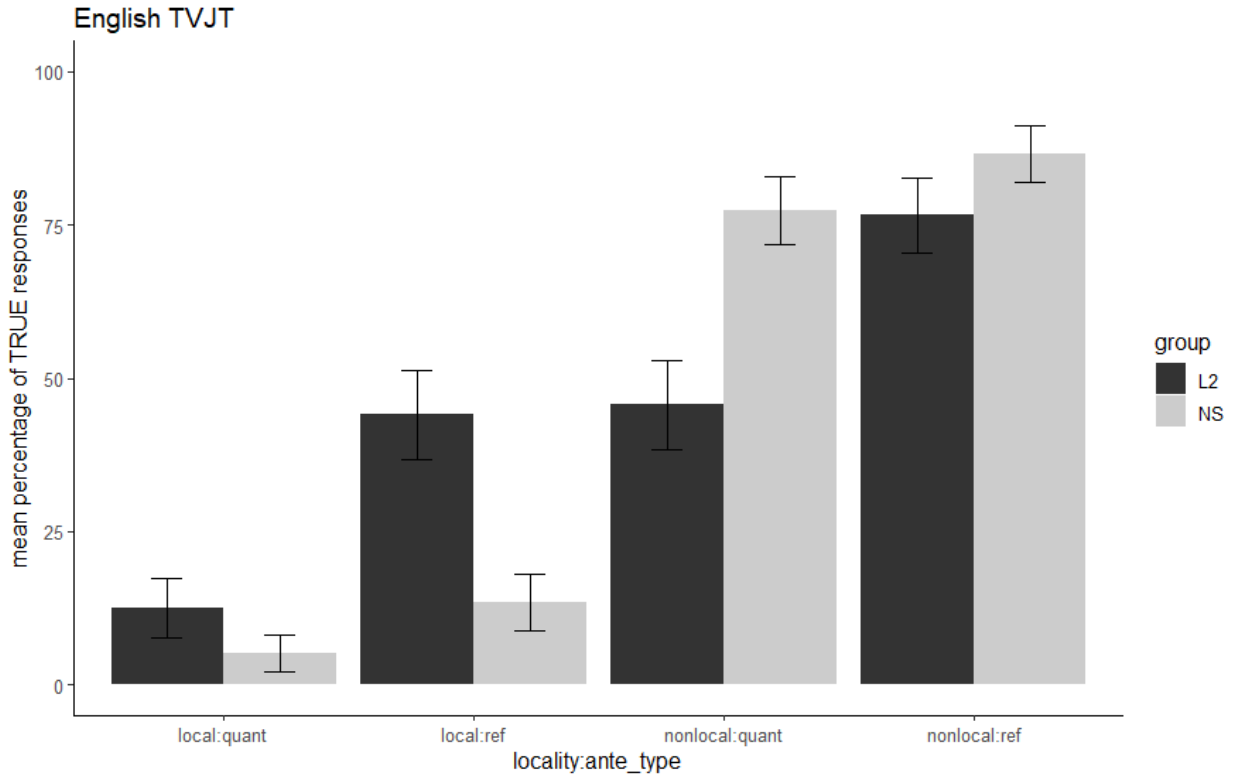
Hypothesis	**Participants**		**antecedent = Referential NP**	**antecedent = Quantificational NP**
	NS-English	**Local antecedent**	A. FALSE	B. FALSE
		LD antecedent	C. TRUE	D. TRUE
H3	**L2-English**	**Local antecedent**	A. TRUE	B. FALSE
		LD antecedent	C. TRUE	D. TRUE

4.2.1.3.Results and Discussion

As in Korean TVJT, the mean accuracy rates of the non-target items were calculated. It was 79.2% for native speakers of English and 80.2% for Korean-speaking learners of English. As done in Korean TVJT, the mean acceptance scores of each condition were calculated by

assigning a score of 1 to TRUE response and 0 to FALSE response. Figure *4.3* shows the mean percentage of TRUE responses for each condition in this task.

Figure 4.3. Mean percentage of TRUE responses for each condition in English TVJT



Both groups did not have problems in accepting the pronoun when it is construed with a referential antecedent outside of the local domain, but the two groups' performance differed when the pronoun takes a non-locally present quantificational antecedent. L2 learners had difficulty in allowing it, but no such difficulty was observed with native speakers of English. One thing that needs to be addressed is that native speakers' acceptance of the pronouns with LD antecedents were not at ceiling, and the pronouns with LD quantificational antecedents resulted in less TRUE responses than the pronouns with LD referential antecedents. This suggests that the task was not easy even for the native speakers of English and their TRUE responses were

affected by the availability of the other potential reading. In certain experimental sentences, technically, two readings were available. For example, in (2), which repeats the sample sentence for the condition (A) and (D) in Table 4.7, there are two potentially available readings of *her* – one is *her* as *every girl* and the other is *her* as Jessica. The first reading is licensed as a bound variable reading and it does not violate Pr B. Technically, the second reading can be licensed through coreference assignment and it does not have to obey Pr B. However, due to the application of Rule I, the second reading could not be maintained. On the other hand, in the sample sentence for the condition (B) and (C) in Table 4.7 repeated here in (3), only one reading of *her* (*her* as *Jesssica*) is available. It is because the reading of *her* as *every girl* is available only via variable binding, but it violates Pr B. This asymmetrical availability of the other potential reading might influence the native speakers' judgments of the pronoun with LD antecedents. Hence, they allowed the pronoun with LD quantificational antecedent in (2) but not as much they did with LD referential antecedent in (3).

(2) **Every girl** said that [**Jessica** thought highly of **her**].

(3) **Jessica** said that [**Every girl** thought highly of **her**].

When the antecedent is in the local domain, the two groups were successful in rejecting the pronoun construed as a quantificational antecedent, but they showed asymmetrical responses in rejecting a referential antecedent for the pronoun. Unlike native speakers of English who disallowed it, L2 learners allowed it to some degree. The descriptive data shows that native speakers of English exhibit categorical judgments with pronouns as locally-bound antecedents vs. LD-bound antecedents, regardless of whether they are referential or quantificational. That is,

they allow the non-locally present antecedents but reject the local ones for the interpretation of the pronouns, obeying Pr B. On the other hand, L2 learners' responses are not always consistent with Pr B. When the antecedents are outside of the local domain, they accept the pronouns interpreted as the referential NPs robustly, but their acceptance is lowered for the pronouns interpreted as the quantificational NPs. When the antecedents are given in the local domain, they correctly reject to interpret the pronouns as the quantificational NPs, but they fail to do so with the referential NPs.

For further statistical analysis, a mixed-effects logistic regression model with a binomial link function was employed. Three manipulating factors (GROUP, ANTE.TYPE, LOCALITY) and their interaction terms were included as fixed effects and subjects and items as random effects. Since Slabakova, White and Guzzo (2017), who tested L2 learners' Quantificational Asymmetry in pronoun interpretation, reported that proficiency level of L2 learners affects their interpretation of English pronouns, scaled proficiency score of the cloze test (PROF.SCORE) was included as a covariate in the model[14]. Table 4.9 shows the model results. In the model, a main effect of ANTE.TYPE (antecedent type) was found to be significant, meaning that participants' responses for the referential antecedents and the quantificational antecedents are significantly different from each other. There was also a main effect of LOCALITY, indicating that participants respond differently for the pronouns with local antecedents than for those with LD antecedents. However, there were no main effects of GROUP and PROF.SCORE, meaning that there was no significant difference between the two groups and the proficiency level did not affect their responses.

[14] The cloze test scores were available with both native speakers of English and L2 learners.

Table 4.9. Fixed effects from the mixed effects logistic regression model performed on responses from English TVJT

	Estimate	**SE**	**z-value**	***p*-value**
Intercept	-0.38	0.08	-4.48	< .001***
Group (NS)	-0.04	0.21	-0.21	0.836
Antecedent type (referential)	-1.23	0.15	-8.45	< .001***
Locality (LD)	-2.87	0.15	-18.86	< .001***
Proficiency score	-0.14	0.10	-1.44	0.149
Group * Antecedent type	-0.72	0.29	-2.50	< .05*
Group * Locality	2.42	0.29	8.25	< .001***
Antecedent type * Locality	-0.38	0.29	-1.32	0.186
Group * Antecedent type * Locality	0.08	0.58	0.14	0.891

Among many interaction terms, there was a significant interaction between GROUP and ANTE.TYPE, suggesting that L2 learners' responses for referential vs. quantificational antecedents were significantly different from those of native speakers. An interaction between GROUP and LOCALITY was also found to be significant. This indicates that native speakers are more likely to disallow the locally bound pronouns than L2 learners while they are more likely to allow the non-locally bound pronouns than L2 learners. Post hoc pairwise comparison was performed using emmeans package to further analyze the interactions. The analysis shows that both L2 learners and native speakers of English responded TRUE to the pronouns with referential antecedents more than to the pronouns with quantificational antecedents (L2: z = -8.80, p < .001; NS: z = -3.82, p < .001). However, there was no significant difference between the two groups for each of the antecedent type (referential antecedent: z = 1.37, p =0.688; quantificational antecedent: -1.52, p = 0.519). These results suggest that the interaction between GROUP and ANTE.TYPE was mainly due to the different acceptance to the pronouns with referential vs. quantificational antecedents within each group. That is, both L2 learners and native speakers of English were more likely to accept the pronoun when it was construed as a referential antecedent than when it was construed as a quantificational antecedent. The pairwise

comparison to further analyze the interaction between GROUP and LOCALITY reveals that L2 learners are more likely to accept the pronouns construed as the local antecedents than native speakers of English ($z = 4.27$, $p < .001$) but for the pronouns construed as the LD antecedents, their acceptance scores are significantly lower than those of native speakers of English ($z = -5.46$, $p < .001$). The analysis also reveals that L2 learners' responses to the locally-bound pronouns vs. the non-locally bound pronouns are significantly different from each other ($z = -9.17$, $p < .001$) and the same findings are hold for native speakers of English ($z = -17.15$, $p < .001$). These results suggest that L2 learners are different from native speakers of English in that they incorrectly allow some instances of the locally bound pronouns, especially when the antecedents are referential, and disallow some pronouns construed as the LD antecedents, especially with the quantificational antecedents.

The findings that native speakers of English show near categorical judgments in that they disallow pronouns with local antecedents but allow them with LD antecedents indicate that Pr B plays an important role in English pronoun interpretation. The responses of L2 learners, however, are not as categorical. They allow local referential antecedents to a greater degree than local quantificational antecedents. This is a result that is similar to the findings reported in L1 acquisition research and different from that of the control group. Furthermore, they show nativelike performance with pronouns with LD referential antecedents but not with LD quantificational antecedents. It is not clear why they have trouble with the conditions where pronouns construed as LD quantification antecedents. It is possible that they lack knowledge of quantificational NPs in general or quantificational NPs can be antecedents of pronouns and because of that, they show the current results. This is not likely, however, given that the L2 participants in this study came out as advanced learners of English in the cloze test. Another

possibility is their L1, Korean. Results of Experiment 1 showed Korean speakers' robust use of coreferential mechanism in licensing overt pronouns in Korean. This could have affected their English pronoun interpretation. If the coreferential reading of the pronoun with the local referential antecedent was equally available or even preferred to the reading of the pronoun with the LD quantificational antecedent to L2 learners, the latter reading could have been rejected due to the former reading. The finding that L2 learners overaccepted the pronoun with local referential antecedent supports this explanation. The results of English TVJT is summarized in 4.2.3 with a short discussion about its relevance to H3.

4.2.2. Sentence Interpretation Task: Methods, Results and Discussion

An English SIT was employed in order to find out whether the bound variable reading is available when an English pronoun takes a LD referential antecedent by L2 learners. Also, the results of this task inform us which mechanism is being used more predominantly for the pronoun with a LD referential antecedent. As in Experiment 1, only the overall patterns of the results were reported to show the tendency of their use.

4.2.2.1.Materials

Two sentences were created as in a SIT conducted in Experiment 1. The first sentence contained two NPs and a pronoun *him/her*, and only one of the two NPs functioned as the antecedent of the anaphor by manipulating the gender information of the two NPs. The second sentence had an elided VP. After reading the two sentences, they were asked to choose the most appropriate interpretation of the two sentences. Unlike the Korean counterpart task, where two conditions were constructed by having two pronoun-antecedent distance types (local vs. LD), the English

task had only one condition, a pronoun with a LD antecedent as shown in Table 4.10. The reason for it is because a pronoun with a local one is not allowed due to Pr B, and hence it will be hard for the participants to make sense of that sentence without any context. As in an English TVJT, English names were used in the task. Six experimental items were interspersed with 12 filler items in a randomized order, resulting in a total of 18 items in each list, and presented in two different lists using a Latin square design.

Table 4.10. Example token set for English SIT

LD antecedent
Mary heard that Jack thought highly of her. Sarah heard that Jack did so too. RESPONSE OPTIONS **1. Strict reading** Both Mary and Sarah heard that Jack thought highly of Mary. **2. Sloppy reading** Mary heard that Jack thought highly of Mary but Sarah heard that Jack thought highly of Sarah. **3. External antecedent reading** Both Mary and Sarah heard that Jack thought highly of a girl. **4. None of the above**

4.2.2.2.Predictions

For native speakers of English, either the sloppy reading or the strict reading is predicted to be the most appropriate interpretation. If they interpret *her* in the first sentence as a bound variable, then the sloppy reading will be more likely to be selected for the answer. On the contrary, if *her* gets a coreferential reading and hence interpreted as *Mary*, then the strict reading will be the more probable answer. Technically, the external reading can also be chosen as the answer. However, given that a discourse antecedent is not easily assumed in English, particularly when it

is not explicitly introduced in the discourse as in this task, the probability of the external reading being selected as the most appropriate interpretation is low.

For L2 learners, if there is influence from Korean, their answer will be affected. Because the availability of the coreferential reading is greater in Korean, L2 learners will overaccept the strict reading and underaccept the sloppy reading as the answer compared to the native speakers of English. Another possibility that may occur due to L1 transfer is L2 learners' overacceptance of the external reading as the answer. It is based on the previous findings that Korean speakers, unlike English speakers, allow a sentence-external antecedent for an overt pronoun even when no such antecedent is mentioned in the contexts (H. Kim, 2008). The following table summarizes such predictions.

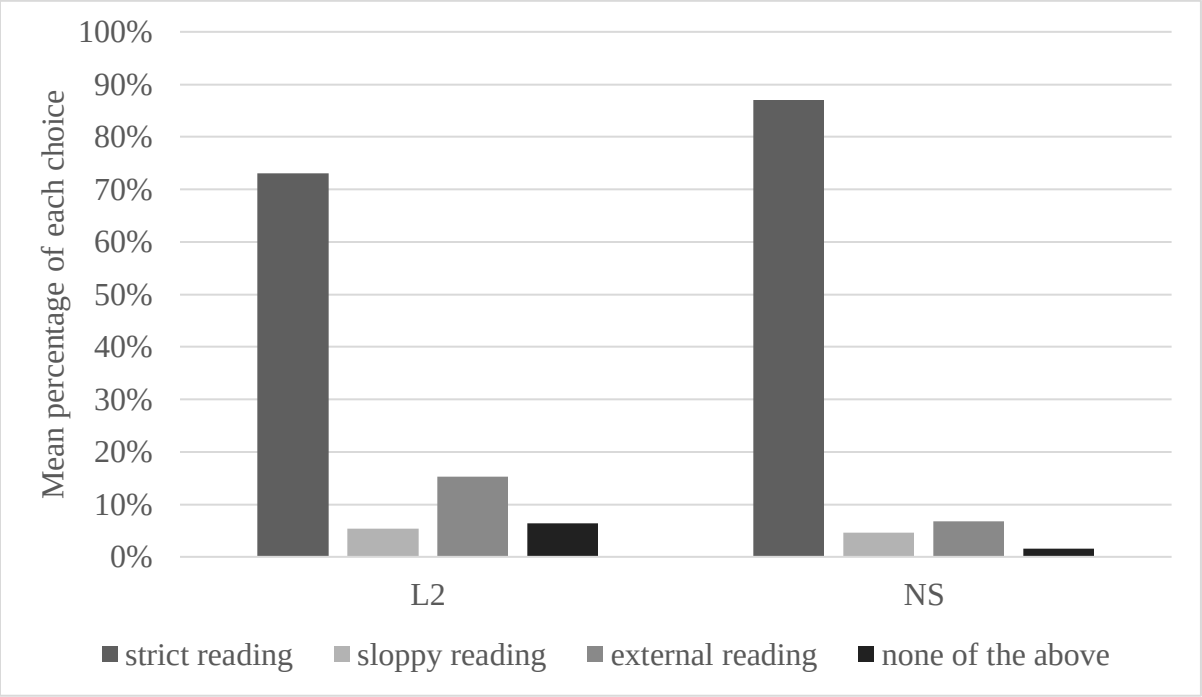
Table 4.11. Predictions for English SIT

Hypothesis	Participant	Response
	NS-English	strict or sloppy reading
H3	L2-English	strict, sloppy or external reading

4.2.2.3.Results

Participants' responses for each condition is summarized in Figure 4.4. As for the Korean SIT results, statistical analysis was not included because this task was designed to compare the two groups' preferred way of licensing English pronouns with the referential antecedent.

Figure 4.4. Choice of reading for each condition in English SIT



Native speakers of English chose the strict reading the most when their interpretation of *him/her* in the context of VP ellipsis was being questioned (mean percentage of each choice: strict reading = 87.04%, sloppy reading = 4.63%, external reading = 7.79%, none of the above = 1.54%). It seems that native speakers prefer to interpret pronouns to have the coreferential reading over the bound variable reading in this context even though both readings are available. However, this does not necessarily mean either that the bound variable reading is not available or that English pronouns are preferred to be interpreted through coreference assignment in general.

Just like NSs, L2 learners chose the strict reading as the most appropriate one in the context of VP ellipsis (mean percentage of each choice: strict reading = 73.05%, sloppy reading = 5.32%, external reading = 15.25%, none of the above = 6.38%). This suggests that L2 learners also prefer to search for the antecedent of the pronoun through coreference assignment in VP ellipsis context. One thing to note, though, is that L2 learners' choice of external reading is about

twice as much as NSs', which seems to be due to the transfer from their L1-Korean. It was predicted that L2 learners may overaccept the external reading due to their L1-Korean where a discourse antecedent is more easily assumed in the interpretation of pronouns. The current results seem to be in line with such prediction because there was difference between L2 learners and NSs in their choice of the external reading. The results of English SIT are summarized again in the following section and discussed in terms of the relevant hypothesis together with the results of English TVJT.

4.2.3. Summary of the results of English TVJT and SIT

The results of TVJT with native speakers of English were as expected. Native speakers of English showed a near categorical pattern: regardless of the antecedent type, pronouns with LD antecedents were allowed while those with local antecedents were not. This is consistent with both Pr B and Rule I, operating in English. However, L2 learners were different from native speakers of English in that they had problems in rejecting local referential NPs as antecedents of pronouns. They had no such difficulty in rejecting pronouns with local quantificational antecedents. The results also showed that they have difficulty in accepting LD quantificational antecedents of pronouns, although they performed similarly to native speakers of English in the case of pronouns with LD referential antecedents. These results are in line with our hypothesis (H3) because they provide supporting evidence for the L1-transfer. First, the findings with local antecedents in English TVJT are parallel to those in Korean TVJT. In Korean TVJT, there was an asymmetry of acceptance between referential and quantificational antecedents when they were located in the same local domain with the overt pronouns. This suggests that L2 learners' asymmetrical acceptance of pronouns with local referential antecedents vs. local quantificational

antecedents may be attributed to the transfer from their L1-Korean, which supports H3. Second, the unexpected findings with LD quantificational antecedents can also be explained from the L1-trasnfer. One possibility to account for such unexpected findings is to assume that the L2 learners participated in this study did not know that pronouns can take quantificational antecedents at all. However, given that the proficiency scores of the L2 learners were ranged intermediate-high (mean = 34.71; SD = 2.39; range = 28-39), it is unlikely that they lack the relevant knowledge. The next possibility is their native language, where a tendency to use coreferential mechanism in licensing overt pronouns is reported in Experiment 1. If such properties in their L1 affects their responses with English pronoun interpretation, L2 learners are expected to have more instances of rejecting the pronouns with the quantificational antecedents. This is exactly what was found with the current results and therefore, the findings with LD quantificational antecedents also support H3.

The results of SIT showed that native speakers chose the strict reading as the most appropriate interpretation in the context of VP ellipsis and L2 learners' choice was not different from native speakers of English. This indicates that coreferential reading is primarily used in the VP ellipsis context although bound variable reading is also available. One important finding in SIT was that L2 learners' choice of the external reading was more frequent than that of native speakers of English. This suggests that L2 learners were more likely to posit a discourse antecedent when interpreting pronouns in the VP ellipsis context than native speakers of English. This is consistent with the findings of Korean SIT where the sentence-external antecedent for an overt pronoun was allowed easily even when no such antecedent was introduced, and hence supports H3.

4.3. General discussion

4.3.1. Status of Korean overt pronouns

Results of Experiment 1 show that both bound variable and coreferential readings are available with the overt pronoun in Korean because both referential and quantificational NPs were allowed as the antecedents of *kunye* 'she/her' when they were presented outside of the local domain. However, there was a referential/quantificational asymmetry when the antecedents were in the same local domain with *kunye*: the participants were more likely to allow the local referential antecedents than the local quantificational antecedents. The availability of a local referential antecedent suggests that Rule I is not operative in Korean. It is not clear why Rule I does not operate in Korean but I assume that it is related to the general property of Korean as a discourse-oriented language. It has been claimed that Korean is one of the languages where discourse-pragmatic factors play much greater role than syntactic factors in language comprehension (Huang, 1984; Kwon & Sturt, 2013; H. Sohn, 1980). That is, Korean allows discourse to override syntax easily. This may have eliminated the needs of Rule I. In other words, since pragmatically licensed coreferential readings can be easily obtained instead of syntactically licensed bound variable readings, Rule I, which specifies the contexts where the coreferential readings can surface, would not be required.

One thing to note about the results is that the local quantificational antecedents were not entirely rejected, though. This was unexpected because the quantificational antecedents are licensed only through variable binding and the bound variable reading is subject to Pr B. In order to account for this unexpected acceptance (about 30%), the status of *kunye* is reconsidered. As introduced earlier, there has been a debate over the status of *ku* 'he/him'. Some claim that it is a 3rd person pronoun corresponds to an English pronoun 'he/him' (e.g., G. Lee, 2001; M.-Y. Kang,

1988; Yang, 1985) while others claim that it is different from an English pronoun (e.g., An, 2008; K.-S. Kim, 2010). The reason why there is disagreement on its status is because *ku* is somehow related to one of the demonstrative forms in Korean[15]. Based on such similarity, Choi (2013) proposed that a 3rd person referring expression *ku* in Korean, which I assumed a pronoun in this study, is indeed not a pronoun but a nominal phrase which consists of a demonstrative *ku* and a null category *pro* having a feature [+human][16]. Under his proposal, *kunye* can be analyzed as a demonstrative *ku* and a DP *nye* which has a feature [+human, +feminine]. In other words, *ku* is not 'he/him' but 'that person' and *kunye* is not 'she/her' but 'that female person'. If this is correct, *kunye* itself consists of the smallest complete domain (DP), as indicated within square brackets in (4). Then, *kunye* is not in the same local domain with *every girl*, and hence the construal of *kunye* as *every girl* has to be available, because it does not violate Pr B.

(4) 지혜가 **어느 소녀**나 [**그녀**를] 대단하게 여겼다고 말했다.

Jihye-ka **enu sonye**-na [**kunye**-lul] taytanhakey yekiessta-ko malhayssta.

Jihye said that **every girl** thought highly of [**that female person**].

This analysis of *kunye* can also explain the availability of the sloppy reading that was observed with the local referential antecedents in the SIT. The sloppy reading, which indicates that the bound variable reading is assigned, was not expected to be available with *kunye*

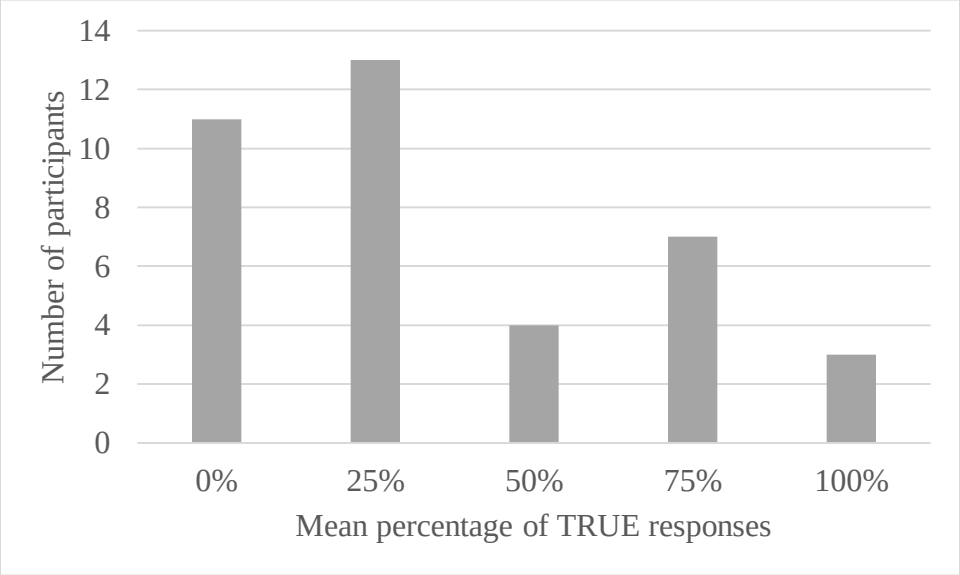
[15] Korean demonstratives three-way distinction: proximal forms, speaker-centered distal forms, and speak- and hearer-centered distal forms. For example, demonstrative *i* 'this' refers to a proximal object relative to the speaker, *ku* 'that' refers to a distant object that is close to the hearer, and *ce* 'that over there' refers to a distance object that is far from both the speaker and the hearer.

[16] Most of the cases, *ku* refers to the male person but sometimes, *ku* can be used regardless of gender. This means that *ku* sometimes refer to the female person. Based on such observation, Choi (2013) proposed that a null category *pro* has a feature [+human] not [+human, +masculine].

construed as the local referential antecedent under the assumption that *kunye* is a pronoun. It was because the bound variable reading is subject to Pr B. Unlike the prediction, the current results show that the sloppy reading was available. This again can be explained under the idea that *kunye* is not parsed as a pronoun but a structure composed of a demonstrative *ku* and a DP with [+human, +feminine]. If so, *kunye* is not clause-mate with the antecedent, and hence there should be no problem having the bound variable reading.

It seems that the new analysis of *kunye* has explanations for some unexpected findings of this study. However, the new analysis also creates a new puzzle. If the construal of *kunye* as *every girl* in (4) does not violate Pr B, its acceptance should have been higher than the current results because there is no reason why it cannot be allowed. Yet, the acceptance rates were about 30%. A way to account for this is to examine the individual results, following K. Kim and Han (2016). They proposed that two competing grammars are available regarding *ku* – one as a pronoun and the other as a demonstrative combined with a DP –, and Korean speakers may acquire only one of them due to the lack of relevant input data, based on the *two-grammar hypothesis* by Han, Lidz, and Musolino (2007). If this is correct, we will find two groups of speakers whose judgments regarding *kunye* with the local quantificational antecedent differ. The group who analyzes *kunye* as a pronoun will reject it while the group who analyzes *kunye* as a demonstrative and a DP will allow it. This is exactly what was found in the individual results as shown in Figure 4.5.

Figure 4.5. Number of individual participants for each mean percentage of TRUE responses with condition B (*kunye* with the local quantificational antecedent) in Korean TVJT



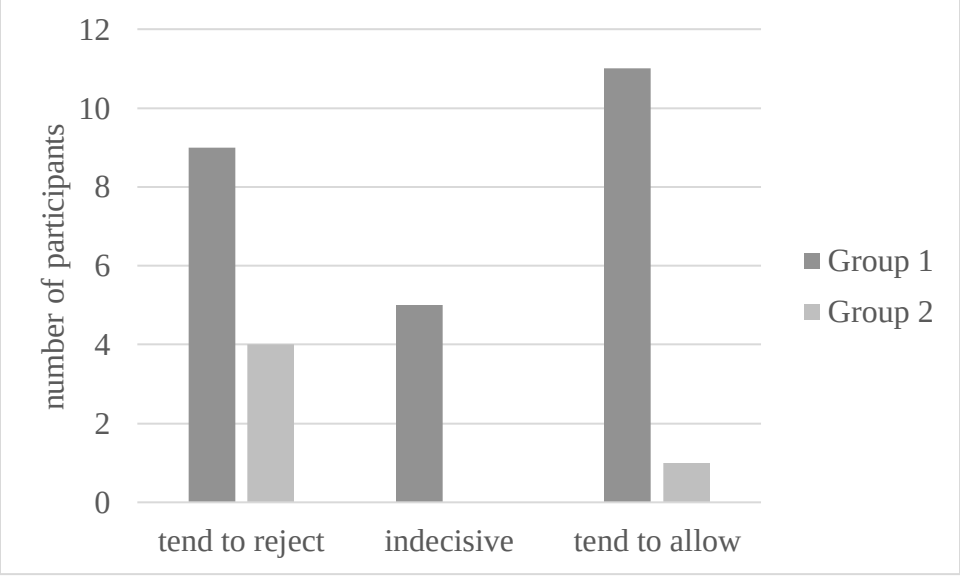
The individual results show that 24 out of 38 speakers rejected *kunye* with the local quantificational antecedent, indicating that they analyzed *kunye* as a pronoun. On the other hand, there was another group of participants (10 out of 38) who allowed it, based on their grammar of *kunye* as a demonstrative and a DP. These results suggest that there are indeed two groups of speakers with the competing grammars of *ku*, as claimed in K. M. Kim and Han (2016).

4.3.2. Korean speakers' individual performance in Experiments 1 and 2

Results of Experiment 2 suggest that there are some similarities between L1-Korean L2-English learners' interpretation of English pronouns and their interpretation of Korean overt pronouns. Hence, individual Korean speakers are compared on their performance in the Korean vs. English TVJT, focusing on how they responded to the pronoun with the local referential antecedent. If how they interpret Korean overt pronouns affect their interpretation of English pronouns, there will be correlation between their mean percentage of TRUE responses in the two tasks. In order

to see the correlation between the two, I first created two groups from the L2 learners. Group 1 is the group where the participants had a tendency to allow *kunye* with the local referential antecedents. If the participants allowed three or more out of four items having *kunye* with the local referential antecedents, they were categorized in this group. Group 2 is the group where the participants tended to reject it, meaning that they allowed one or none out of four items. The participants who allowed two out of four items were excluded because they were indecisive about *kunye* with the local referential antecedents. There were 25 in Group 1 and 5 in Group 2. Within the group, the participants' responses to *him/her* with the local referential antecedents were examined, and Figure 4.6 displays the number of participants for its response types by each group.

Figure 4.6. Number of participants' response types to condition A (*him/her* with the local referential antecedents) in English TVJT by each group



In Group 1, who had the tendency to allow *kunye* with the local referential antecedent, 11 individuals had the same tendency for an English pronoun, and 9 had the opposite tendency. In

Group 2, who tended to reject *kunye* if it was construed as the local referential antecedent, four had the same tendency for an English pronoun, and only one had the opposite tendency. Based on this, we cannot conclude that there is a strong correlation between the participants' responses to Korean TVJT and English TVJT. However, the results suggest that there are some individuals who may transfer their way of interpreting Korean overt pronouns to their English pronoun interpretation. Because the current results cannot provide strong evidence for the L1-transfer effect, it will be further explored in future research by adopting an additional L2 group whose L1 is different from Korean.

4.3.3. Relation to DPBE in L1 acquisition

Results of TVJT in Experiment 2 show that L1-Korean L2-English learners apparently violate Principle B when the pronoun takes a local referential antecedent. This resembles the DPBE, which is the findings robustly reported in L1 acquisition studies such that children have difficulty in disallowing a pronoun that takes a local referential NP as its antecedent (see section 2.5 in Chapter 2). Then, the question is how the DPBE relates to the L2. If Korean-speaking L2-English learners' overacceptance of local referential antecedents is related to the DPBE, the current findings can also be explained with the reasons proposed in L1 acquisition studies. I will now explore this possibility.

There are two representative accounts for the DPBE. One is the pragmatic account (Thornton & Wexler, 1999) and the other is the processing account (Reinhart, 2006). In the pragmatic account, the DPBE is caused by a deficiency in relevant pragmatic knowledge (Principle P). Children know Principle B and do not allow locally bound pronouns. However, they allow a local antecedent for a pronoun because they lack the knowledge that two

interpretations of pronouns, bound variable reading and coreferential reading, are available and that coreferential readings can obtain only when pragmatically licensed. On the contrary, according to the processing accounts, children possess all knowledge required for the interpretations of pronouns, but children show the DPBE because they have limited processing capacity. When multiple NPs are available in the sentence, the parser performs an operation to choose the correct antecedent between them. Children may be unable to perform this operation due to working memory limitations and end up guessing arbitrarily between multiple interpretations (i.e., bound variable reading, coreferential reading) generated by the grammar.

These two accounts can be used to explain our L2 learners' pronoun interpretation data. In addition to them, there is one more possibility available to explain L2 learners' data: L1 transfer. I will now turn to how these accounts can or cannot fit into our data. Results of Experiment 2 suggest that our L2 learners lack Rule I and hence they allowed local referential antecedents for pronouns. These results cannot be explained with the pragmatic account. Our participants are adults and therefore in full possession of pragmatic knowledge. Therefore, pragmatic immaturity cannot explain why L2 learners' performance was similar to the DPBE.

On the contrary, the processing account may be able to account for our results. Some literature indeed has proposed that certain problems relating to L2 pronoun interpretation may be attributed to differences in processing capacities (Sorace, 2011, 2016; Slabakova et al., 2017). For example, Slabakova et al. (2017) who tested the DPBE in L2 showed that lower proficiency L2-English learners were less accurate in rejecting local referential antecedents for pronouns than higher proficiency learners. Their explanation for the results was that the lower proficiency learners had limited processing capacity and hence could not handle the computational complexity that arises while finding an appropriate referent for the pronoun. This did not apply

to the higher proficiency learners because they became capable of accomplishing the necessary reference set computation. If their explanation is on the right track, advanced L2 learners should not overaccept the pronouns bound by the local referential antecedents. This prediction, however, is not borne out in this study. Thus, the processing accounts could not explain our results.

Our results can be best explained with L1 transfer. As shown in the results of TVJT in Experiment 1, Rule I does not operate in Korean and therefore, our participants robustly allowed pronouns with local referential antecedents in Korean. This seems to affect our participants' judgments on English pronouns. As discussed previously, however, our study design is limited to make a strong argument about L1 transfer because there was a single L1 group and the effects were based on the similarity between their performance in L1 and L2. In order to definitely argue for transfer, an additional group with L1 where Rule I is operative will be tested in future research and their judgments will be compared to those of Korean-speaking learners of English. Having addition L1 group will also help us assess the processing account, given that the processing account would apply to any L1-group, unlike the transfer account.

4.4. Conclusion

The aim of Experiments 1 and 2 was to examine the status of Korean overt pronoun and the possible L1-transfer effect in L1-Korean L2-English learners' interpretation of English pronouns. The results first show that Korean overt pronoun *ku* 'he/him' or *kunye* 'she/her' allow both bound variable readings and coreferential readings, but due to the suspension of Rule I, coreferential readings can obtain even when the bound variable readings are available, unlike English. The results also suggest that there may be two contrasting grammars available with *ku*

or *kunye* – a pronoun or a DP (a demonstrative + a DP) – and there may be two groups of speakers who have one over the other grammar, which is in line with the findings of K. Kim and Han (2016). With regard to the L1-effect, the results did not provide definitive evidence to support it, but they suggest that it may be the case for L1-Korean L2-English learners' English pronoun interpretation. This possibility will be better addressed in the future study having an additional L2 group with a different L1.

CHAPTER 5: ONLINE APPLICATION OF PRINCIPLE B IN KOREAN AND IN ENGLISH

The objectives of Experiments 3 through 6 are the following: 1) examine whether and how Pr B constrains the real-time processing of overt pronouns in Korean and English, and 2) examine whether the processing strategy deployed in Korean overt pronoun processing influences their processing of English pronouns by Korean speakers.

Pronoun processing in Korean was examined from the perspective of the three hypotheses that were proposed in Chapter 2 that seeks to answer the role of Pr B in the real-time search for an antecedent of a pronoun – the *Binding as initial filter (BAIF) hypothesis*, the *Binding as defeasible filter (BADF) hypothesis* and the *feature-match hypothesis*.

If the Korean overt pronoun *kunye* 'she/her' is like overt pronouns in English with dominant bound variable readings, Korean speakers will use Pr B as a filter during overt pronoun processing in Korean, which is the position of *BAIF* and *BADF*. If the *BAIF hypothesis* is true, only the LD antecedents sanctioned by Pr B will be considered from the early stages of processing. If the *BADF hypothesis*, a variant of the *BAIF hypothesis*, is true, it may be possible that the antecedents compatible with Pr B (i.e., LD antecedents) will be considered in the initial parsing stages but in the later processing stages, Pr B-incompatible antecedents (i.e., local antecedents) may also be considered[17].

On the contrary, it may be that *kunye* is different from overt English pronouns, as we saw in Experiment 1 where apparent Pr B violations with *kunye* were observed. At the same time, the behavior of *kunye* with quantificational antecedents suggests that Pr B is operative in Korean,

[17] Pr B licenses only the LD antecedents, and hence the Pr B-compatible antecedents always refers to the LD antecedents and the Pr B-incompatible antecedents always refers to the local antecedents.

and that the apparent Pr B violations with referential antecedents may result through coreference. If coreferential readings of *kunye*, which can bypass Pr B, are primary and readily available during the real-time antecedent search process, Korean speakers may consider not only the Pr B-compatible antecedents but also those incompatible with Pr B. In terms of real-time processing, two scenarios are possible. First, as predicted by the *feature-match hypothesis*, it is possible that Korean speakers will consider both local and LD antecedents during the initial stages of processing of *kunye* but later narrow down the search to the LD antecedents. A second possibility is that both local and LD antecedents will be considered at all processing stages. If Korean speakers were giving judgments based on their final parse where both local and LD antecedents were activated, they could end up accepting the local antecedents. In fact, this is in line with the findings of Experiment 1 where Korean speakers allowed *kunye* construed as a local antecedent in their final judgments. Therefore, this possibility, which is introduced as H2 in the study (and I will call it *coreferential reading effect hypothesis*), is additionally tested to find out the overt pronoun processing pattern in Korean.

As for English pronoun processing, the accumulated evidence demonstrates that Pr B plays an important role in the antecedent search process during parsing. Most of the studies have reported evidence supporting the *BAIF hypothesis*, under which only LD antecedents that are Pr B-compatible are accessed during pronoun processing, and local antecedents remain invisible to the parser. If this is also the findings of this study with native speakers of English, the results will be aligned to the predictions of the *BAIF hypothesis*. Alternatively, this pattern might be observed only during the initial processing stages and later, local antecedents might become visible to the parser, which is a result that would conform to the prediction of the *BADF hypothesis*. However, the results may conform to the predictions of the *feature-match hypothesis*,

as reported in some studies examining English pronoun processing. That is, both LD and local antecedents might be retrieved during the initial processing if they carry matching features with the pronoun, because all available cues are assumed to contribute in parallel to an antecedent's activation, but in later stages, the focus will be more on structurally accessible antecedents. For English pronoun processing, the *coreferential reading effect hypothesis* is not entertained, given the overwhelming evidence from prior research that local antecedents are not grammatically allowed and thus its activation is not expected at the later stages of parsing.

In this study, L1-Korean L2-English learners' pronoun processing in English was also tested. Many prior studies have reported L1-transfer effect in L2 acquisition and processing. If processing patterns of Korean overt pronouns differ from those of English pronouns and if L1-Korean plays a role in English pronoun processing, L1-Korean L2-English learners will process English pronouns more like Korean speakers processing Korean pronouns than like English native speakers processing English pronouns. On the other hand, if processing patterns of Korean overt pronouns differ from those of English pronouns but if there is no L1-transfer effect, L1-Korean L2-English learners will process English pronoun just like how native speakers of English do.

Table 5.1 summarizes the three hypotheses (four hypotheses for L1-Korean and L2-Korean) against which the real-time antecedent search of a pronoun in terms of available antecedents and their timing, which refers to the time when the constraints that guide the search are presumed to be active, can be assessed. The predictions that each hypothesis makes for L1-Korean vs. L1-English vs. L2-English pronoun processing are also listed.

Table 5.1. Summary of hypotheses for pronoun processing and predictions for L1-Korean, L1-English, and L2-English (bold font used to indicate the hypothesis that I expect to be supported)

Language	Hypothesis	Available antecedents	Timing
L1-Korean	BAIF hypothesis	LD antecedents	All stages of processing
	BADF hypothesis	LD antecedents; Local antecedents	Early stages of processing – LD antecedents; Late stages of processing – Local antecedents
	Feature-match hypothesis	LD antecedents; Local antecedents	Early stages of processing – LD, Local antecedents; Late stages of processing – LD antecedents
	Coreferential reading effect hypothesis	**LD antecedents; Local antecedents**	**All stages of processing**
L1-English	**BAIF hypothesis**	**LD antecedents**	**All stages of processing**
	BADF hypothesis	LD antecedents; Local antecedents	Early stages of processing – LD antecedents; Late stages of processing – Local antecedents
	Feature-match hypothesis	LD antecedents; Local antecedents	Early stages of processing – LD, Local antecedents; Late stages of processing – LD antecedents
L2-English	BAIF hypothesis	LD antecedents	All stages of processing
	BADF hypothesis	LD antecedents; Local antecedents	Early stages of processing – LD antecedents; Late stages of processing – Local antecedents
	Feature-match hypothesis	LD antecedents; Local antecedents	Early stages of processing – LD, Local antecedents; Late stages of processing – LD antecedents
	Coreferential reading effect hypothesis	**LD antecedents; Local antecedents**	**All stages of processing**

5.1. Experiment 3 and 4: Korean online reading task

Experiments 3 and 4 are designed to test the coreferential reading effect hypothesis (H2) and explore whether and how Pr B is applied during the real-time processing of overt pronouns in Korean. Moreover, the two experiments aim to examine whether the referential/quantificational asymmetry reported in the pronoun interpretation is also found in processing. The three

hypotheses on pronoun processing proposed in the literature did not make distinction between the two types of antecedents, because they were based on English where the bound pronouns are strictly constrained by Pr B. However, in Korean, we might observe the referential/quantificational asymmetry even in pronoun processing if Pr B can be violated more easily with the referential antecedents, but not with the quantificational ones, due to the availability of coreferential reading.

H2. *Coreferential reading effect hypothesis*

> Pr B will constrain the antecedent search process of an overt pronoun in Korean, but Principle B-incompatible antecedents will be available additionally through coreference at all stages of processing.

Results of Experiment 1 suggest that Pr B is operative in Korean and that coreferential readings of overt pronouns, which can be licensed in discourse bypassing Pr B, are readily available. Based on that, in Experiments 3 and 4, how Pr B operates in Korean overt pronoun processing was explored using an eye-movement monitoring technique. Both bound variable and coreferential readings are available when the pronoun takes the referential antecedent but when the pronoun takes the quantificational antecedent, only the bound variable reading is available. Therefore, the pronoun processing pattern is expected to differ depending on the antecedent type under the *coreferential reading effect hypothesis*. When the antecedents are referential NPs, both local and LD antecedents will be considered, and their activation will continue until they resolve the meaning of the pronoun. On the contrary, when the antecedents are quantificational, local antecedents will not be available during parsing because of Pr B, just like English pronoun

processing. Following this reasoning, antecedent types were separately tested focusing on the role of Pr B during parsing. In Experiment 3, how Pr B operates while Korean overt pronoun is parsed with referential antecedents was examined while in Experiment 4, Korean overt pronoun processing with quantificational antecedents was investigated. Table 5.2 provides a summary of each Experiment in terms of antecedent type being tested.

Table 5.2. Summary of Experiments 3 and 4

Experiment	Antecedent type	Prediction on available antecedents	Prediction on timing
3	Referential NPs	LD antecedents; Local antecedents	All stages of processing
4	Quantificational NPs	LD antecedents	All stages of processing

5.1.1. Overall methodology

5.1.1.1.Procedure

There was one reading task in Korean where participants' eye-movements were recorded, and it included the materials for both Experiments 3 and 4. The materials were arranged in a Latin-square design, resulting in four lists. There were 32 experimental items for Experiment 3 and 32 experimental items for Experiment 4, with 80 fillers and 16 pseudo-fillers, resulting in 160 items per list in total. The detailed description of materials for each experiment is provided in 5.1.2.1 (for Experiment 3) and in 5.1.3.1 (for Experiment 4). The fillers contained a variety of sentence structures, different from both types of experimental items but approximately equivalent in length. The 16 pseudo-fillers were of two types: eight items contained a reflexive pronoun *caki-casin* 'himself/herself' and another eight items contained object pronouns where the local antecedent was provided first by fronting the embedded clause. The examples for the pseudo-fillers are given in (1).

(1) a. Pseudo-filler type #1

준석이는 [민지가 새로 산 연필로 자기자신을 예쁘게 그렸다]고 말했다.

Cwunseki-nun [Minci-ka saylo san yenphil-lo cakicasin-ul yeyppukey kulyessta]-ko malhayssta.

'Cwunsek said that Minci sketched herself beautifully with a new pencil.'

b. Pseudo-filler type #2

[민지가 새로 산 연필로 그녀를 예쁘게 그렸다]고 유미가 말했다.

[Minci-ka saylo san yenphil-lo kunye-lul yeyppukey kulyessta]-ko Yumi-ka malhayssta.

'Yumi said that Minci sketched her beautifully with a new pencil.'

The pseudo-fillers were included to prevent participants from becoming habituated to the type of anaphoric element or the position of the inaccessible antecedent in the experimental items, thus minimizing the risk of participants' development of a strategy. Binary yes/no comprehension questions followed two thirds of the 160 items in each list to ensure that participants were paying attention and reading for comprehension. Comprehension questions did not explicitly probe the referent of the pronoun, in order not to draw attention to the purpose of the experiment or encourage strategic reading behavior. The experiment began with the presentation of six practice items to familiarize participants with the procedure, three of which were followed by a comprehension question.

5.1.1.2.Data acquisition and preparation

All participants eye movements were recorded using the desktop-mounted Eyelink 1000 plus system (SR Research, Canada). Participants were seated in front of a PC monitor at a distance, with their chin on a chinrest and their forehead resting against a bar. The camera which tracked their eye movements was placed on the desk below the monitor. The distance from top of the monitor to eyes was 102.5cm. Before the experiment began, the recording of participants' eye movements was calibrated on a nine-point grid. Viewing was binocular, but only data from the right eye was recorded, except a few cases where the left eye was recorded due to the difficulty in tracking the right eye. The pupil was tracked at a 1000Hz sampling rate. There was a drift correction procedure before each trial in which a target appeared in the left corner of the screen in the middle, and participants had to press a button while fixating on the target. After the set-up, participants were presented with a screen containing instructions, followed by practice trials, three of which were followed by practice comprehension questions. Responses to the comprehension questions and to the drift correction screen were made using a gamepad connected to the host PC via a USB port. Participants were instructed to sit still for the duration of the experiment. Participants were allowed to take a short break if they wanted, at the three designated break times during the experiment. The eye-tracking part of the experiment took around 50 minutes in total, after which participants did the offline judgment tasks.

The experimental items were divided into regions of interest for the purpose of the analysis. Eye-movement data from the following regions was analyzed for Experiments 3 and 4: pre-critical, pronoun, spillover and prefinal. Table 5.3 shows how the text in the critical sentence was divided into regions.

Table 5.3. Regions of interest for the experimental sentences in Experiments 3 and 4

Experiment 3					
	Pre-critical	Pronoun	Spillover	Prefinal	
미란이는 주리가 뾰족한	바늘로	그녀를	실수로	찔렀다고	말했다.
Miran Juri sharp	needle	her	by mistake	pricked	said
'Miran said that Juri pricked her with a sharp needle by mistake.'					
Experiment 4					
	Pre-critical	Pronoun	Spillover	Prefinal	
어느 여자나 어떤 소녀가 뾰족한	바늘로	그녀를	실수로	찔렀냐고	물었다.
every woman which girl sharp	needle	her	by mistake	pricked	asked
'Every woman asked which girl pricked her with a sharp needle by mistake.'					

It has been reported that the overall first-pass skipping rate in Korean is about 10%, which is relatively low compared to English (about 20%) (Lee, Lee, & Gordon, 2007). This relative low skipping rate suggests that words in Korean may not be easily passed during the readings of Korean sentences. Therefore, for Korean sentences, each region contained a single word composed of three or four syllable blocks. The **pre-critical** region contained the word before the pronoun as presented in Table 5.3. The **pronoun** region contained the pronoun with an accusative case marker *-lul*. The **spillover** region contained a single word following the pronoun. The **prefinal** region contained a single word following the spillover region. The words in the pre-critical region and the spillover region were matched in terms of frequency[18] and syllable length across items.

In each region, five reading measures were reported: *first fixation duration*, *first-pass reading time*, *regression-path time*, *rereading time*, and *total viewing time*. *First fixation duration* is the length of the first fixation in a particular region. *First-pass time* is the sum of the fixation durations in a region before it is exited for the first time. The region can be exited to the right (towards new material) or the left (backwards to inspect previous material). *Regression-*

[18] Frequency of Korean words were checked using Sejong malmwungchi hwalyong system based on Sejong Corpus (Lee et al., 2010; http://kkma.snu.ac.kr/).

path time is the sum of the fixation durations in a region before it is exited to the right, towards new material. *Rereading time* is the sum of durations in a region after it has been re-entered. *Total viewing time* is the sum of all fixation durations in a region. These measures are considered in monolingual reading research as points of a continuum that represent different processing stages, from an early to a late stage (see Staub & Rayner, 2007 for review).

Prior to the analysis, individual fixations shorter than 80ms and within one degree of visual angle of a neighboring fixation were merged with the neighboring fixation. Other fixations shorter than 80ms, and longer than 1200ms were removed.

5.1.2. Experiment 3

5.1.2.1.Materials

To examine the time-course of pronoun resolution in Korean, a design where gender features of the overt pronoun and the antecedents were manipulated was adopted. Thirty two experimental items, 8 per condition, were constructed in a 2 (local NP gender match/mismatch) x 2 (LD NP gender match/mismatch) design. The sample token set is given in Table 5.4. Each target sentence was bi-clausal and contained two potential antecedents (both are names) which appeared before the embedded object overt pronoun *kunye*.

Table 5.4. Example token set for Experiment 3

Condition	Sentence
A. Double match (DM)	미란이는 [주리가 뾰족한 바늘로 그녀를 실수로 찔렀다]고 말했다. Mirani-nun [Juri-ka ppyocokhan panul-lo kunye-lul silswulo ccillessta]-ko malhayssta. 'Miran said that Juri pricked her with a sharp needle by mistake.'
B. Local mismatch (LMM)	미란이는 [준호가 뾰족한 바늘로 그녀를 실수로 찔렀다]고 말했다. Mirani-nun [Junho-ka ppyocokhan panul-lo kunye-lul silswulo ccillessta]-ko malhayssta. 'Miran said that Junho pricked her with a sharp needle by mistake.'

Table 5.4. cont'd

Condition	Sentence
C. LD mismatch (LDMM)	성호는 [주리가 뾰족한 바늘로 그녀를 실수로 찔렀다]고 말했다. Sungho-nun [Juri-ka ppyocokhan panul-lo kunye-lul silswulo ccillessta]-ko malhayssta. 'Sungho said that Juri pricked her with a sharp needle by mistake.'
D. Double mismatch (DMM)	성호는 [준호가 뾰족한 바늘로 그녀를 실수로 찔렀다]고 말했다. Sungho-nun [Junho-ka ppyocokhan panul-lo kunye-lul silswulo ccillessta]-ko malhayssta. 'Sungho said that Junho pricked her with a sharp needle by mistake.'

The names were matched in terms of syllable length and were typical girls' names (for the match conditions) and typical boys' names (for the mismatch conditions) because only the feminine pronoun form *kunye* was used. The first name (the non-local/LD antecedent) was always the matrix subject, and it was always an accessible antecedent as it is outside of the local domain containing the pronoun. The second name (the local antecedent) was always the subject of the embedded clause. It was always an inaccessible antecedent, which means that it was ruled out as an antecedent of the pronoun according to Pr B, because it was in the same local domain as the pronoun and c-commanded by the pronoun.

5.1.2.2.Predictions

If the *coreferential reading effect hypothesis* is correct, Korean speakers will consider both LD and local antecedents while processing Korean overt pronouns at all stages. Therefore, the gender match/mismatch of both local and LD antecedent will affect the parsing at all stages. This will lead to longer reading times (RTs) in the DM condition compared to the conditions where only one antecedent carries matching gender feature (the LMM and the LDMM conditions) because of retrieval interference. With regard to the DMM condition, it can have either the longest RTs compared to the other three conditions if comprehenders try to make sense of the

sentence by positing a discourse antecedent, which is very likely based on the results from Korean TVJT, or the shortest RTs if they give up parsing due to its ungrammaticality.

If the *coreferential reading effect hypothesis* is incorrect, there are three possibilities that we may find. First, as predicted by the *feature-match hypothesis*, Korean speakers will consider both LD and local antecedents during initial stages of parsing but the antecedent search will be narrowed down to the LD antecedents later in the parse. Therefore, the DM condition is predicted to show longer RTs than the LMM and the LDMM conditions at early stages but during later processing stages, the LDMM and the DMM will have longer RTs than the other two conditions. Second, Korean speakers will show similar findings reported in English pronoun processing literature. That is, they will apply Pr B during processing from the early stages of processing, as predicted by the *BAIF hypothesis*. Therefore, the local antecedent will be ruled out during antecedent search process, resulting in no gender incongruence effect of the local antecedent. This will lead to the increased RTs in the LDMM condition and the DMM condition compared to the other two conditions due to the mismatching gender feature of the LD antecedents from the initial processing stages. As an alternative to this, it is also possible to see the application of Pr B only during the initial retrieval of antecedents, which is based on the *BADF hypothesis*. This means that comprehenders will consider the gender cues available with the LD antecedents at the early stages of processing but later, they will show evidence of considering the local antecedents also. Therefore, the RTs in the LDMM and the DMM will be longer than those in the other two conditions with the early reading measures. On the contrary, with the late reading measures, the longer RTs will be observed with the DM than with the LMM. Additionally, the LDMM will take longer to read than the DMM if comprehenders posit that DMM is ungrammatical and give up parsing, but if they try to make sense of the DMM by

having a sentence-external antecedent, RTs for the DMM will be longer than the LDMM. These predictions are summarized in Table 5.5.

Table 5.5. Predictions for Experiment 3 (bold font used to indicate the prediction)

Hypothesis	RTs
BAIF hypothesis	LDMM, DMM > DM, LM
BADF hypothesis	Early processing: LDMM, DMM > DM, LM Later processing: (DM > LMM, LDMM > DMM) or (DMM > DM > LMM, LDMM)
Feature-based antecedent search hypothesis	Early processing: (DM > LMM, LDMM > DMM) or (DMM > DM > LMM, LDMM) Later processing: LDMM, DMM > DM, LM
Coreferential reading effect hypothesis	**(DM > LMM, LDMM > DMM) or (DMM > DM > LMM, LDMM)**

5.1.2.3.Results

The skipping rates in the analyzed regions were as follows: pre-critical, 1%; pronoun, 15%; spillover, 6%; prefinal, 1%. Before the statistical analysis, the dataset was log-transformed. Untransformed and transformed data were plotted against a normal distribution line and visually inspected. Because the transformed data better fit the normal distribution, it was used in the analysis in place of the untransformed data. This was the case for all regions and measures. For rereading time, trials in which a region was not refixated after the first-pass contributed a rereading time of zero to the calculation of averages.

The data was sum coded and analyzed using linear mixed-effects modelling, using the lmerTest package in R (Kuznetsova, Brockhoff, & Christensen, 2017). For the fixed effects, the two-level factors of LOCGENDER (local antecedent gender – match vs. mismatch) and LDGENDER (LD antecedent gender – match vs. mismatch) were included. For the random effects, the maximal structure (by-subject and by-item random intercepts and slopes) was created (Barr, Levy, Scheepers, & Tily, 2013). If this model failed to converge, the random slope that

accounted for the least amount of variance was removed and the model refitted until convergence was achieved.

Prior to analyzing the data, responses to the comprehension questions were examined and accuracy rates were calculated. Korean speakers' average accuracy was 88.15%. The descriptive summary and statistical analyses of the eye-movement data are reported in two separate sections, *early processing* and *later processing*[19]. First fixation durations, first-pass times, and regression-path times on the pre-critical, pronoun and spillover regions are presented under *early processing*, and rereading times and total viewing times on the pre-critical, pronoun and spillover region, as well as all of the reading measures on the prefinal region are presented under *late processing*.

Early processing

Results for the first fixation durations, first-pass times, and regression-path times are presented first. Table 5.6 shows the means in these reading measures for the pre-critical, pronoun and spillover regions. The results of the statistical analysis for these regions for first fixation durations and for first-pass times are separately presented in Table 5.7 (first fixation durations), Table 5.8 (first-pass times), and Table 5.9 (regression-path times).

[19] The separation of the two was based on Sturt (2003).

Table 5.6. Means (in milliseconds) and standard deviations for first fixation durations, first-pass times, and regression-path times in each condition in the pre-critical, pronoun and spillover regions in Experiment 3

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
First fixation duration	234 (75)	235 (74)	226 (75)	235 (80)
First-pass time	409 (216)	413 (232)	394 (220)	424 (237)
Regression-path time	544 (315)	571 (357)	553 (343)	580 (368)
Pronoun region				
First fixation duration	225 (63)	225 (62)	218 (60)	227 (64)
First-pass time	245 (77)	239 (78)	241 (86)	244 (82)
Regression-path time	297 (160)	289 (165)	306 (175)	292 (168)
Spillover region				
First fixation duration	234 (71)	225 (65)	236 (63)	234 (67)
First-pass time	285 (118)	281 (113)	291 (114)	283 (116)
Regression-path time	383 (287)	390 (264)	394 (273)	362 (260)

Table 5.7. Summary of statistical analyses for first fixation durations in the pre-critical, pronoun and spillover regions of Experiment 3

First fixation duration					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.001	0.008	0.111	0.912
	Local NP gender	-0.010	0.009	-1.130	0.268
	LD NP gender	0.009	0.008	1.078	0.283
	Local NP gender * LD NP gender	0.011	0.016	0.698	0.485
Pronoun region	Intercept	-0.002	0.009	-0.216	0.830
	Local NP gender	-0.006	0.008	-0.810	0.424
	LD NP gender	0.005	0.008	0.676	0.501
	Local NP gender * LD NP gender	0.016	0.018	0.925	0.362
Spillover region	Intercept	0.000	0.009	0.045	0.964
	Local NP gender	0.012	0.007	1.640	0.106
	LD NP gender	-0.014	0.008	-1.663	0.105
	Local NP gender * LD NP gender	0.009	0.015	0.607	0.546

Table 5.8. Summary of statistical analyses for first-pass times in the pre-critical, pronoun and spillover regions of Experiment 3

First-pass times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.002	0.022	0.100	0.920
	Local NP gender	-0.016	0.013	-1.178	0.246
	LD NP gender	0.006	0.012	0.518	0.606
	Local NP gender * LD NP gender	0.022	0.025	0.900	0.373
Pronoun region	Intercept	-0.005	0.011	-0.469	0.641
	Local NP gender	0.004	0.009	0.438	0.664
	LD NP gender	-0.000	0.009	-0.014	0.989
	Local NP gender * LD NP gender	0.018	0.019	0.953	0.348
Spillover region	Intercept	-0.001	0.012	-0.089	0.930
	Local NP gender	0.010	0.011	0.929	0.360
	LD NP gender	-0.008	0.012	-0.648	0.522
	Local NP gender * LD NP gender	-0.009	0.019	-0.457	0.649

Table 5.9. Summary of statistical analyses for regression-path times in the pre-critical, pronoun and spillover regions of Experiment 3

Regression-path times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.002	0.027	0.059	0.954
	Local NP gender	-0.018	0.013	-1.383	0.174
	LD NP gender	-0.002	0.014	-0.131	0.897
	Local NP gender * LD NP gender	0.001	0.026	0.046	0.964
Pronoun region	Intercept	-0.008	0.016	-0.467	0.642
	Local NP gender	0.019	0.014	1.407	0.168
	LD NP gender	-0.008	0.016	-0.510	0.615
	Local NP gender * LD NP gender	0.002	0.025	0.084	0.933
Spillover region	Intercept	-0.004	0.016	-0.236	0.815
	Local NP gender	0.012	0.016	0.776	0.442
	LD NP gender	0.005	0.015	0.368	0.715
	Local NP gender * LD NP gender	-0.043	0.027	-1.600	0.110

Pre-critical region

No differences between conditions in any of the early measures of the pre-critical region were found, because the material in the four conditions was identical up to this point except for the names. There were no reliable effects observed in any of the early measures.

Pronoun region

There were no differences between conditions in the early measures of the pronoun region, as in the pre-critical region. No reliable effects were found in any of the early measures.

Spillover region

First fixation durations, first-pass reading times, and regression-path times were similar across all conditions in this region. Statistically significant effects of the early measures were not found.

Later processing

Rereading times and total viewing times for the pre-critical, pronoun and spillover regions, as well as all reading measures in the prefinal regions are presented in this section. Table 5.10 provides a summary of the means for the measures indexing later processing in all regions. The results of the statistical analyses are presented in Table 5.11 (first fixation durations, first pass times and regression-path times in prefinal region), Table 5.12 (rereading times) and Table 5.13 (total viewing times).

Table 5.10. Means (in milliseconds) and standard deviations for reading measures indicating later processing in Experiment 3

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
Rereading time	117 (281)	124 (282)	124 (279)	116 (286)
Total viewing time	848 (493)	781 (426)	798 (438)	862 (470)
Pronoun region				
Rereading time	40 (132)	44 (143)	55 (146)	41 (135)
Total viewing time	410 (231)	376 (221)	396 (225)	406 (244)
Spillover region				
Rereading time	83 (266)	82 (216)	91 (259)	55 (188)
Total viewing time	474 (278)	442 (227)	463 (259)	459 (270)
Prefinal region				
First fixation duration	221 (70)	219 (69)	222 (69)	226 (73)
First-pass time	323 (167)	290 (131)	306 (145)	312 (160)
Regression-path time	1097 (1099)	829 (797)	942 (920)	1063 (1043)
Rereading time	737 (1080)	517 (797)	614 (928)	733 (1046)
Total viewing time	467 (272)	421 (258)	444 (251)	435 (237)

Table 5.11. Summary of statistical analyses for first fixation durations, first pass times and regression-path times in the prefinal region of Experiment 3

Prefinal region					
		Estimate	SE	*t*-value	*p*-value
First fixation durations	Intercept	-0.000	0.009	-0.015	0.989
	Local NP gender	0.001	0.008	0.089	0.930
	LD NP gender	-0.007	0.008	-0.853	0.394
	Local NP gender * LD NP gender	0.009	0.015	0.613	0.540
First pass times	Intercept	0.001	0.019	0.075	0.940
	Local NP gender	0.018	0.011	1.605	0.116
	LD NP gender	-0.006	0.011	-0.564	0.574
	Local NP gender * LD NP gender	0.033	0.024	1.386	0.174
Regression-path times	Intercept	0.005	0.033	0.157	0.876
	Local NP gender	0.027	0.028	0.959	0.345
	LD NP gender	-0.011	0.022	-0.491	0.626
	Local NP gender * LD NP gender	0.125	0.043	2.919	0.004 **

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.12. Summary of statistical analyses for rereading times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 3

Rereading times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.005	0.046	0.099	0.922
	Local NP gender	0.020	0.061	0.329	0.743
	LD NP gender	0.004	0.071	0.062	0.951
	Local NP gender * LD NP gender	-0.106	0.156	-0.683	0.499
Pronoun region	Intercept	-0.000	0.050	-0.004	0.997
	Local NP gender	0.058	0.061	0.939	0.353
	LD NP gender	-0.059	0.064	-0.927	0.362
	Local NP gender * LD NP gender	-0.108	0.122	-0.884	0.383
Spillover region	Intercept	0.003	0.044	0.077	0.939
	Local NP gender	0.004	0.063	0.069	0.945
	LD NP gender	0.032	0.061	0.534	0.596
	Local NP gender * LD NP gender	-0.188	0.120	-1.572	0.127
Prefinal region	Intercept	0.030	0.138	0.215	0.831
	Local NP gender	-0.008	0.104	-0.073	0.943
	LD NP gender	-0.049	0.085	-0.576	0.569
	Local NP gender * LD NP gender	0.149	0.149	0.997	0.323

Table 5.13. Summary of statistical analyses for total viewing times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 3

Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.005	0.027	0.192	0.848
	Local NP gender	-0.006	0.016	-0.378	0.709
	LD NP gender	-0.009	0.013	-0.719	0.478
	Local NP gender * LD NP gender	0.053	0.023	2.291	0.023 *
Pronoun region	Intercept	-0.006	0.020	-0.290	0.773
	Local NP gender	0.017	0.016	1.099	0.279
	LD NP gender	-0.009	0.014	-0.653	0.517
	Local NP gender * LD NP gender	0.040	0.029	1.392	0.169
Spillover region	Intercept	-0.000	0.020	-0.019	0.985
	Local NP gender	0.016	0.013	1.219	0.226
	LD NP gender	-0.000	0.013	-0.024	0.981
	Local NP gender * LD NP gender	0.009	0.030	0.294	0.771

Table 5.13. cont'd

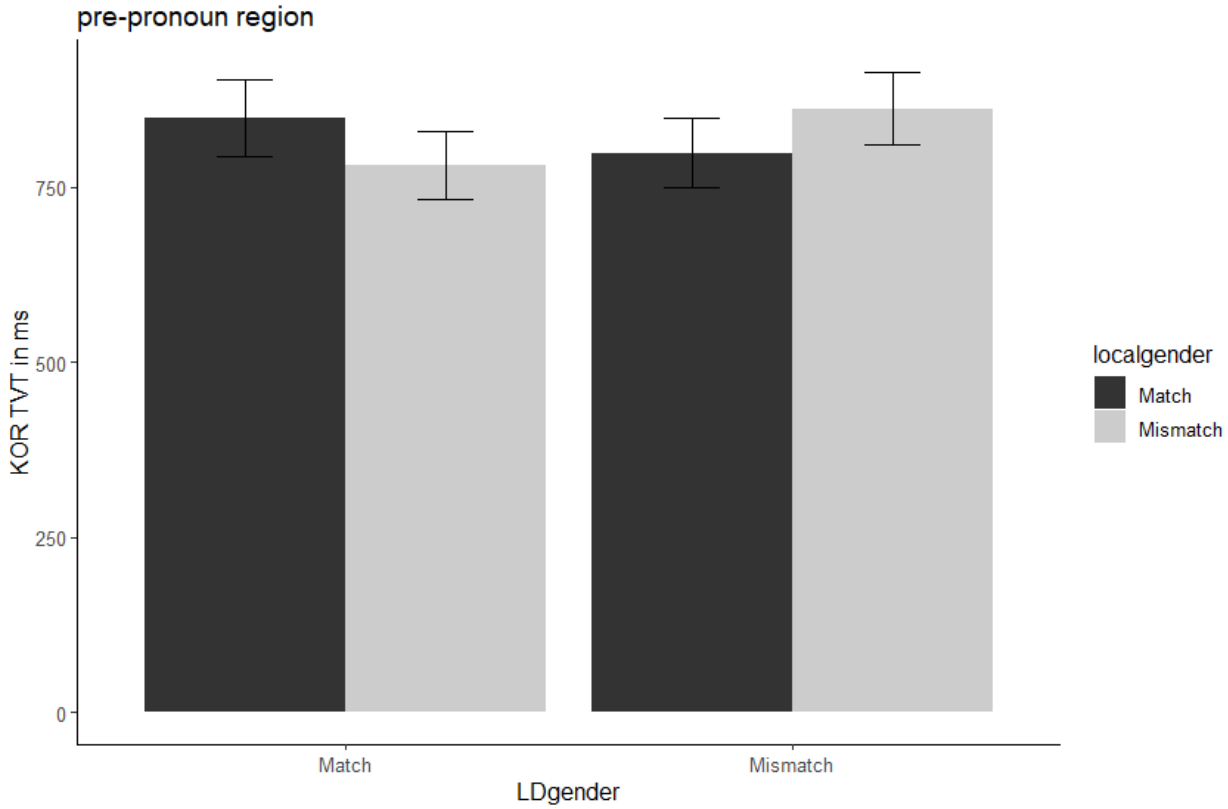
Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Prefinal region	Intercept	0.000	0.023	0.011	0.992
	Local NP gender	0.034	0.014	2.472	0.017 *
	LD NP gender	-0.006	0.013	-0.441	0.661
	Local NP gender * LD NP gender	0.045	0.033	1.336	0.191

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

In the pre-critical region, rereading times were similar across all conditions but there were differences between conditions in total viewing times. Total viewing times in the DM condition and the DMM condition were longer in comparison to the other two conditions. Statistical analysis of this measure reveals a significant interaction between the local NP's gender and the LD NP's gender. This was due to the different directions of the gender incongruence effect within the two levels of LD antecedents' gender. In other words, comprehenders had longer total viewing times in the pre-critical region if the two antecedents carry matching gender features (or mismatching gender features) in comparison to conditions where one antecedent, regardless of its position, is matched with the pronoun in terms of gender, as shown in Figure 5.1.

Figure 5.1. Total reading times of each condition in pre-critical region of Experiment 3



Pronoun region

Rereading times were similar across all conditions in the pronoun region. As for total viewing times, patterns similar to what was found in the pre-critical region were observed. Total viewing times in the DM condition and the DMM condition were longer in comparison to the other two conditions. Such differences, however, were not statistically confirmed.

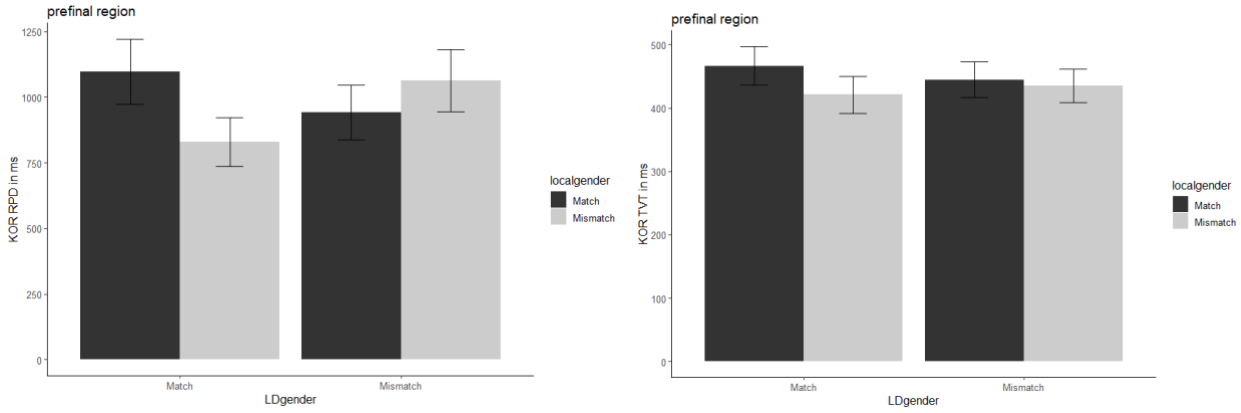
Spillover region

In the spillover region, both rereading times and total viewing times showed no differences across conditions. No reliable effects were found in both measures.

Prefinal region

In the prefinal region, first fixation durations, first-pass times and rereading times were similar across conditions, and no statistically significant effects were found. However, there were differences in regression-path times, as shown in Figure 5.2 (left panel): the DM and the DMM conditions had longer regression-path times than the LMM and the LDMM conditions. The statistical analysis reveals a significant interaction between LOCGENDER and LDGENDER in regression-path times. This shows that there was significantly more regression to the previous regions with the double match/mismatch conditions than with the single match/mismatch conditions. Also, as presented in Figure 5.2 (right panel), total viewing times in the conditions with the gender-matched LD antecedents (the LMM and the DMM conditions) were shorter than the other two conditions (the DM and the LDMM conditions). The statistical model reveals a significant main effect of LOCGENDER in total viewing times, suggesting that the conditions where the local antecedent was gender-matched had significantly longer total viewing times than those with the gender-mismatched local antecedents.

Figure 5.2. Regression-path times (left panel) and total viewing times (right panel) of each condition in prefinal region of Experiment 3



5.1.2.4.Summary of results from Experiment 3

There were no differences between the conditions in first fixation durations, first-pass reading times and regression-path times in the pre-critical, pronoun and spillover regions analyzed, and there were no numerical trends indicating differences between the conditions. In other words, no effects were found during the initial parsing of the overt pronoun in Korean with referential antecedents.

The results for measures indicative of later processing showed reliable effects. First, there was a significant interaction between the gender of the local NP and the LD NP in the prefinal region. The regression-path times in the prefinal region were affected by the gender feature of both antecedents. That is, test subjects had longer regression-path times with the double match/mismatch conditions than with the single match conditions, and between the two single match conditions, they had longer regression-path times when the local antecedent is gender-matched with the pronoun than when the LD antecedent was. There was another significant interaction of the two factors in total viewing times at the pre-critical region. The total viewing times were longer when there were two antecedents carrying matching or mismatching gender features than when only one potential antecedent had a matching gender feature. In the prefinal region, a main effect of the local NP's gender was found with total viewing times, which suggests that total viewing times for the conditions with the gender-matched local antecedents were longer than the ones with the gender-mismatched local antecedents. These results suggest that during later stages of processing, both LD and local antecedents were activated and influenced Korean speakers' processing of *kunye*, partially supporting the *coreferential reading effect hypothesis*.

The statistically significant results are summarized in Table 5.14, and they are discussed further in 5.1.4 where I revisit the *coreferential reading effect hypothesis* together with the results from Experiment 4.

Table 5.14. Summary of statistically significant results from Experiment 3

Processing timing	Region of interest	Reading measure	Result
Late	Pre-critical region	Total viewing time	DM, DMM > LMM, LDMM
	Prefinal region	Regression-path time	DM, DMM > LMM, LDMM
		Total viewing time	DM, LDMM > LMM, DMM

5.1.3. Experiment 4

5.1.3.1.Materials

As in Experiment 3, 32 experimental items, 8 per condition, were constructed. Each target sentence was bi-clausal and had two potential antecedents (one was a quantificational NP, *enu* 'every' + NP, and the other was a *wh*-phrase, *etten* 'which' + NP), which occurred before the embedded object overt pronoun. The NPs that appeared with a quantifier or a *wh*-word were matched in syllable length and frequency and inherently feminine in terms of gender feature (e.g., *sonye* 'girl', *yeca* 'woman'). The quantificational NP always appeared in the matrix subject position and hence it was considered to be an accessible antecedent, whereas the *wh*-phrase appeared in the embedded subject position and was therefore an inaccessible antecedent. An example token set is presented in Table 5.15.

Table 5.15. Example token set for Experiment 4

Condition	Sentence
A. Double match (DM)	어느 여자나 [어떤 소녀가 뾰족한 바늘로 그녀를 실수로 찔렀냐]고 물었다. Enu yeca-na [etten sonye-ka ppyocokhan panul-lo kunye-lul silswulo ccillessnya]-ko mwulessta. 'Every woman asked which girl pricked her with a sharp needle by mistake.'
B. Local mismatch (LMM)	어느 여자나 [어떤 소년이 뾰족한 바늘로 그녀를 실수로 찔렀냐]고 물었다. Enu yeca-na [etten sonyen-i ppyocokhan panul-lo kunye-lul silswulo ccillessnya]-ko mwulessta. 'Every woman asked which boy pricked her with a sharp needle by mistake.'
C. LD mismatch (LDMM)	어느 남자나 [어떤 소녀가 뾰족한 바늘로 그녀를 실수로 찔렀냐]고 물었다. Enu namca-na [etten sonye-ka ppyocokhan panul-lo kunye-lul silswulo ccillessnya]-ko mwulessta. 'Every man asked which girl pricked her with a sharp needle by mistake.'
D. Double mismatch (DMM)	어느 남자나 [어떤 소년이 뾰족한 바늘로 그녀를 실수로 찔렀냐]고 물었다. Enu namca-na [etten sonyen-i ppyocokhan panul-lo kunye-lul silswulo ccillessnya]-ko mwulessta. 'Every man asked which boy pricked her with a sharp needle by mistake.'

As described in 5.1.1.1, the 32 experimental items were intermixed with the 32 experimental items of Experiment 3, 80 fillers and 16 pseudo-fillers.

5.1.3.2.Predictions

If the *coreferential reading effect hypothesis* is correct, two slightly different patterns may be observed. First, as the *BAIF hypothesis* predicts, only the cues available with LD antecedents will be utilized during parsing. In other words, the gender features of the local antecedents would not contribute to the reading time differences but those of the LD antecedents would. Therefore, there is predicted to be no difference in reading time between 1) the DM and the LMM conditions, and 2) the LDMM and the DMM conditions, but longer reading times would be observed for the LDMM and the DMM conditions in comparison to the DM and the LMM

conditions due to the mismatching gender information of the LD antecedents. Alternatively, this pattern can be limited during early stages of processing and the cues available with Pr B-incompatible antecedents can be utilized during later stages of processing, as the *BADF hypothesis* predicts. If so, there will be reading time differences between the DM condition and the conditions with a single gender-matched antecedent (the LMM and the LDMM conditions), with later reading measures. As for the DMM condition, the reading times can be either the longest or the shortest.

If the *coreferential reading effect hypothesis* is incorrect, there are many other patterns that we might get. One possibility is that we may observe the similar processing pattern predicted in Experiment 3. That is, both LD and local antecedents will be activated at all stages of parsing even when an overt pronoun construes only as a bound variable. Hence, longer reading times are expected for the conditions where both local and LD antecedents carry matching gender feature in comparison to the conditions where one of the two antecedents is gender-matched. The double mismatch condition can show either the longest reading times or the shortest reading times depending on how comprehenders parse the sentences in the condition. Alternatively, as the *feature-match hypothesis* predicts, this pattern can be observed at early stages of processing and later, the parser will focus more on the cues available with the LD antecedents, resulting in longer reading times for the conditions with the gender-matched LD antecedents than those without. A summary of the predictions for Experiment 4 is presented in Table 5.16.

Table 5.16. Predictions for Experiment 4 (bold font used to indicate the prediction)

Hypothesis	RTs
BAIF hypothesis	**LDMM, DMM > DM, LM**
BADF hypothesis	Early processing: LDMM, DMM > DM, LM Later processing: (DM > LMM, LDMM > DMM) or (DMM > DM > LMM, LDMM)
Feature-match hypothesis	Early processing: (DM > LMM, LDMM > DMM) or (DMM > DM > LMM, LDMM) Later processing: LDMM, DMM > DM, LM
Coreferential reading effect hypothesis	(DM > LMM, LDMM > DMM) or (DMM > DM > LMM, LDMM)

5.1.3.3.Results

The skipping rates in the analyzed regions were as follows: pre-critical, 4%; pronoun, 16%; spillover, 12%; prefinal, 2%. Data log transformations and composition of the statistical models is the same as in Experiment 3, as described in 5.1.2.3.

The presentation of the descriptive summary and the statistical analyses of the eye-movement data is divided into two sections, *early processing* and *later processing*.

Early processing

Table 5.17 shows the means of first fixation durations, first-pass times and regression times for the pre-critical, pronoun and spillover regions, which are indicative of early processing. The results of the statistical analyses for these regions and measures are presented in Table 5.18 (first fixation durations), Table 5.19 (first-pass times), and Table 5.20 (regression-path times).

Table 5.17. Means (in milliseconds) and standard deviations for first fixation durations, first-pass times and regression-path times in each condition in the pre-critical, pronoun and spillover regions in Experiment 4

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
First fixation duration	228 (70)	233 (74)	232 (74)	222 (69)
First-pass time	339 (174)	355 (187)	359 (190)	326 (166)
Regression-path time	492 (337)	520 (383)	492 (352)	496 (390)
Pronoun region				
First fixation duration	224 (60)	230 (70)	227 (73)	216 (59)
First-pass time	243 (85)	239 (85)	247 (87)	234 (79)
Regression-path time	315 (214)	300 (190)	315 (191)	305 (196)
Spillover region				
First fixation duration	229 (62)	229 (66)	240 (68)	229 (59)
First-pass time	274 (112)	280 (117)	270 (92)	267 (108)
Regression-path time	385 (295)	351 (235)	396 (351)	340 (254)

Table 5.18. Summary of statistical analyses for first fixation durations in the pre-critical, pronoun and spillover regions of Experiment 4

First fixation duration					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.000	0.009	-0.009	0.993
	Local NP gender	0.005	0.009	0.534	0.597
	LD NP gender	0.007	0.009	0.832	0.412
	Local NP gender * LD NP gender	-0.027	0.018	-1.496	0.142
Pronoun region	Intercept	-0.003	0.009	-0.362	0.719
	Local NP gender	0.005	0.011	0.474	0.639
	LD NP gender	0.012	0.009	1.325	0.193
	Local NP gender * LD NP gender	-0.019	0.018	-1.080	0.286
Spillover region	Intercept	0.000	0.008	0.002	0.999
	Local NP gender	0.006	0.009	0.649	0.523
	LD NP gender	-0.014	0.009	-1.545	0.134
	Local NP gender * LD NP gender	-0.015	0.016	-0.925	0.361

Table 5.19. Summary of statistical analyses for first-pass times in the pre-critical, pronoun and spillover regions of Experiment 4

First-pass times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.003	0.022	-0.114	0.910
	Local NP gender	0.010	0.012	0.845	0.405
	LD NP gender	0.004	0.013	0.287	0.776
	Local NP gender * LD NP gender	-0.045	0.026	-1.775	0.084 †
Pronoun region	Intercept	-0.006	0.011	-0.560	0.578
	Local NP gender	0.012	0.010	1.225	0.230
	LD NP gender	0.003	0.009	0.326	0.745
	Local NP gender * LD NP gender	-0.014	0.019	-0.750	0.457
Spillover region	Intercept	-0.005	0.013	-0.395	0.695
	Local NP gender	0.000	0.011	0.010	0.992
	LD NP gender	0.002	0.013	0.180	0.859
	Local NP gender * LD NP gender	-0.020	0.020	-1.012	0.313

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

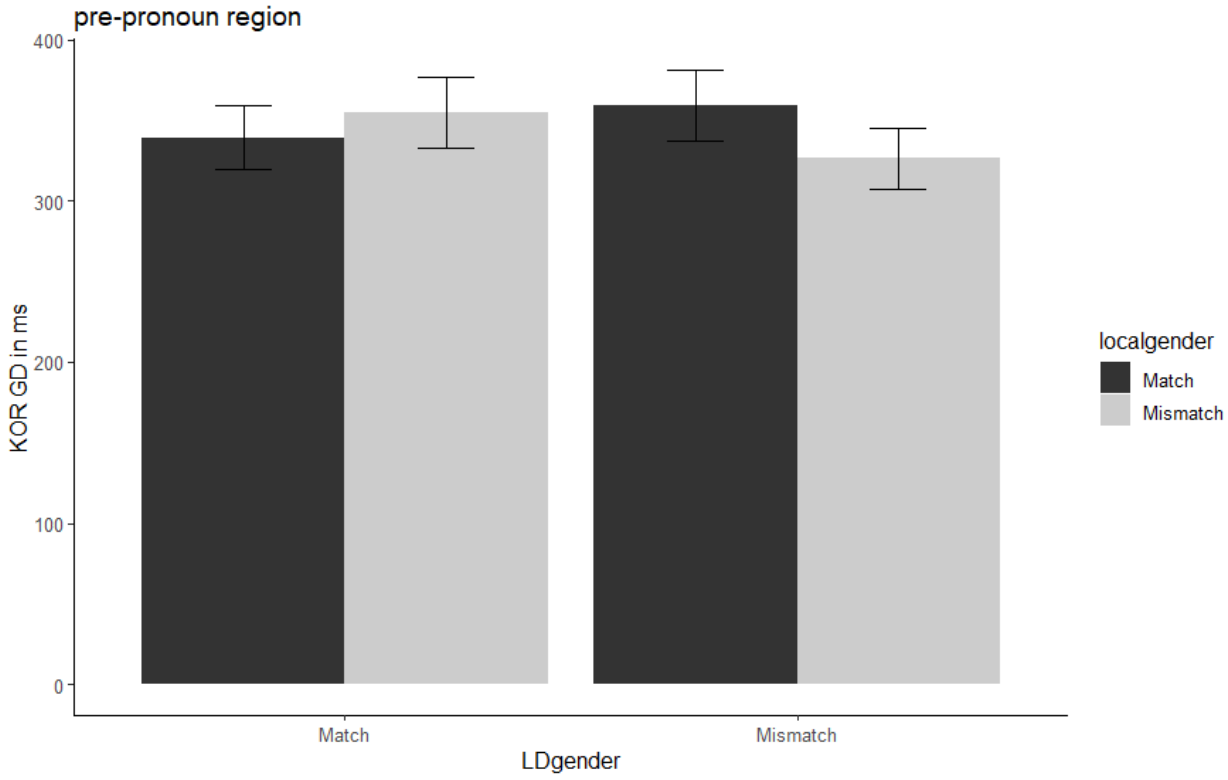
Table 5.20. Summary of statistical analyses for regression-path times in the pre-critical, pronoun and spillover regions of Experiment 4

Regression-path times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.007	0.027	-0.252	0.802
	Local NP gender	-0.003	0.014	-0.240	0.811
	LD NP gender	0.018	0.018	0.990	0.331
	Local NP gender * LD NP gender	-0.014	0.028	-0.484	0.629
Pronoun region	Intercept	-0.010	0.017	-0.565	0.575
	Local NP gender	0.019	0.013	1.467	0.144
	LD NP gender	-0.005	0.013	-0.365	0.716
	Local NP gender * LD NP gender	-0.007	0.028	-0.261	0.796
Spillover region	Intercept	-0.006	0.020	-0.313	0.756
	Local NP gender	0.029	0.018	1.613	0.115
	LD NP gender	0.006	0.017	0.367	0.716
	Local NP gender * LD NP gender	-0.032	0.029	-1.112	0.268

Pre-critical region

In the pre-critical region, first fixation durations and regression-path times were similar across the conditions, and no statistically significant effects were found in first fixation durations. However, first-pass reading times were not similar across the conditions. The statistical analysis reveals that the interaction between LOCGENDER and LDGENDER almost reached significance, due to the different directions of the gender incongruence effect within the two levels of LD NP gender. As Figure 5.3 shows, which presents the mean first-pass reading times in the four conditions, the reading time was 16ms longer in the LMM condition than the DM condition whereas it was 33ms shorter in the DMM condition than the LDMM condition.

Figure 5.3. First-pass reading times of each condition in pre-critical region of Experiment 4



Pronoun region

No differences among the four conditions were observed with the early measures in the pronoun region. Also, there were no reliable effects found in the models.

Spillover region

The early measures in the spillover region did not show any differences across the conditions. The statistical analyses do not reveal any significant effects in the early measures.

Later processing

Results for the later measures (first fixation durations, first-pass times and regression-path times in the prefinal region and rereading times and total viewing times in all regions) are presented here. Table 5.21 summarizes the means in the later measures. The outcome of the statistical analyses for these regions is provided in Table 5.22 (first fixation durations, first-pass times and regression-path times in the prefinal region), Table 5.23 (rereading times) and Table 5.24 (total viewing times).

Table 5.21. Means (in milliseconds) and standard deviations for reading measures indicating later processing in Experiment 4

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
Rereading time	127 (298)	127 (327)	97 (262)	127 (322)
Total viewing time	666 (390)	672 (400)	753 (499)	688 (418)
Pronoun region				
Rereading time	54 (169)	44 (144)	63 (180)	43 (144)
Total viewing time	377 (207)	359 (203)	400 (254)	365 (196)
Spillover region				
Rereading time	86 (249)	54 (192)	116 (321)	54 (182)
Total viewing time	401 (223)	371 (192)	443 (254)	400 (233)
Prefinal region				
First fixation duration	230 (76)	221 (69)	232 (76)	227 (71)
First-pass time	311 (148)	315 (159)	331 (178)	311 (160)
Regression-path time	665 (742)	689 (794)	804 (948)	701 (730)
Rereading time	333 (734)	363 (772)	479 (982)	354 (709)
Total viewing time	465 (285)	443 (268)	505 (355)	462 (290)

Table 5.22. Summary of statistical analyses for first fixation durations, first-pass times and regression-path times in the prefinal region of Experiment 4

Prefinal region					
		Estimate	SE	*t*-value	*p*-value
First fixation durations	Intercept	0.000	0.009	0.012	0.991
	Local NP gender	0.011	0.009	1.190	0.240
	LD NP gender	-0.006	0.009	-0.679	0.502
	Local NP gender * LD NP gender	0.008	0.016	0.484	0.630
First-pass times	Intercept	-0.002	0.019	-0.089	0.930
	Local NP gender	0.012	0.013	0.945	0.352
	LD NP gender	-0.008	0.012	-0.633	0.533
	Local NP gender * LD NP gender	-0.020	0.023	-0.895	0.373
Regression-path times	Intercept	0.005	0.030	0.166	0.869
	Local NP gender	0.016	0.020	0.798	0.427
	LD NP gender	-0.042	0.022	-1.916	0.066 †
	Local NP gender * LD NP gender	-0.025	0.040	-0.616	0.539

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.23. Summary of statistical analyses for rereading times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 4

Rereading times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.0003	0.056	0.053	0.958
	Local NP gender	-0.018	0.060	-0.293	0.770
	LD NP gender	0.058	0.067	0.863	0.393
	Local NP gender * LD NP gender	0.108	0.125	0.865	0.389
Pronoun region	Intercept	0.000	0.041	0.010	0.992
	Local NP gender	0.079	0.057	1.387	0.174
	LD NP gender	-0.011	0.054	-0.197	0.844
	Local NP gender * LD NP gender	-0.093	0.119	-0.784	0.436
Spillover region	Intercept	0.014	0.059	0.235	0.815
	Local NP gender	0.154	0.069	2.230	0.031 *
	LD NP gender	-0.032	0.057	-0.572	0.569
	Local NP gender * LD NP gender	-0.017	0.134	-0.125	0.901
Prefinal region	Intercept	0.037	0.114	0.320	0.751
	Local NP gender	0.010	0.073	0.139	0.890
	LD NP gender	-0.118	0.092	-1.284	0.209
	Local NP gender * LD NP gender	-0.072	0.144	-0.501	0.617

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.24. Summary of statistical analyses for total viewing times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 4

Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.003	0.031	-0.081	0.936
	Local NP gender	0.011	0.016	0.685	0.500
	LD NP gender	-0.014	0.018	-0.758	0.455
	Local NP gender * LD NP gender	-0.024	0.028	-0.873	0.386
Pronoun region	Intercept	-0.008	0.021	-0.393	0.696
	Local NP gender	0.021	0.013	1.567	0.124
	LD NP gender	-0.015	0.014	-1.064	0.295
	Local NP gender * LD NP gender	-0.003	0.028	-0.121	0.904
Spillover region	Intercept	-0.006	0.022	-0.262	0.794
	Local NP gender	0.031	0.013	2.338	0.025 *
	LD NP gender	-0.029	0.015	-2.021	0.052 †
	Local NP gender * LD NP gender	-0.010	0.026	-0.404	0.687
Prefinal region	Intercept	0.000	0.028	0.005	0.996
	Local NP gender	0.024	0.014	1.759	0.088 †
	LD NP gender	-0.016	0.014	-1.138	0.260
	Local NP gender * LD NP gender	-0.008	0.028	-0.293	0.771

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

In this region, rereading times and total viewing times were similar across the conditions, and there were no significant differences.

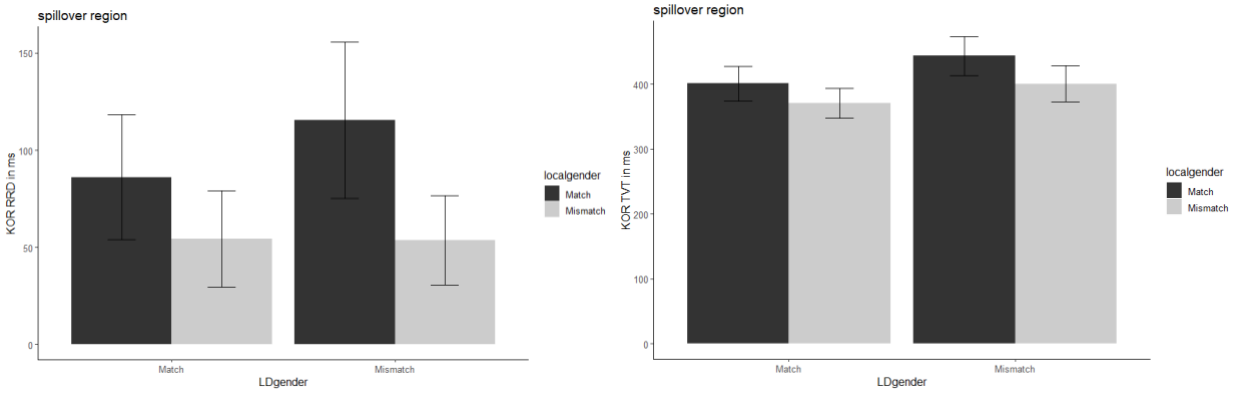
Pronoun region

As in the pre-critical region, rereading times and total viewing times in the pronoun region did not differ from each other in all four conditions, and no reliable effects were found.

Spillover region

In the spillover region, rereading times in the conditions with gender-matched LD antecedents were shorter than those with gender-mismatched LD antecedents, and this was confirmed statistically. The model reveals a significant main effect of LOCGENDER, as presented in Figure 5.4 (left panel). There were differences in total viewing times too (see the right panel in Figure 5.4), and the differences were found to be significant. First, there was a significant main effect of LOCGENDER, which means that total viewing times were significantly longer when the local antecedents were gender-matched than when they were gender-mismatched. In addition, a main effect of LDGENDER was marginally significant, which indicates that there was a trend for longer total viewing times with the gender-mismatched LD antecedents in comparison to the gender-matched LD antecedents.

Figure 5.4. Rereading times (left panel) and total viewing times (right panel) of each condition in spillover region of Experiment 4

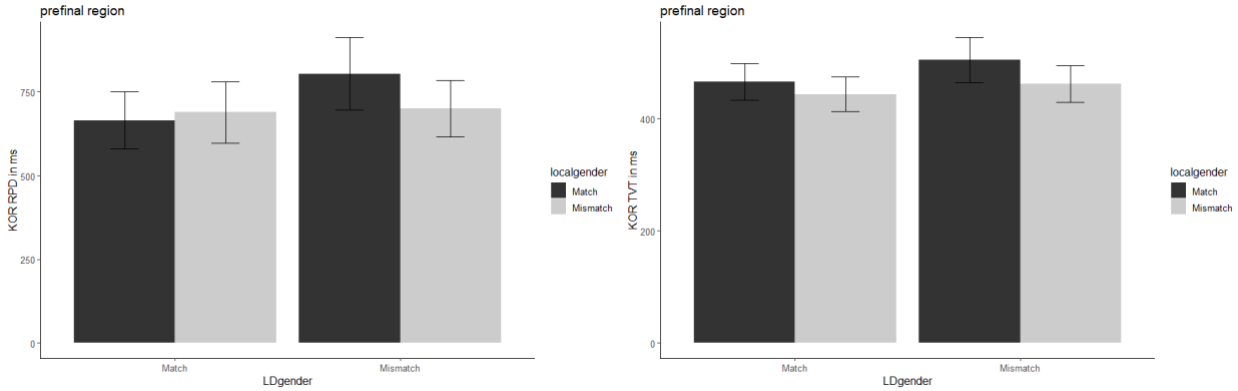


Prefinal region

First fixation durations, first-pass times and rereading times in prefinal region were similar across the conditions, and hence there were no statistically significant effects. However, there was a marginally significant main effect of LDGENDER in regression-path times. This means

that regression-path times for the conditions where the LD antecedents were gender-mismatched were marginally longer than those for the conditions where the LD antecedents were gender-matched, as Figure 5.5 (left panel) shows. The statistical analysis also reveals a marginally significant main effect of LOCGENDER in total viewing times, indicating that total viewing times for the DM and the LDMM conditions were longer than those for the LM and the DMM conditions (see the right panel of the Figure 5.5).

Figure 5.5. Regression-path times (left panel) and total viewing times (right panel) of each condition in prefinal region of Experiment 4



5.1.3.4.Summary of results from Experiment 4

There were no differences between the conditions in first fixation durations in any of the regions analyzed, and there were no numerical trends indicating differences between the conditions. First-pass reading times were similar across conditions in all regions except the pre-critical region. There was a marginally significant interaction between LOCGENDER and LDGENDER, due to the different directions of the gender incongruence effect within the two levels of LD NP gender. This effect does not seem to be meaningful because it was fleeting and was in a different direction from the effects reported in the later measures. It will therefore not be discussed any further.

Although there was no sign of significant effects in the results of the early measures, reliable effects were found in the results of the later measures. First, a main effect of LDGEDNER was found to be marginally significant in regression-path times in the prefinal region. This was due to the increased regression-path times of the LDMM condition, which suggests that there were more regressions to the previous regions while the comprehenders read the condition where the LD antecedents were gender-mismatched compared to the other conditions. The gender incongruence effect of the LD antecedents was also found to be marginally significant in total viewing times in the spillover region. This indicates that total viewing times of the conditions with the gender-mismatched LD antecedents were longer than those of the conditions with the gender-matched LD antecedents.

The results of the later measures also showed there was a significant main effect of LOCGENDER. In the spillover region, rereading times of the DM and the LDMM conditions were longer than those of the other two conditions. In the same region, the gender incongruence effect of the local antecedents was found to be significant in total viewing times, and it approached significance in the prefinal region. This was due to the increased total viewing times of the conditions with gender-matched local antecedents (the DM and the LM conditions) in comparison to the conditions with gender-mismatched local antecedents (the LDMM and the DMM conditions). The fact that we found the gender incongruence effects with both LD and local antecedents in later processing measures suggests that comprehenders consider both LD and local antecedents even with the bound variable construal of the overt pronoun in Korean during later processing, going against the predictions of the *coreferential reading effect hypothesis*.

These statistically significant results are summarized in Table 5.25 and they are discussed further in 5.1.4 where I revisit the *coreferential reading effect hypothesis* together with the results from Experiment 3.

Table 5.25. Summary of statistically significant results from Experiment 4

Processing timing	Region of interest	Reading measure	Result
Early	Pre-critical region	First-pass reading time	LMM, LDMM > DM, DMM
Late	Spillover region	Rereading time	DM, LDMM > LMM, DMM
		Total viewing time	LDMM > DM, LMM; DM, LDMM > LMM, DMM
	Prefinal region	Regression-path time	LDMM, DMM > DM, LMM
		Total viewing time	DM, LDMM > LMM, DMM

5.1.4. Discussion of results from Experiment 3 and 4

The aim of Experiments 3 and 4 was to examine the antecedent search process of overt pronouns in Korean, by focusing on the role of Pr B during processing. It was predicted that Pr B does not fully constrain the antecedent search process of an overt pronoun in Korean when it takes a referential antecedent, but it does when the pronoun takes a quantificational antecedent. This was based on the asymmetrical availability of the coreferential reading in the interpretation of *kunye* with different types of antecedents in offline tasks. If this hypothesis is correct, Korean speakers would consider both LD and local antecedents while searching for the antecedent of the overt pronoun in Korean with a referential antecedent, but they would consider only the LD antecedent if the pronoun is construed with a quantificational antecedent.

The results of Experiment 3 are partially in line with the predictions based on this hypothesis. In Experiment 3, there was a significant interaction between LOCGENDER and LDGENDER in regression-path times (at the prefinal region) and total viewing times (at the pre-critical region). This means that participants had more processing difficulty, reflected in longer

reading times, in the double match/mismatch conditions compared to the single match conditions. That is, the presence of the gender-matching local antecedent interfered with antecedent retrieval of *kunye* in the double match condition. This suggests that Korean speakers use both cues available with LD and local antecedents during the antecedent search process for *kunye*. In addition, the results of Experiment 3 also showed a significant gender incongruence effect of local antecedents in total viewing times at the prefinal region. This indicates that participants had more processing difficulty when the local antecedent was gender-matched than when it was not, which also provides evidence that Korean speakers consider the local antecedents until they resolve the meaning of the pronoun. Unfortunately, no evidence was found to support the prediction in terms of the timing. Both LD and local antecedents were predicted to be activated from the initial parsing in H2, but the results showed no indication of their activation in the early measures. It is not clear why the effects were not found in the early measures, but it may be related to how the parser operates in Korean, a point that is discussed further below.

The results of Experiment 3 were also assessed on the basis of the three hypotheses proposed in the literature. The results are incompatible with the predictions of the *BAIF* and the *BDAF hypotheses*, because there was no evidence showing that Pr B is applied from the initial parsing with only the LD antecedents visible to the parser. The results seem to be compatible with the *feature-match hypothesis* because both LD and local antecedents were activated during parsing of *kunye*, but again, the prediction of the hypothesis regarding the timing of activation was not supported. In the *feature-match hypothesis*, the activation of the two antecedents is expected to begin in the initial parsing stages with the parser focusing more on the antecedents compatible with Pr B at later processing stages. However, the current results showed the

activation of the two antecedents only with the later measures. Hence, it can be concluded that this hypothesis is only partially supported, just like the *coreferential reading effect hypothesis* proposed in this study.

The results of Experiment 4 are not compatible with the predictions based on the *coreferential reading effect hypothesis*. In Experiment 4, only the bound variable construal of *kunye* was targeted to examine by including quantificational NPs and *wh*-phrase as potential antecedents. As in Experiment 3, all the reliable effects were found only with the later measures. There was a marginally significant effect of LDGENDER in regression-path times at the prefinal region, which seems to be attributed to the increased reading times of the LDMM condition. The results of total viewing times at the spillover region also showed the main effect of LDGENDER, meaning that longer time was spent in parsing when the LD antecedents were mismatched than when they were not. There was a significant gender incongruence effect of local antecedents in rereading times and total viewing times at the spillover region. This indicates that the gender-matched local antecedents caused more processing difficulty, resulting in the increased reading times, than the gender-mismatching local antecedents during the antecedent search process of *kunye*. An effect of LOCGENDER in total viewing times reached significance, meaning that participants had more difficulty with the gender-matched local antecedents than with the gender-mismatched ones. These results are incompatible with the *BAIF* and the *BADF hypothesis* because the gender incongruence effect of the LD antecedents was not found in the early measures. They are partly compatible with the *feature-match* hypothesis or the *coreferential reading hypothesis* because of lack of evidence for considering both LD and local antecedents from the initial processing stages.

Taken together, the results of Experiments 3 and 4 shed light on how native Korean speakers process overt pronouns in the language. First, the results showed that both local and LD antecedents are activated during the antecedent search process. This is different from English pronoun processing where it has been reported that speakers are sensitive to the gender cues of the LD antecedent from the initial parsing stages, although there is disagreement on whether this effect persists to later parsing stages. However, Korean speakers do not show such sensitivity to Pr B in their processing. Instead, they experience retrieval interference when there are two gender-matched antecedents, showing that they are considering both LD and local antecedents. This finding is consistent with Korean speakers' offline judgment data. In Experiment 1, Korean speakers allowed overt pronouns with local referential antecedents robustly. This may be attributed to the fact that the local referential antecedents are activated until the readers interpret the pronoun.

Second, the results showed the delay of the effects. Under the *coreferential reading effect hypothesis*, it was expected to see the activation of the two antecedents from the initial processing stages, but unlike this prediction, the effects of the two antecedents were observed only with the later measures. It is not clear why the activation of the two antecedents were delayed, but it may be related to how the parser of head-final language works. In accounting for the sentence processing of head-final language, two models have been proposed in the literature. One model emphasizes incremental assembly of detailed grammatical structure as each new word is encountered (e.g., Inoue & Fodor, 1995; Mazuka & Itoh, 1995; Kamide & Mitchell, 1999; Kamide, Altmann, & Haywood, 2003). In the other model, which is called *head-driven parsing model*, structure building is delayed until a clause-final verb (i.e., head of a phrase) is reached (e.g., Pritchett, 1992, Mulders, 2002). If the Korean parser works as predicted by the

head-driven parsing model, we may be able to account for why the gender incongruence effects of the two antecedents were found only with the later measures. That is, dependencies between pronouns and their potential antecedents can be formed after the verb is encountered, and therefore evidence showing the formation of anaphoric dependencies (e.g., gender incongruence effects) is not found until later. Mazuka (1991) reported the findings that support this possibility. In her study, she examined how the null pronoun *pro* in Japanese, a *pro*-drop language like Korean, is processed real-time when it establishes a cataphoric dependency with an antecedent[20] and found that the assignment of reference to *pro* occurs only during a later stage of parsing. However, her findings were not replicated when the processing of *pro* in Korean was examined in Kwon and Sturt (2013). The reason why they failed to reproduce Mazuka's findings may be related to their research design (for further discussion, see Kwon & Sturt (2013)). Given that they investigated the processing of the null pronoun not the overt pronoun, their results may not shed lights on the interpretation of the current results. However, their results suggest that further research is required to explore whether the evidence for the incremental processing can be found with the Korean overt pronoun.

Lastly, the current results showed that the activation of the two antecedents takes place regardless of the antecedent type. When the pronoun takes a referential antecedent, both bound variable and coreferential readings can be obtained at least in Korean. However, when the pronoun takes a quantificational antecedent, only the bound variable reading is available. Given that only the bound variable reading is subject to Pr B, the role of Pr B was expected to be stronger with quantificational antecedents than with referential antecedents during the processing

[20] Cataphora is sometimes called backward anaphora, in which a pronoun appears before its antecedent as shown below.

(i) After he$_i$ arrived, the boy$_i$ used the phone.

of Korean overt pronouns. However, the referential/quantificational asymmetry was not reflected in the processing pattern. This is an unexpected finding and no ready explanation presents itself. One thing to think about is the materials used in Experiment 4. Unlike Experiment 3, where the status of the two antecedents were controlled the same as names, the status of the two antecedents in Experiment 4 was slightly different: one was the quantificational NP (*enu* 'every + NP) and the other was the *wh*-phrase (*etten* 'which' + NP). As in English, *etten* 'which' can be discourse linked (D-linked). Also, it can also be construed as an indefinite 'some'. It is unclear whether such properties of *etten* have affected the current results, but the results might have been different if the second antecedent did not have *etten*. This possibility will be explored in the future study by including the experimental sentence with the antecedents using the same quantifier like "every girl said that every woman …".

Another possible reason why we did not find the referential/quantificational asymmetry may be because there is no asymmetry for pronoun processing in general. The three hypotheses proposed to account for pronoun processing did not distinguish predictions for different types of antecedents. In other words, their predictions were not separated for the referential antecedents vs. the quantificational antecedents. This may be because the pronoun processing pattern is the same regardless of the antecedent type. Alternatively, the referential/quantificational asymmetry may be present, but it does not affect Korean overt pronoun processing. Offline judgment data in Experiment 1 showed that Pr B is operative in Korean, but it can also be easily violated. Additionally, the offline data showed that the violation of Pr B may be allowed even for the quantificational antecedents because *kunye* construed as the local quantificational antecedent was accepted to some degree (about 35%). As discussed in Chapter 4, this may be related to the status of *kunye*. Because some participants analyzed it as a demonstrative combined with a DP

and in that analysis, its binding domain is a DP consisting of *kunye*, the local quantificational antecedent was allowed. It is possible that this somehow affects their processing pattern of *kunye* with the local quantificational antecedent and thus both LD and local antecedents are activated during parsing. It is not clear which reason better explains the lack of the referential/quantificational asymmetry in pronoun processing, but the results of Experiments 5 and 6 would provide implications for that because English pronoun processing with different antecedent types was tested in those experiments.

5.2. Experiment 5 and 6: English online reading task

Experiments 5 and 6 are designed to test H4. In these experiments, the time-course application of Pr B in English pronoun processing during native and non-native language comprehension was explored using an eye-movement monitoring technique.

H4. L1-Korean L2-English learners will transfer their processing preferences of overt pronouns from Korean to English.

Results of Experiments 3 and 4 showed that Pr B-compatible and Pr B-incompatible antecedents are available in the real-time antecedent search process of an overt pronoun in Korean at later parsing stages regardless of whether the antecedents are referential or quantificational. Unlike these processing patterns of Korean overt pronouns, many prior studies have reported evidence supporting the *BAIF hypothesis* in English pronoun processing. Hence, native speakers of English are expected to consider the LD antecedents only in their processing of a pronoun, and no difference is expected between the referential antecedents and the

quantification antecedents because of the stronger role of Pr B in English. If L1-Korean L2-English learners' processing preferences of overt pronouns in Korean transfer and affect how they process English pronouns, they will process English pronouns more like Korean speakers processing Korean pronouns than like native English speakers processing English pronouns. In other words, L2 learners' English pronoun processing pattern will resemble their processing pattern of Korean overt pronouns. As in the online experiments testing Korean, two types of antecedents were tested separately, in order to see if English pronoun processing patterns differ depending on the antecedent type. In Experiment 5, how Korean speaking L2 learners of English would interpret English pronouns with referential antecedents was investigated, while in Experiment 6, their English pronoun processing with quantificational antecedents was examined. Table 5.26 provides a summary of each Experiment with two participant groups.

Table 5.26. Summary of Experiments 5 and 6

Participant	Experiment	Antecedent type	Prediction on available antecedents	Prediction on timing
L2 learners	5	Referential NPs	LD antecedents; Local antecedents	Later stages of processing
	6	Quantificational NPs	LD antecedents; Local antecedents	Later stages of processing
Native speakers of English	5	Referential NPs	LD antecedents	All stages of processing
	6	Quantificational NPs	LD antecedents	All stages of processing

5.2.1. Overall methodology

5.2.1.1.Procedure

There was one reading task in English where participants' eye-movements were recorded, and it included the materials for both Experiments 5 and 6. As in the reading task in Korean for

Experiments 3 and 4, the materials were distributed to four lists in a Latin-square design. There were a total of 160 items per list including 32 experimental items for Experiment 5, 32 experimental items for Experiment 6, 88 fillers, and 8 pseudo-fillers. The detailed description about materials for each experiment is provided in 5.1.2.1 (for Experiment 5) and in 5.1.3.1 (for Experiment 6). The fillers contained a variety of sentence structure, different from both types of experimental items but approximately equivalent length. The 8 pseudo-fillers were the items containing a reflexive pronoun such as *himself* and *herself*, as shown in (2). The purpose of its inclusion was to prevent participants from developing expectations about the pronoun-antecedent relationships under investigation.

(2) Pseudo-filler

Sylvia remembered that Judy sketched herself for the assignment of her art class.

As in Experiments 3 and 4, yes/no comprehension questions were provided for two thirds of the 160 items in each list, to ensure that participants were reading the sentences for comprehension. Comprehension questions did not explicitly probe the referent of the pronoun, in order not to draw attention to the purpose of the experiment or encourage strategic reading behavior. The experiment began with the presentation of six practice items to familiarize participants with the procedure, three of which were followed by a comprehension question.

5.2.1.2.Data acquisition and preparation

The set up for the data acquisition and how the data was prepared for the analysis in Experiments 5 and 6 was the same as in Experiments 3 and 4 (see section 5.1.1.2 for the description).

The experimental items were divided into four regions of interest – pre-critical, pronoun, spillover and prefinal – and eye-movement data from the regions was analyzed. Table 5.27 presents how the text in the critical sentence was divided into regions.

Table 5.27. Regions of interest for the experimental sentences in Experiments 5 and 6

Experiment 5					
Jane said that	Pre-critical Mary pric-	Pronoun ked her	Spillover with a	Prefinal sharp needle	by mistake
Experiment 6					
Every woman asked which	Pre-critical girl pric-	Pronoun ked her	Spillover with a	Prefinal sharp needle	by mistake

In English, as the pronouns are very short and frequent, they are highly likely to be skipped while reading. Accordingly, the **pronoun** region contained the pronoun and three letters that preceded it as shown in Table 5.27, following other experimental designs investigating pronoun resolution using the eye-tracker (e.g., Patterson, Trompelt, & Felser, 2014; Van Gompel & Majid, 2004). Previous studies have defined a critical pronoun region in that manner to increase the size of the region in order to avoid excessing skipping (Ehrlich & Rayner, 1983; Garrod, Freudenthal, & Boyle, 1994) as well as to account for potential parafoveal proceeding of the pronoun. The **pre-critical** region consisted of the word before the pronoun excluding the final three letters, which forms part of the pronoun region), and the previous word. The **spillover** region contained the two words following the pronoun, and the **prefinal** region contained the next two words.

In each region, five reading measures were reported, as in Experiments 3 and 4: *first fixation duration*, *first-pass reading time*, *regression-path time*, *rereading time*, and *total viewing time* (description of these reading measures is given in 5.1.1.2). Also, prior to the analysis, fixations less than 80ms within one degree of visual angle of another fixation was merged with

that fixation. Among the remaining fixations, those shorter than 80ms or longer than 1200ms were removed.

5.2.2. Experiment 5

5.2.2.1.Materials

As in Experiment 3, 32 experimental items were created in a 2 (local NP gender match/mismatch) x 2 (LD NP gender match/mismatch) design. An example token set is shown in Table 5.28. the names were matched in terms of length, and either typical girl's names or boy's names were used because both *him* and *her* were used in the experimental sentences. Names were counterbalanced across items to avoid any frequency effects. The first name was always an accessible antecedent whereas the second name was an inaccessible antecedent based on Pr B.

Table 5.28. Example token set for Experiment 5

Condition	Sentence
A. Double match (DM)	Jane said that Mary pricked her with a sharp needle by mistake.
B. Local mismatch (LMM)	Jane said that Mark pricked her with a sharp needle by mistake.
C. LD mismatch (LDMM)	John said that Mary pricked her with a sharp needle by mistake.
D. Double mismatch (DMM)	John said that Mary pricked her with a sharp needle by mistake.

5.2.2.2.Predictions

As many previous studies showed, it is predicted that native speakers of English consider the LD antecedents from the early stages of processing when retrieving an antecedent for a pronoun due

to the application of Pr B, following the prediction of the *BAIF hypothesis*. Therefore, the gender match/mismatch of the local antecedent will not make any reading time difference during the antecedent search process, but the gender incongruence effect of the LD antecedent will be observed from the initial parsing stages. In other words, the increased RTs will be observed in the LDMM and the DMM conditions compared to the RTs in the DM and the LMM conditions. Also, no reading time difference is expected between 1) the LDMM and the DMM conditions, and 2) the DM and the LMM conditions. It is also possible that native speakers of English show the pronoun processing pattern predicted by the *BADF hypothesis*. If this hypothesis is correct, native speakers will not show evidence of interference from the local antecedent at the early stages of processing but later the interference from the local antecedent will be found. Therefore, the LDMM and the DMM will have longer RTs than the DM and the LMM conditions with early reading measures but with late reading measures, the DM and the DMM will have longer RTs than the other two conditions. Lastly, the predictions for the *feature-match hypothesis* can be found with the native speakers of English. That is, both local and LD antecedents will be considered in initial processing stages but the readers will home in on the LD antecedents at later processing stages. Hence, with early measures, the increased RTs will be found with the DM and the DMM conditions than with the LMM and the LDMM conditions, because of retrieval interference or no antecedent match effect reported in Badecker and Straub (2002). With late measures, the RTs in the LDMM and the DMM will be longer than those in the DM and the LMM.

If H4 is correct, Korean speakers will consider both Pr B-compatible antecedents and Pr B-incompatible antecedents while processing English pronouns at later stages, just like how they processed overt pronouns in Korean with referential antecedents. Therefore, the gender

match/mismatch of both local and LD antecedent will affect the parsing at later stages. This will increase the RTs in the double match/mismatch conditions (the DM and the DMM conditions), compared to the single match conditions (the LMM and the LDMM conditions). If H4 is incorrect, Korean speakers will show similar processing patterns as the native speakers of English. That is, they will apply Pr B during processing from the early stages of processing, as predicted by the *BAIF hypothesis*. Therefore, the local antecedent will be ruled out during antecedent search process, resulting in no gender incongruence effect of the local antecedent. This will lead to the increased RTs in the LDMM condition and the DMM condition compared to the other two conditions due to the mismatching gender feature of the LD antecedents from the initial processing stages. As an alternative to this, it is also possible to see the application of Pr B only during the initial retrieval of antecedents, which is based on the *BADF hypothesis*. This means that comprehenders will consider the LD antecedents at the early stages of processing but later, they will show the interference from the local antecedents. Therefore, the RTs in the LDMM and the DMM will be longer than those in the other two conditions with early reading measures, but with late reading measures, the longer RTs will be observed with the DM and the DMM than with the LMM and the LDMM. Alternately, this pattern can be flipped such that they have the retrieval interference effect or no antecedent effect with early reading measures and the gender incongruence effect of the LD antecedents with later measures. These predictions are summarized in Table 5.29.

Table 5.29. Predictions for Experiment 5 (bold font used to indicate the prediction)

Participant	Hypothesis	RTs
L2 learners	BAIF hypothesis	LDMM, DMM > DM, LM
	BADF hypothesis	Early processing: LDMM, DMM > DM, LM Later processing: DM, DMM > LMM, LDMM
	Feature-match hypothesis	Early processing: DM, DMM > LMM, LDMM Later processing: LDMM, DMM > DM, LM
	H4	**Later processing: DM, DMM > LMM, LDMM**
Native speakers of English	**BAIF hypothesis**	**LDMM, DMM > DM, LM**
	BADF hypothesis	Early processing: LDMM, DMM > DM, LM Later processing: DM, DMM > LMM, LDMM
	Feature-match hypothesis	Early processing: DM, DMM > LMM, LDMM Later processing: LDMM, DMM > DM, LM

5.2.2.3.Results

The skipping rates in the analyzed regions for the four reported regions were 8% (pre-critical), 14% (pronoun), 1% (spillover), 0% (prefinal) in the control group (native speakers of English) and 4% (pre-critical), 7% (pronoun), 1% (spillover), 0% (prefinal) in the L2 learners group. Before the statistical analysis the dataset was log-transformed as in Experiments 3 and 4. Due to its better fit to the normal distribution, it was used in the analysis in place of the untransformed data, for all regions and measures. For rereading time, trials in which a region was not refixated after the first-pass contributed a rereading time of zero to the calculation of averages. Prior to the analysis, participants' accuracy for the comprehension questions were examined and the mean accuracy rates were similar between L2 learners (76.49%) and native speakers of English (77.69%).

The data was analyzed using linear mixed-effects modelling, using the lmerTest package in R (Kuznetsova, Brockhoff, & Christensen, 2017). For each reaching time measure the analysis included sum coded, fixed main effects of LOCGENDER (local antecedent gender – match vs. mismatch) and LDGEDNER (LD antecedent gender – match vs. mismatch) and their interaction. SUBJECT and ITEM random intercepts, as well as SUBJECT and ITEM random slopes for each

fixed effect, were included suing a maximal random effects structure. If the model failed to converge, the random effect parameter that accounted for the least variance in the data was removed, and the model refit until convergence in the data was achieved. Results of native speakers are provided first, and then results of L2 learners are provided. For each participant group, their summaries of the reading time data and statistical analyses are reported in two sections, *early processing* (first fixation duration, first-pass times and regression-path times on the pre-critical, pronoun and spillover regions) and *later processing* (all reading measures on the prefinal region, as well as rereading times and total viewing times on the pre-critical, pronoun and spillover region), as in Experiments 3 and 4.

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Early processing

Table 5.30 shows the mean reading times for each early measure (first fixation durations, first-pass times and regression-path times) for the pre-critical, pronoun and spillover regions. The results of the statistical analysis for these regions are separately presented in Table 5.31 (first fixation durations), Table 5.32 (first-pass times), and Table 5.33 (regression-path times).

Table 5.30. English native speakers' means (in milliseconds) and standard deviations for first fixation durations, first-pass times, and regression-path times in each condition in the pre-critical, pronoun and spillover regions in Experiment 5

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
First fixation duration	219 (61)	215 (57)	223 (70)	222 (65)
First-pass time	288 (119)	280 (116)	292 (127)	296 (132)
Regression-path time	316 (164)	345 (204)	335 (184)	329 (169)
Pronoun region				
First fixation duration	217 (61)	214 (65)	218 (62)	214 (58)
First-pass time	241 (87)	237 (89)	249 (92)	246 (99)
Regression-path time	286 (141)	310 (195)	288 (133)	302 (162)
Spillover region				
First fixation duration	212 (51)	208 (54)	214 (56)	207 (52)
First-pass time	363 (163)	372 (180)	370 (170)	351 (182)
Regression-path time	446 (234)	478 (245)	503 (304)	527 (333)

Table 5.31. Summary of statistical analyses for English native speakers' first fixation durations in the pre-critical, pronoun and spillover regions of Experiment 5

First fixation duration					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.002	0.007	-0.285	0.777
	Local NP gender	0.004	0.007	0.548	0.586
	LD NP gender	-0.007	0.008	-0.825	0.415
	Local NP gender * LD NP gender	0.004	0.013	0.265	0.791
Pronoun region	Intercept	0.001	0.007	0.157	0.876
	Local NP gender	0.007	0.007	0.898	0.372
	LD NP gender	-0.001	0.008	-0.138	0.891
	Local NP gender * LD NP gender	0.000	0.014	0.023	0.982
Spillover region	Intercept	0.001	0.006	0.074	0.942
	Local NP gender	0.010	0.008	1.685	0.102
	LD NP gender	-0.002	0.006	-0.258	0.798
	Local NP gender * LD NP gender	-0.005	0.012	-0.434	0.666

Table 5.32. Summary of statistical analyses for English native speakers' first-pass times in the pre-critical, pronoun and spillover regions of Experiment 5

First-pass times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.009	0.016	-0.577	0.566
	Local NP gender	0.003	0.010	0.289	0.775
	LD NP gender	-0.008	0.009	-0.829	0.413
	Local NP gender * LD NP gender	0.011	0.019	0.609	0.546
Pronoun region	Intercept	-0.001	0.008	-0.085	0.933
	Local NP gender	0.008	0.009	0.921	0.360
	LD NP gender	-0.011	0.010	-1.041	0.303
	Local NP gender * LD NP gender	0.004	0.018	0.206	0.838
Spillover region	Intercept	-0.001	0.016	-0.053	0.958
	Local NP gender	0.012	0.011	1.097	0.278
	LD NP gender	0.017	0.010	1.665	0.106
	Local NP gender * LD NP gender	-0.024	0.023	-1.675	0.102

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.33. Summary of statistical analyses for English native speakers' regression-path times in the pre-critical, pronoun and spillover regions of Experiment 5

Regression-path times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.012	0.019	-0.626	0.533
	Local NP gender	-0.009	0.013	-0.704	0.487
	LD NP gender	-0.003	0.011	-0.284	0.779
	Local NP gender * LD NP gender	-0.034	0.021	-1.632	0.108
Pronoun region	Intercept	-0.000	0.011	-0.016	0.988
	Local NP gender	-0.014	0.012	-1.134	0.264
	LD NP gender	-0.004	0.012	-0.330	0.743
	Local NP gender * LD NP gender	-0.005	0.026	-0.200	0.843
Spillover region	Intercept	-0.001	0.020	-0.067	0.947
	Local NP gender	-0.018	0.014	-1.349	0.185
	LD NP gender	-0.029	0.011	-2.675	0.008 **
	Local NP gender * LD NP gender	-0.024	0.027	-0.867	0.392

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

No differences between conditions were found in any of the early measures in the pre-critical reason. The statistical analyses reveal no reliable effects in any of the early measures in this region.

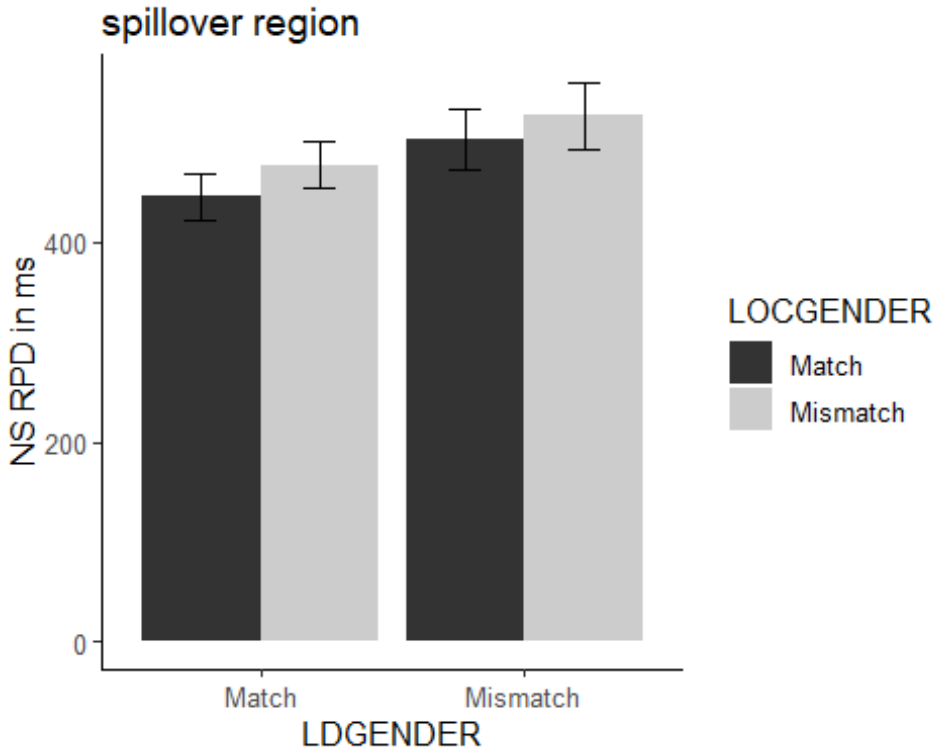
Pronoun region

There were no differences between conditions in the early measures of the pronoun region, as in the pre-critical region. No reliable effects were found in any of the early measures from the statistical analysis.

Spillover region

No reliable effects emerged in this region except regression-path times. No statistically significant differences in first fixation durations and first-pass times were found across conditions. However, there was a main gender incongruence effect of LD antecedents in regression-path times (see Figure 5.6). This means that regression-path times were longer when the LD antecedents were mismatched than when they were matched.

Figure 5.6. English native speakers' regression-path times of each condition in spillover region of Experiment 5



Later processing

Rereading times and total viewing times for the pre-critical, pronoun, spillover and prefinal regions, as well as first fixation durations, first-pass times and regression-path times in the prefinal region are presented in this section. Table 5.34 provides a summary of the means for these late measures. The results of the statistical analyses are presented in Table 5.35 (first fixation durations, first-pass times and regression-path times in the prefinal region), Table 5.36 (rereading times) and Table 5.37 (total viewing times).

Table 5.34. English native speakers' means (in milliseconds) and standard deviations for reading measures indicating later processing in Experiment 5

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
Rereading time	10 (57)	33 (122)	21 (88)	10 (63)
Total viewing time	435 (243)	431 (246)	461 (286)	483 (274)
Pronoun region				
Rereading time	32 (95)	57 (167)	27 (86)	37 (108)
Total viewing time	366 (189)	356 (200)	410 (247)	401 (229)
Spillover region				
Rereading time	68 (180)	82 (205)	116 (265)	165 (333)
Total viewing time	583 (292)	597 (298)	666 (362)	616 (327)
Prefinal region				
First fixation duration	224 (67)	223 (72)	230 (82)	231 (79)
First-pass time	427 (240)	397 (210)	416 (235)	423 (231)
Regression-path time	1384 (1103)	1204 (888)	1528 (1297)	1419 (1139)
Rereading time	924 (1104)	772 (892)	1069 (1256)	961 (1149)
Total viewing time	589 (313)	556 (322)	603 (349)	603 (331)

Table 5.35. Summary of statistical analyses for English native speakers' first fixation durations, first-pass times and regression-path times in the prefinal region of Experiment 5

Prefinal region					
		Estimate	SE	*t*-value	*p*-value
First fixation durations	Intercept	0.000	0.008	0.020	0.984
	Local NP gender	0.001	0.007	0.135	0.892
	LD NP gender	-0.009	0.008	-1.205	0.236
	Local NP gender * LD NP gender	0.012	0.015	0.797	0.430
First-pass times	Intercept	0.002	0.020	0.082	0.935
	Local NP gender	0.003	0.013	0.242	0.810
	LD NP gender	-0.005	0.013	-0.366	0.716
	Local NP gender * LD NP gender	0.045	0.022	2.013	0.046 *
Regression-path times	Intercept	0.005	0.039	0.132	0.895
	Local NP gender	0.032	0.016	1.964	0.059 †
	LD NP gender	-0.041	0.014	-2.849	0.006 **
	Local NP gender * LD NP gender	0.013	0.027	0.472	0.639

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.36. Summary of statistical analyses for English native speakers' rereading times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 5

Rereading times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.005	0.023	0.207	0.837
	Local NP gender	-0.014	0.039	-0.348	0.730
	LD NP gender	0.028	0.045	0.627	0.535
	Local NP gender * LD NP gender	-0.214	0.073	-2.943	0.005 **
Pronoun region	Intercept	0.002	0.040	0.062	0.951
	Local NP gender	-0.073	0.049	-1.467	0.147
	LD NP gender	0.035	0.048	0.726	0.470
	Local NP gender * LD NP gender	-0.046	0.106	-0.431	0.668
Spillover region	Intercept	0.003	0.057	0.054	0.957
	Local NP gender	-0.089	0.060	-1.491	0.144
	LD NP gender	-0.201	0.052	-3.860	0.000 ***
	Local NP gender * LD NP gender	0.086	0.128	0.672	0.506
Prefinal region	Intercept	0.022	0.124	0.176	0.861
	Local NP gender	0.067	0.061	1.099	0.281
	LD NP gender	-0.090	0.053	-1.701	0.093 †
	Local NP gender * LD NP gender	-0.221	0.139	-1.591	0.121

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.37. Summary of statistical analyses for English native speakers' total viewing times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 5

Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.010	0.025	-0.397	0.692
	Local NP gender	-0.014	0.014	-1.034	0.310
	LD NP gender	-0.032	0.012	-2.668	0.011 *
	Local NP gender * LD NP gender	0.028	0.025	1.123	0.271
Pronoun region	Intercept	-0.003	0.017	-0.161	0.873
	Local NP gender	0.014	0.014	1.016	0.318
	LD NP gender	-0.044	0.015	-2.975	0.005 **
	Local NP gender * LD NP gender	0.011	0.026	0.412	0.682
Spillover region	Intercept	0.004	0.021	0.185	0.854
	Local NP gender	0.014	0.011	1.258	0.212
	LD NP gender	-0.026	0.012	-2.139	0.041 *
	Local NP gender * LD NP gender	-0.043	0.023	-1.913	0.063 †
Prefinal region	Intercept	0.002	0.029	0.070	0.945
	Local NP gender	0.014	0.012	1.178	0.248
	LD NP gender	-0.026	0.011	-2.380	0.021 *
	Local NP gender * LD NP gender	0.049	0.021	2.281	0.025 *

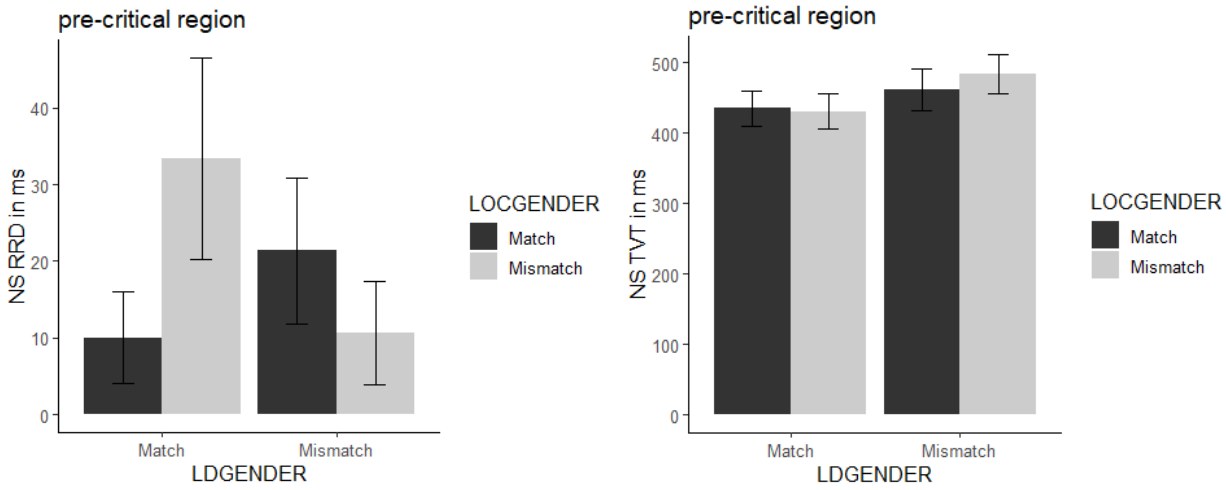
* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

Two reliable effects were found in this region. First, there was a significant interaction of the two factors in rereading times, due to the different directions of the gender incongruence effect within the two levels of LD antecedents' gender. That is, when the LD antecedents were gender-matched, the LMM condition had the longer RT than the DM condition, and yet the LDMM condition had the longer RT than the DMM condition when the LD antecedents were gender-mismatched. This is presented in the left panel of Figure 5.7. Second, there was a main effect of LDGENDER in total viewing times, meaning that the readers took longer times to read the

gender-mismatched LD antecedents than the gender-matched LD antecedents, as shown in Figure 5.7 (right panel).

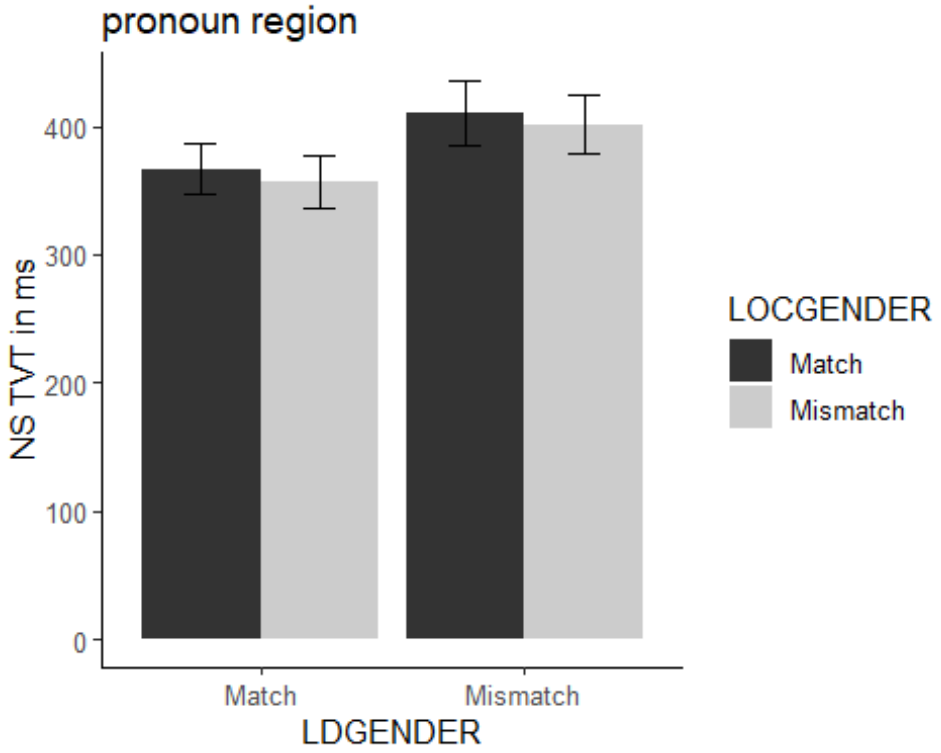
Figure 5.7. English native speakers' rereading times (left panel) and total viewing times (right panel) of each condition in pre-critical region of Experiment 5



Pronoun region

Rereading times in this region were similar across conditions. However, there were differences in total viewing times. The statistical analysis reveals the LD antecedents' gender incongruence effect, indicating that total viewing times for the mismatched LD antecedents were longer than the matched ones (see Figure 5.8).

Figure 5.8. English native speakers' total viewing times of each condition in the pronoun region of Experiment 5

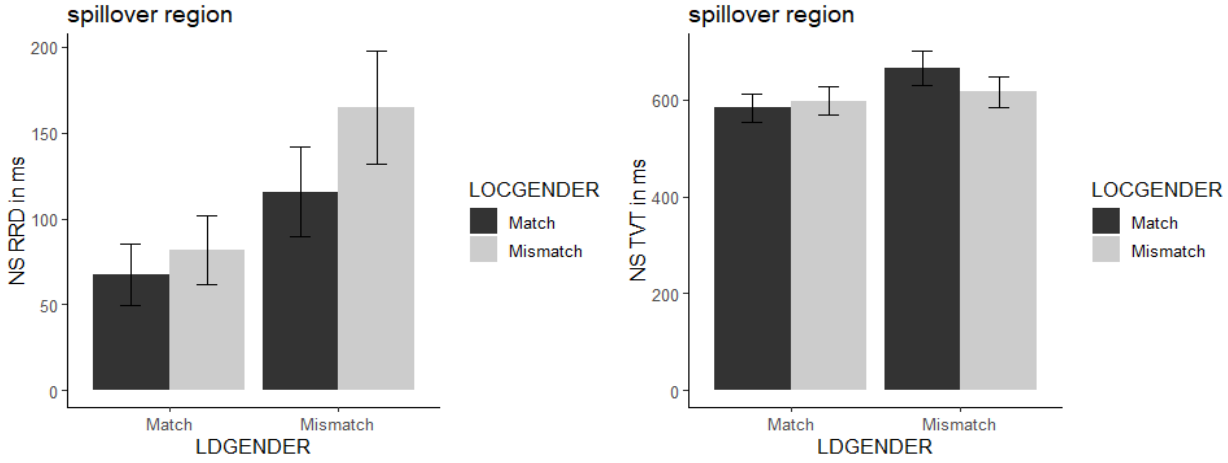


Spillover region

In the spillover region, there was a main effect of LDGENDER in rereading times, due to the longer rereading times of the gender-mismatched LD antecedents than the gender-matched LD antecedents. As shown in the left panel of Figure 5.9, the rereading times for the double mismatch condition were especially long compared to the other three conditions, which appears to be attributed to the readers' struggle to find the appropriate antecedent for the pronoun. The gender incongruence effect of LD antecedents was also observed in total viewing times. This means that the LDMM and the DMM conditions had longer total viewing times than the DM and the LMM conditions, as presented in the right panel of Figure 5.9. Also, the interaction between

the two factors almost reached significance in total viewing times, due to the increased RTs of the LDMM.

Figure 5.9. English native speakers' rereading times (left panel) and total viewing times (right panel) of each condition in the spillover region of Experiment 5

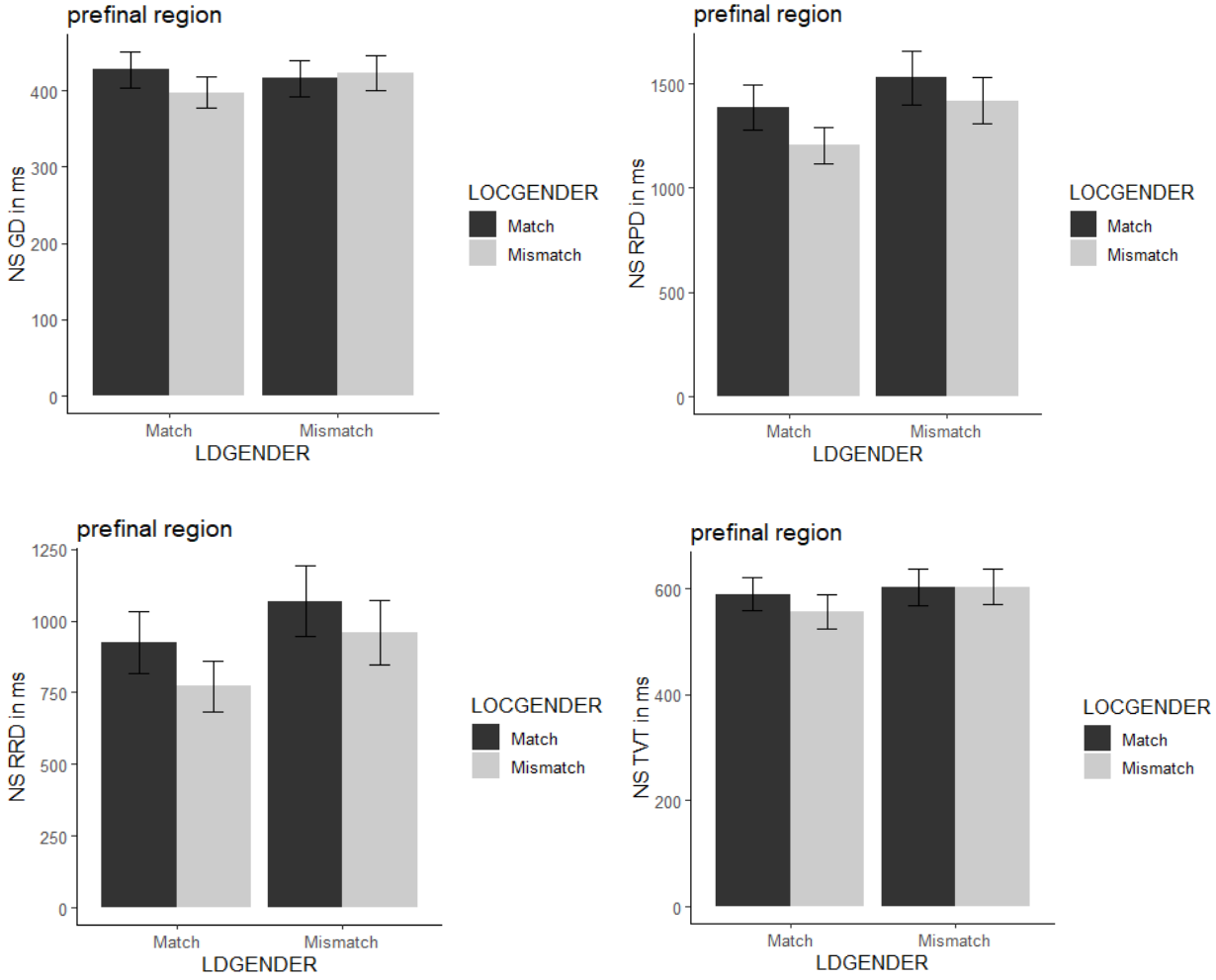


Prefinal region

In the prefinal region, reliable effects were found except first fixation durations, and Figure 5.10 displays the effects in the prefinal region. The statistical analysis on first-pass times reveals a significant interaction between the two factors, due to the different direction of the gender incongruence effect within the two levels of LD antecedents' gender. This time, the double match/mismatch conditions (DM and DMM) showed longer RTs than the single match conditions (LMM and LDMM). In regression-path times, rereading times and total viewing times, the main effect of LDGENDER was significant (marginally significant for rereading times), meaning that the gender-mismatched LD antecedents were more difficult to process, reflected on longer reading times, than the gender-matched LD antecedents. There was a marginally significant effect of LOCGENDER in regression-path times and a significant

interaction of the two factors in total viewing times, indicating that the gender information of the local antecedents was retrieved too.

Figure 5.10. English native speakers' first-pass times (top left), regression-path times (top right), rereading times (bottom left) and total viewing times (bottom right) of each condition in the prefinal region of Experiment 5



L2 LEARNERS

Early processing

Summary of the mean reading times for the early measures (first fixation durations, first-pass times and regression-path times) in the pre-critical, pronoun and spillover regions is presented in

Table 5.38. The results of the statistical analysis for these regions are separately presented in Table 5.39 (first fixation durations), Table 5.40 (first-pass times), and Table 5.41 (regression-path times).

Table 5.38. L2 learners' means (in milliseconds) and standard deviations for first fixation durations, first-pass times, and regression-path times in each condition in the pre-critical, pronoun and spillover regions in Experiment 5

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
First fixation duration	249 (93)	247 (88)	247 (88)	250 (91)
First-pass time	412 (230)	392 (210)	421 (232)	395 (211)
Regression-path time	524 (333)	508 (324)	506 (304)	476 (271)
Pronoun region				
First fixation duration	233 (78)	235 (83)	233 (79)	245 (85)
First-pass time	312 (155)	311 (156)	318 (167)	320 (155)
Regression-path time	383 (232)	413 (254)	429 (289)	425 (272)
Spillover region				
First fixation duration	240 (72)	241 (72)	246 (79)	243 (77)
First-pass time	526 (261)	536 (251)	561 (294)	545 (292)
Regression-path time	692 (358)	651 (350)	732 (409)	755 (473)

Table 5.39. Summary of statistical analyses for L2 learners' first fixation durations in the pre-critical, pronoun and spillover regions of Experiment 5

First fixation duration					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.001	0.012	-0.050	0.960
	Local NP gender	0.002	0.009	0.221	0.826
	LD NP gender	-0.004	0.009	-0.393	0.696
	Local NP gender * LD NP gender	0.005	0.018	0.297	0.768
Pronoun region	Intercept	0.001	0.010	0.051	0.960
	Local NP gender	-0.010	0.009	-1.042	0.305
	LD NP gender	-0.010	0.011	-0.959	0.345
	Local NP gender * LD NP gender	0.017	0.018	0.948	0.349
Spillover region	Intercept	0.001	0.008	0.098	0.923
	Local NP gender	0.001	0.007	0.133	0.894
	LD NP gender	-0.005	0.007	-0.729	0.470
	Local NP gender * LD NP gender	-0.006	0.014	-0.463	0.644

Table 5.40. Summary of statistical analyses for L2 learners' first-pass times in the pre-critical, pronoun and spillover regions of Experiment 5

First-pass times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.003	0.022	-0.140	0.889
	Local NP gender	0.021	0.013	1.705	0.095 †
	LD NP gender	0.001	0.012	-0.069	0.945
	Local NP gender * LD NP gender	-0.011	0.022	-0.521	0.603
Pronoun region	Intercept	-0.002	0.017	-0.115	0.909
	Local NP gender	0.001	0.011	0.054	0.957
	LD NP gender	-0.014	0.011	-1.320	0.189
	Local NP gender * LD NP gender	0.002	0.022	0.084	0.934
Spillover region	Intercept	0.001	0.020	0.055	0.956
	Local NP gender	0.001	0.015	0.052	0.959
	LD NP gender	-0.004	0.015	-0.303	0.764
	Local NP gender * LD NP gender	-0.036	0.024	-1.494	0.145

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.41. Summary of statistical analyses for L2 learners' regression-path times in the pre-critical, pronoun and spillover regions of Experiment 5

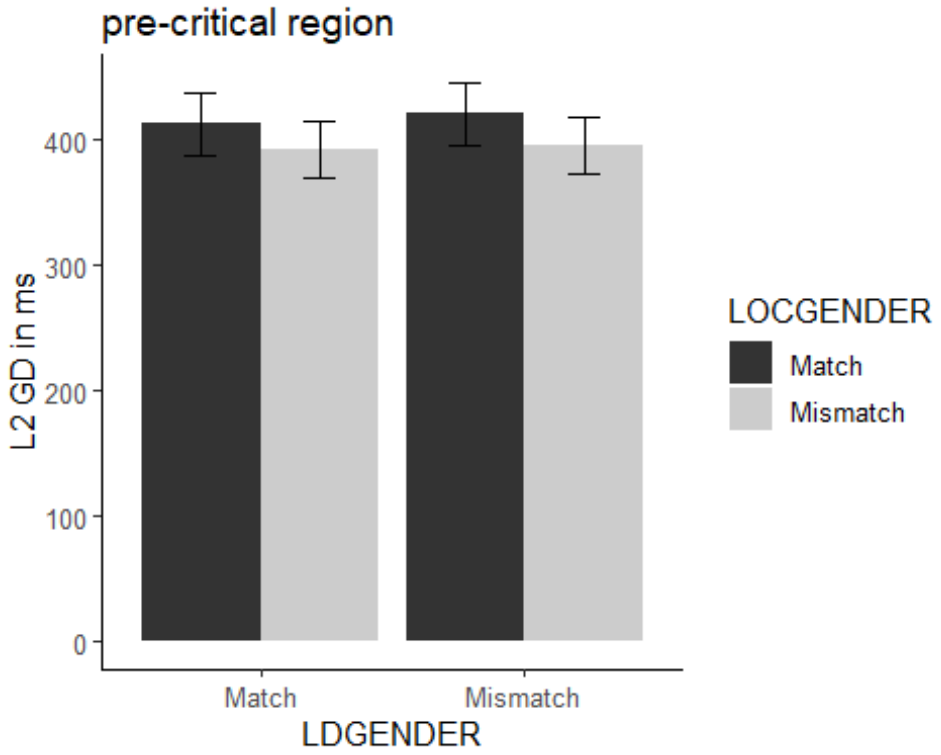
Regression-path times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.007	0.026	-0.275	0.784
	Local NP gender	0.015	0.013	1.105	0.281
	LD NP gender	0.007	0.012	0.567	0.573
	Local NP gender * LD NP gender	-0.011	0.026	-0.439	0.664
Pronoun region	Intercept	-0.004	0.021	-0.199	0.843
	Local NP gender	-0.012	0.013	-0.898	0.376
	LD NP gender	-0.027	0.015	-1.804	0.078 †
	Local NP gender * LD NP gender	-0.040	0.029	-1.379	0.175
Spillover region	Intercept	0.003	0.023	0.142	0.888
	Local NP gender	0.014	0.012	1.118	0.272
	LD NP gender	-0.026	0.013	-2.002	0.056 †
	Local NP gender * LD NP gender	0.013	0.027	0.490	0.628

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

In this region, no reliable effects were found in first fixation durations and regression-path times. However, the gender incongruence effect of the local antecedents was found to be marginally significant in first-pass times. This means that first-pass times for the conditions with matching local antecedents were longer than those with mismatching local antecedents, as shown in Figure 5.11.

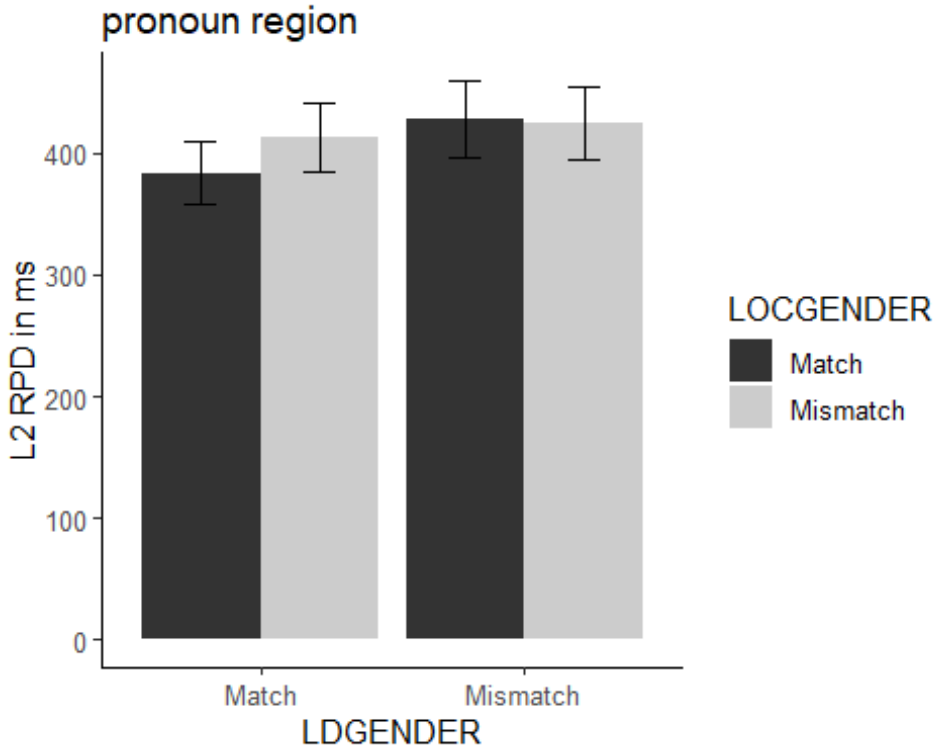
Figure 5.11. L2 learners' first-pass times of each condition in the pre-critical region of Experiment 5



Pronoun region

In this region, only the regression-path times showed a reliable effect. The model reveals that the effect of LDGENDER almost approached significance. This means that regression-path times tended to be longer for the mismatched LD antecedents than for the matched LD antecedents (see Figure 5.12).

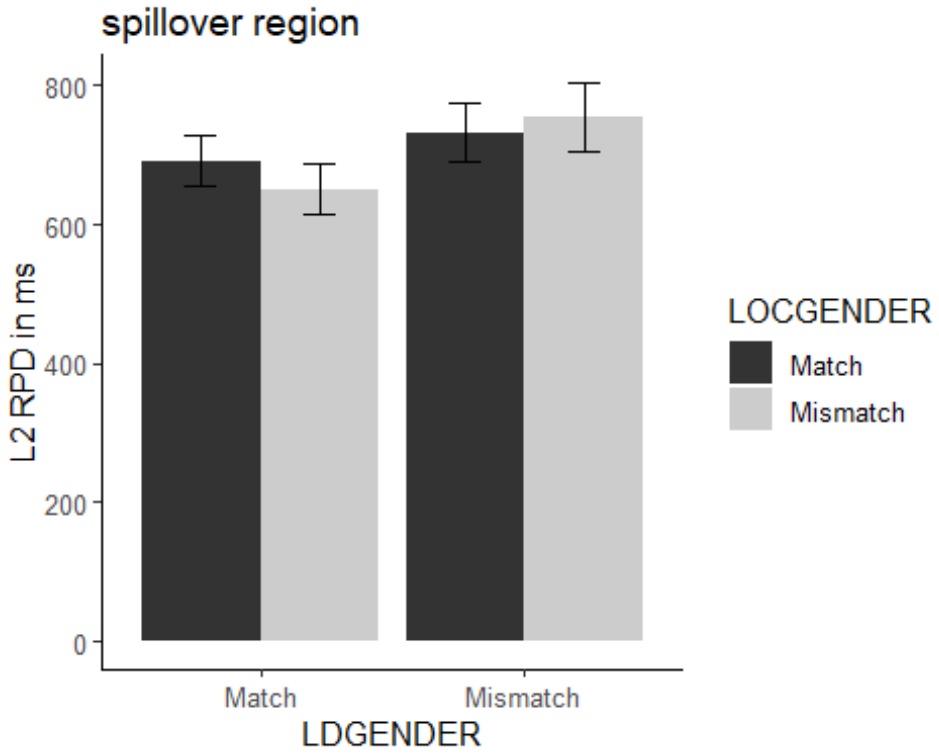
Figure 5.12. L2 learners' regression-path times of each condition in the pronoun region of Experiment 5



Spillover region

As in the pronoun region, a marginally significant gender incongruence effect of the LD antecedents was observed in regression-path times in spillover region. In other words, the LDMM and the DMM had longer regression-path times than the other two conditions, as displayed in Figure 5.13. No other reliable effects were found.

Figure 5.13. L2 learners' regression-path times of each condition in the spillover region of Experiment 5



Later processing

The means for the measures indicative of later processing are summarized in Table 5.42. The results of the statistical analyses are provided separately in Table 5.43 (first fixation durations, first-pass times and regression-path times in the prefinal region), Table 5.44 (rereading times) and Table 5.45 (total viewing times).

Table 5.42. L2 learners' means (in milliseconds) and standard deviations for reading measures indicating later processing in Experiment 5

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
Rereading time	58 (191)	70 (223)	43 (155)	52 (168)
Total viewing time	717 (410)	685 (416)	734 (446)	743 (433)
Pronoun region				
Rereading time	56 (160)	89 (213)	88 (242)	99 (245)
Total viewing time	491 (310)	510 (305)	547 (326)	530 (302)
Spillover region				
Rereading time	119 (299)	71 (223)	125 (321)	157 (407)
Total viewing time	838 (426)	817 (452)	892 (478)	917 (473)
Prefinal region				
First fixation duration	236 (73)	239 (74)	238 (77)	244 (78)
First-pass time	568 (299)	575 (285)	595 (317)	585 (314)
Regression-path time	1943 (1425)	1809 (1463)	1929 (1401)	2060 (1534)
Rereading time	1353 (1389)	1134 (1294)	1290 (1330)	1438 (1499)
Total viewing time	777 (392)	756 (410)	774 (409)	800 (396)

Table 5.43. Summary of statistical analyses for L2 learners' first fixation durations, first-pass times and regression-path times in the prefinal region of Experiment 5

Prefinal region					
		Estimate	SE	*t*-value	*p*-value
First fixation durations	Intercept	0.001	0.008	0.077	0.939
	Local NP gender	-0.104	0.007	-1.695	0.109
	LD NP gender	-0.005	0.007	-0.700	0.487
	Local NP gender * LD NP gender	0.016	0.015	1.083	0.280
First-pass times	Intercept	0.003	0.024	0.125	0.901
	Local NP gender	-0.004	0.011	-0.346	0.729
	LD NP gender	-0.011	0.013	-0.859	0.398
	Local NP gender * LD NP gender	-0.022	0.024	-0.896	0.375
Regression-path times	Intercept	0.005	0.040	0.115	0.909
	Local NP gender	0.010	0.015	0.654	0.518
	LD NP gender	-0.032	0.014	-2.321	0.021 *
	Local NP gender * LD NP gender	0.054	0.029	1.824	0.076 †

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.44. Summary of statistical analyses for L2 learners' rereading times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 5

Rereading times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.001	0.037	0.021	0.983
	Local NP gender	-0.033	0.044	-0.752	0.452
	LD NP gender	0.037	0.048	0.774	0.445
	Local NP gender * LD NP gender	0.011	0.086	0.131	0.896
Pronoun region	Intercept	-0.002	0.043	-0.053	0.958
	Local NP gender	-0.104	0.066	-1.563	0.128
	LD NP gender	-0.026	0.058	-0.451	0.654
	Local NP gender * LD NP gender	-0.064	0.115	-0.553	0.582
Spillover region	Intercept	-0.001	0.052	-0.009	0.993
	Local NP gender	0.051	0.058	0.878	0.384
	LD NP gender	-0.079	0.068	-1.158	0.255
	Local NP gender * LD NP gender	0.179	0.118	1.518	0.135
Prefinal region	Intercept	0.015	0.128	0.114	0.909
	Local NP gender	0.081	0.068	1.187	0.245
	LD NP gender	-0.089	0.065	-1.367	0.178
	Local NP gender * LD NP gender	0.166	0.112	1.487	0.140

Table 5.45. Summary of statistical analyses for L2 learners' total viewing times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 5

Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.002	0.030	0.072	0.943
	Local NP gender	0.010	0.016	0.604	0.550
	LD NP gender	-0.022	0.012	-1.833	0.072 †
	Local NP gender * LD NP gender	0.029	0.023	1.221	0.233
Pronoun region	Intercept	-0.001	0.025	-0.037	0.971
	Local NP gender	-0.005	0.013	-0.359	0.720
	LD NP gender	-0.039	0.013	-3.081	0.003 **
	Local NP gender * LD NP gender	-0.038	0.027	-1.371	0.176
Spillover region	Intercept	0.004	0.024	0.160	0.873
	Local NP gender	0.002	0.013	0.165	0.870
	LD NP gender	-0.035	0.012	-2.884	0.008 **
	Local NP gender * LD NP gender	0.024	0.026	0.946	0.351

Table 5.45. cont'd

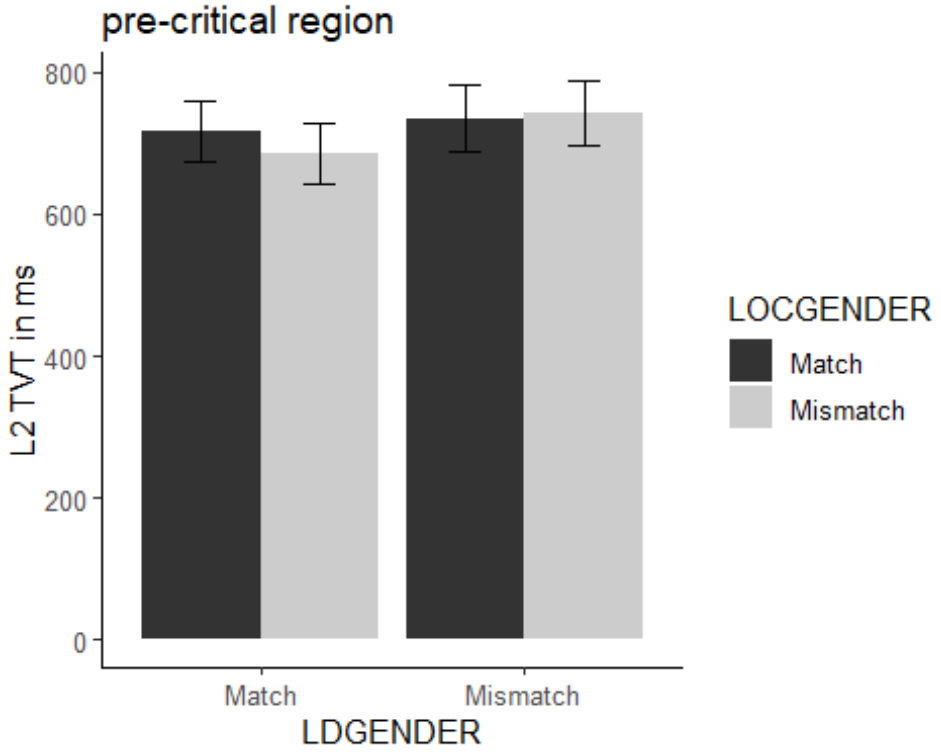
Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Prefinal region	Intercept	0.003	0.027	0.111	0.912
	Local NP gender	-0.002	0.010	-0.185	0.854
	LD NP gender	-0.013	0.011	-1.151	0.259
	Local NP gender * LD NP gender	0.027	0.021	1.281	0.206

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

A marginally significant effect of LDGENDER was found in total viewing times. This means that as Figure 5.14 shows, there was difference in total viewing times between the LD gender-match conditions (DM and LMM) and the LD gender-mismatch conditions (LDMM and DMM). No reliable effects were observed in rereading times.

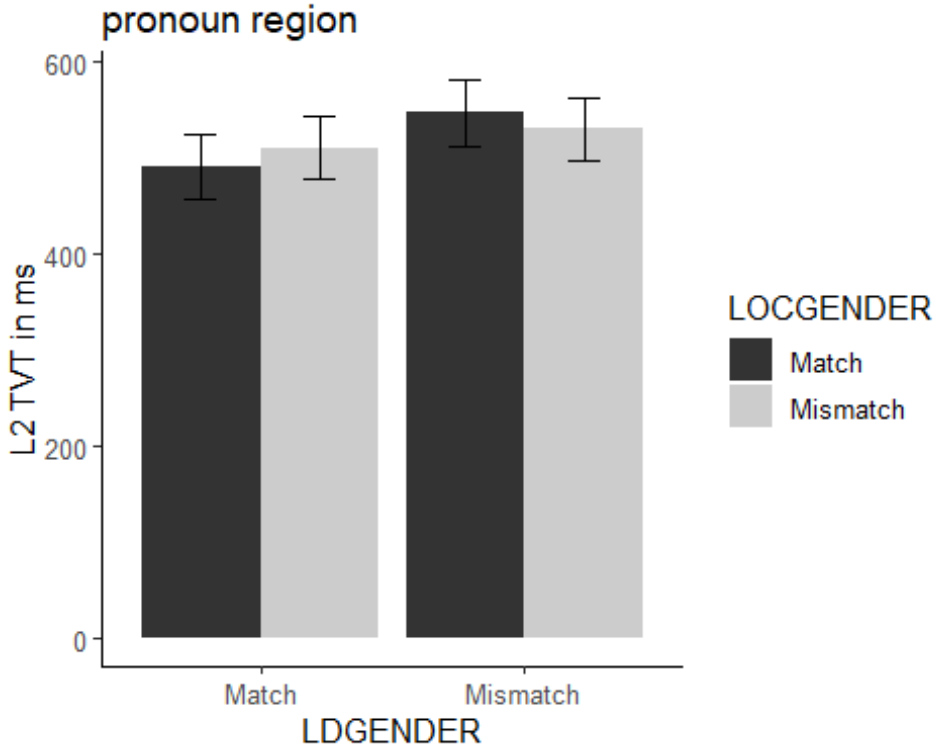
Figure 5.14. L2 learners' total viewing times of each condition in the pre-critical region of Experiment 5



Pronoun region

As in the pre-critical region, the gender incongruence effect of the LD antecedents was found to be significant in total viewing times, due to longer reading times of the gender-mismatched LD antecedents compared to the gender-matched ones (see Figure 5.15). The statistical analysis does not reveal any reliable effects in rereading times.

Figure 5.15. L2 learners' total viewing times of each condition in the pronoun region of Experiment 5

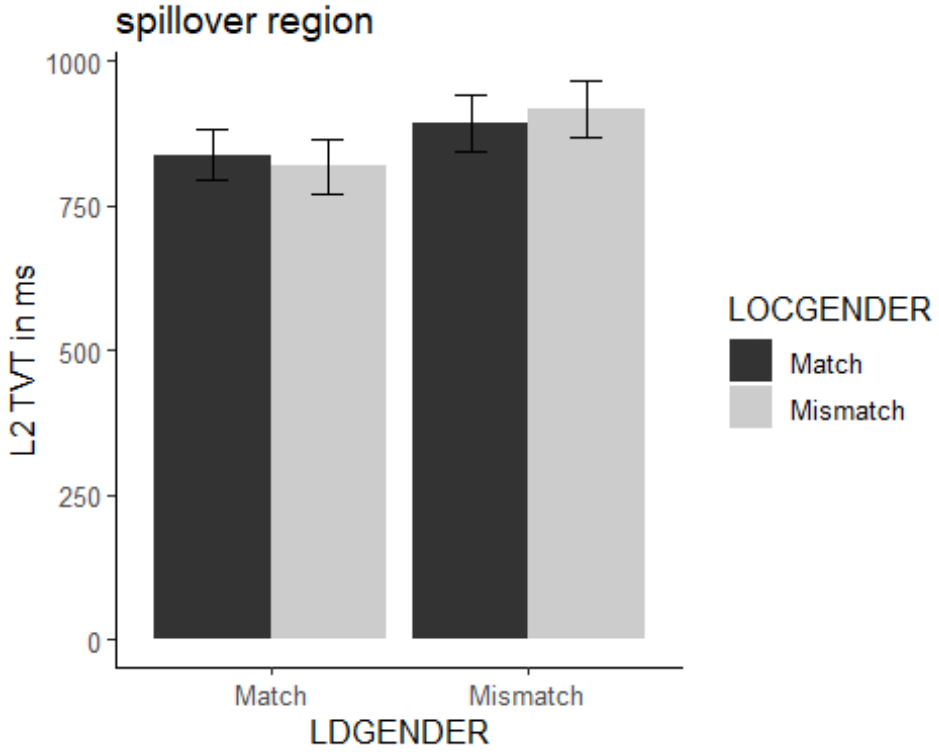


Spillover region

Again, in this region, there was a significant effect of LDGENDER in total viewing times. As plotted in Figure 5.16, total viewing times of the LDMM and the DMM conditions were longer

than those of the DM and the LMM conditions. This indicates that L2 learners considered the gender cues of the LD antecedents during the antecedent retrieval process. No reliable effects were observed in rereading times in this region.

Figure 5.16. L2 learners' total viewing times of each condition in the spillover region of Experiment 5

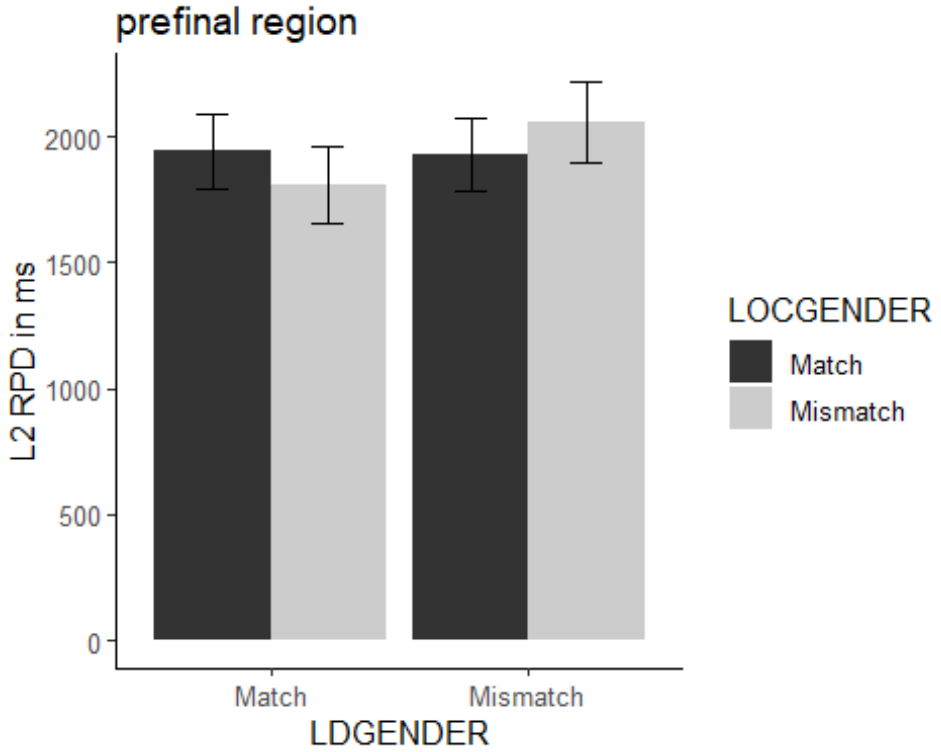


Prefinal region

There were no statistically significant differences in first fixation durations, first-pass times, rereading times and total viewing times in this region. However, there was a significant gender incongruence effect of the LD antecedents in regression-path times, due to the increased RTs of the LDMM and the DMM conditions. In regression-path times, an interaction of the two factors almost reached significance too, due to the differences between the single match conditions

(LMM and LDMM) and the double match/mismatch conditions (DM and DMM), as shown in Figure 5.17.

Figure 5.17. L2 learners' regression-path times of each condition in the prefinal region of Experiment 5



5.2.2.4.Summary of results from Experiment 5

NATIVE SPEAKERS

Among the measures indicating the early processing, only one reliable effect was found in spillover region. Regression-path times in this region were shorter when the gender of the pronoun matched the gender of the LD antecedent than when it did not. They did not differ reliably as a function of whether the local antecedent matched the pronoun. This indicates that native speakers of English applied Pr B quickly after their reading of the pronoun.

In contrast to the early measures, the results of the later measures showed reliable influences of the local antecedents in addition to the effects of the LD antecedents. First, there was a reliable effect of the LD antecedents: regression-path times (at the prefinal region), rereading times (at the spillover and prefinal regions) and total viewing times (at all regions) were longer when the gender of the pronoun and the LD antecedent was mismatched than when it was matched. This indicates the native speakers still considered the LD antecedents during the later stages of processing. Concurrently, there was a reliable effect of the local antecedents: regression-path times in prefinal region in the local match conditions (DM and LDMM) were longer than those in the local mismatch conditions (LMM and DMM). This suggests that the local antecedents were activated during native speakers' real-time antecedent search process and affect processing at a relatively late stage. Additional evidence that they considered both LD and local antecedents came from the results of first-pass times (at the prefinal region) and total viewing times (at the spillover and prefinal regions) where the RTs of either the LDMM or the DM were longer than those of the LMM. One unexpected finding was a significant interaction in rereading times at the pre-critical region, attributed to the different direction of the effects within the two levels of the LD antecedents' gender. Unlike the prediction, the single match conditions (LMM and LDMM) had longer rereading times than the double match conditions (DM and DMM). It is unclear why such interaction was found, but given that this effect was not observed at and beyond the pronoun region, it will be disregarded from the further discussion.

To summarize, the results of native speakers showed that they considered only the LD antecedents early in the processing of the pronoun, but they considered the local antecedents also at the later stages of processing. The results therefore support the *BDIF hypothesis* which claims that the binding constraints are applied at an early stage but this early application of the binding

constraints does not act as a filter on all subsequent processes of interpretation. These results are summarized in in Table 5.46, and they are discussed further in **Error! Reference source not found.** where I revisit H4 together with the results from Experiment 6.

Table 5.46. Summary of English native speakers' statistically significant results from Experiment 5

Processing timing	Region of interest	Reading measure	Result
Early	Spillover region	Regression-path time	LDMM, DMM > DM, LMM
Late	Prefinal region	First-pass time	DM, DMM > LDMM > LMM
	Prefinal region	Regression-path time	LDMM > DMM, DM > LMM
	Pre-critical region	Total viewing time	LDMM, DMM > DM, LMM
	Pronoun region		LDMM, DMM > DM, LMM
	Spillover region		LDMM > DMM > DM, LMM
	Prefinal region		LDMM, DMM > DM > LMM
	Pre-critical region	Rereading time	LDM > LDMM > DM, DMM
	Prefinal region		LDMM, DMM > DM, LMM

L2 LEARNERS

In L2 learners' data, like the data of native speakers of English, reliable effects were found in both early measures and late measures. In the early processing, there was a significant effect of the LD antecedents. Regression-path times at the pronoun and spillover region were longer when the LD antecedents did not carry matching gender features to the pronoun than when they did. This means that the L2 learners applied Pr B early in the pronoun processing and considered the LD antecedents. Unlike the native speakers of English, there was a marginally significant effect of the local antecedents in first-pass times too. The local match conditions (DM and LDMM) showed longer first-pass times than the local mismatch conditions (LMM and DMM), due to the retrieval interference. This suggests that the L2 learners considered the local antecedents even in the early processing stages, unlike the native speakers of English.

Reliable effects were also found in the later measures. As in the early measures, a significant gender incongruence effect of the LD antecedents was found in regression-path times (at the prefinal region) and total viewing times (at the pre-critical, pronoun and spillover regions). The LD match conditions (DM and LMM) were read faster than the LD mismatch conditions (LDMM and DMM). This indicates that the LD antecedents were activated and considered during later parsing too. An interaction of the two factors was found to be marginally significant in regression-path times at the prefinal region, due to longer reading times of the double match/mismatch conditions (DM and DMM) than the single match conditions (LMM and LDMM). This suggests that the local antecedents affected their pronoun processing at later processing stages in addition to the LD antecedents.

In sum, the results of L2 learners showed that both LD and local antecedents affected their processing of English pronouns at all stages of processing. This is different from the results of native speakers of English who considered only the LD antecedents at the early stages and expanded their search limit to the local antecedents at the later parsing stages. The L2 learners' English pronoun processing pattern is not exactly parallel to their processing pattern of the Korean overt pronoun either, but they are similar. The similarity between the two is that Pr B does not constrain the antecedent search process of the pronoun in English as well as in Korean. That is, both LD and the local antecedents affect their pronoun processing in Korean and in English. They are just different in terms of when the effects are observed. The effects of the LD and the local antecedents are found from the initial parsing stages when they process an English pronoun, but they are missing in their early processing of an overt pronoun in Korean. The similarity between their English pronoun processing and Korean pronoun processing seems to provide supporting evidence for H4 which hypothesizes the transfer effect from Korean to

English even in the processing. Table 5.47 presents a summary of L2 learners' reliable effects found in Experiment 5. The results are discussed further in **Error! Reference source not found.** where I readdress H4 along with the results from Experiment 6.

Table 5.47. Summary of L2 learners' statistically significant results from Experiment 5

Processing timing	Region of interest	Reading measure	Result
Early	Pre-critical region	First-pass time	LDMM, DMM > DM, LMM
	Pronoun region	Regression-path time	LDMM, DMM > DM, LMM
	Spillover region		LDMM, DMM > DM, LMM
Late	Pre-critical region	Total viewing time	LDMM, DMM > DM, LMM
	Pronoun region		LDMM, DMM > DM, LMM
	Spillover region		LDMM, DMM > DM, LMM
	Prefinal region	Regression-path time	DMM > LDMM, DM > LMM

5.2.3. Experiment 6

5.2.3.1.Materials

This experiment was aimed to test how native speakers of English and L2 learners process bound variable interpretation of English pronouns. Therefore, the two NPs appeared in the sentence were either a quantificational NP (*every* NP) or a *wh*-phrase (*which* NP). The design was identical to that of Experiment 4 except that the testing language was English. As in Experiment 4, the NPs that co-occurred with a quantifier and a *wh*-word were matched in terms of length and frequency, and their gender information was manipulated by using inherently feminine or masculine (e.g., girl, boy). The quantificational NP was always the LD antecedent, whereas the *wh*-phrase was always the local antecedent. Table 5.48 provides an example token set for Experiment 6.

Table 5.48. Example token set for Experiment 6

Condition	Sentence
A. Double match (DM)	Every woman asked which girl pricked her with a sharp needle by mistake.
B. Local mismatch (LMM)	Every woman asked which boy pricked her with a sharp needle by mistake.
C. LD mismatch (LDMM)	Every man asked which girl pricked her with a sharp needle by mistake.
D. Double mismatch (DMM)	Every man asked which boy pricked her with a sharp needle by mistake.

As described in 5.2.1.1, the 32 experimental items of Experiment 6 were intermixed with the 32 experimental items of Experiment 5, 88 fillers and 8 pseudo-fillers.

5.2.3.2.Predictions

Native speakers of English are expected to apply Pr B from the initial parsing stages and hence to consider the LD antecedents only in their pronoun processing, as predicted by the *BAIF hypothesis*. Therefore, the LD mismatch conditions (LDMM and DMM) will take longer times to read than the LD match conditions (DM and LMM), and this will be observed with all reading measures. Alternately, as found in Experiment 5 and predicted by the *BADF hypothesis*, this pattern will be observed only with the measures indexing early processing, followed by their consideration of both LD and local antecedents during later parsing. This means that with the later measures, the local match conditions (DM and LDMM) will show longer RTs than the local mismatch conditions (LMM and DMM), due to the interference from the local matching antecedents. Lastly, as the *feature-match hypothesis* predicts, both LD and local antecedents will affect the initial pronoun processing of native speakers, but later only Pr B-compatible

antecedents will remain to influence the processing. This means that the increased RTs will be observed with the DM and the DMM conditions compared to the other two conditions with the early measures but the RTs will be longer in the LD mismatch conditions (LDMM and DMM) than in the LD match conditions (DM and LMM) with the later measures.

If H4 is correct, Korean speakers will transfer how they process bound variable interpretation of an overt pronoun in Korean to their processing of an English pronoun. In Experiment 4, we found both LD and local antecedents are considered at later stages of processing. If there is transfer of from Korean to English, we will find evidence showing that L2 learners consider both LD and local antecedents during the antecedent search process of the bound variable reading of an English pronoun. This means that the gender match/mismatch of both LD and local antecedents will affect the parsing, and we will find their effects with the later measures. If H4 is incorrect, it is possible that Korean speakers show the processing pattern similar to that of native speakers of English. In other words, Pr B is applied early in their processing and hence only the LD antecedents affect their processing. If this is the case, only the effect of the LD antecedents will be found: the LD match conditions will be read faster than the LD mismatch conditions. Second possibility is to see the pattern predicted by the *BADF hypothesis*. That is, the effect of the LD antecedents will be observed with the early measures and with the later measures, the effects of both LD and local antecedents will be found. Therefore, the RTs in the LDMM and the DMM will be longer than those in the other two conditions with the early measures but the RTs will be longer for the double match/mismatch conditions (DM and DMM) than for the single match conditions (LMM and LDMM) with the late measures. The last possibility to see the pattern predicted by the *feature-match hypothesis*. In other words, we will find the effects of the LD and the local antecedents with the early measures,

but we will find only the effect of the LD antecedents with the late measures. A summary of these predictions is presented in Table 5.49.

Table 5.49. Predictions for Experiment 6 (bold font used to indicate the prediction)

Participant	Hypothesis	RTs
L2 learners	BAIF hypothesis	LDMM, DMM > DM, LM
	BADF hypothesis	Early processing: LDMM, DMM > DM, LM Later processing: DM, DMM > LMM, LDMM
	Feature-match hypothesis	Early processing: DM, DMM > LMM, LDMM Later processing: LDMM, DMM > DM, LM
	H4	**Later processing: DM, DMM > LMM, LDMM**
Native speakers of English	**BAIF hypothesis**	**LDMM, DMM > DM, LM**
	BADF hypothesis	Early processing: LDMM, DMM > DM, LM Later processing: DM, DMM > LMM, LDMM
	Feature-match hypothesis	Early processing: DM, DMM > LMM, LDMM Later processing: LDMM, DMM > DM, LM

5.2.3.3.Results

The skipping rates in the analyzed regions for the four reported regions were 8% (pre-critical), 17% (pronoun), 3% (spillover), 0% (prefinal) in the control group (native speakers of English) and 6% (pre-critical), 7% (pronoun), 1% (spillover), 0% (prefinal) in the L2 learners group. Data log transformations and composition of the statistical models is the same as in Experiment 5, as described in 5.2.2.3.

The presentation of the descriptive summary and the statistical analyses of the eye-movement data is divided into two sections, *early processing* and *later processing*, as in Experiment 5.

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Early processing

Table 5.50 summarizes the means of the measures indexing the early processing, and the results of their statistical analysis are provided separately in Table 5.51 (first fixation durations in pre-critical, pronoun and spillover region), Table 5.52 (first-pass times in pre-critical, pronoun and spillover region) and Table 5.53 (regression-path times in pre-critical, pronoun and spillover region).

Table 5.50. English native speakers' means (in milliseconds) and standard deviations for first fixation durations, first-pass times, and regression-path times in each condition in the pre-critical, pronoun and spillover regions in Experiment 6

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
First fixation duration	217 (59)	217 (62)	214 (57)	218 (59)
First-pass time	270 (114)	271 (108)	270 (120)	272 (102)
Regression-path time	318 (173)	307 (153)	313 (177)	311 (159)
Pronoun region				
First fixation duration	204 (54)	209 (57)	208 (55)	210 (57)
First-pass time	211 (77)	221 (75)	227 (77)	229 (79)
Regression-path time	288 (178)	290 (205)	294 (178)	291 (188)
Spillover region				
First fixation duration	211 (55)	213 (57)	213 (55)	221 (60)
First-pass time	352 (168)	361 (185)	364 (193)	379 (194)
Regression-path time	485 (297)	495 (335)	569 (436)	587 (429)

Table 5.51. Summary of statistical analyses for English native speakers' first fixation durations in the pre-critical, pronoun and spillover regions of Experiment 6

First fixation duration					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.000	0.006	-0.036	0.971
	Local NP gender	-0.002	0.008	-0.304	0.763
	LD NP gender	0.002	0.006	0.332	0.740
	Local NP gender * LD NP gender	0.008	0.013	0.635	0.529
Pronoun region	Intercept	0.001	0.006	0.076	0.940
	Local NP gender	-0.007	0.007	-0.936	0.353
	LD NP gender	-0.004	0.007	-0.531	0.597
	Local NP gender * LD NP gender	-0.005	0.015	-0.353	0.727
Spillover region	Intercept	0.000	0.006	0.061	0.951
	Local NP gender	-0.009	0.007	-1.209	0.235
	LD NP gender	-0.009	0.006	-1.480	0.143
	Local NP gender * LD NP gender	0.013	0.014	0.894	0.378

Table 5.52. Summary of statistical analyses for English native speakers' first-pass times in the pre-critical, pronoun and spillover regions of Experiment 6

First-pass times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.004	0.013	-0.313	0.755
	Local NP gender	-0.007	0.008	-0.808	0.420
	LD NP gender	-0.002	0.008	-0.220	0.826
	Local NP gender * LD NP gender	0.005	0.018	0.251	0.803
Pronoun region	Intercept	-0.000	0.007	-0.046	0.963
	Local NP gender	-0.002	0.010	-0.238	0.813
	LD NP gender	-0.012	0.009	-1.266	0.211
	Local NP gender * LD NP gender	0.001	0.019	0.042	0.967
Spillover region	Intercept	-0.002	0.017	-0.132	0.896
	Local NP gender	-0.012	0.011	-1.079	0.289
	LD NP gender	-0.010	0.011	-0.974	0.334
	Local NP gender * LD NP gender	0.022	0.020	1.105	0.270

Table 5.53. Summary of statistical analyses for English native speakers' regression-path times in the pre-critical, pronoun and spillover regions of Experiment 6

Regression-path times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.006	0.015	-0.381	0.705
	Local NP gender	-0.001	0.010	-0.097	0.923
	LD NP gender	0.004	0.010	0.364	0.718
	Local NP gender * LD NP gender	0.012	0.019	0.607	0.545
Pronoun region	Intercept	-0.002	0.014	-0.116	0.908
	Local NP gender	0.005	0.014	0.383	0.704
	LD NP gender	-0.004	0.014	-0.289	0.774
	Local NP gender * LD NP gender	0.000	0.026	0.008	0.994
Spillover region	Intercept	-0.001	0.025	-0.033	0.973
	Local NP gender	-0.009	0.017	-0.547	0.588
	LD NP gender	-0.049	0.017	-2.916	0.006 **
	Local NP gender * LD NP gender	0.026	0.028	0.922	0.362

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

No reliable effects were found in any of the measures in this region.

Pronoun region

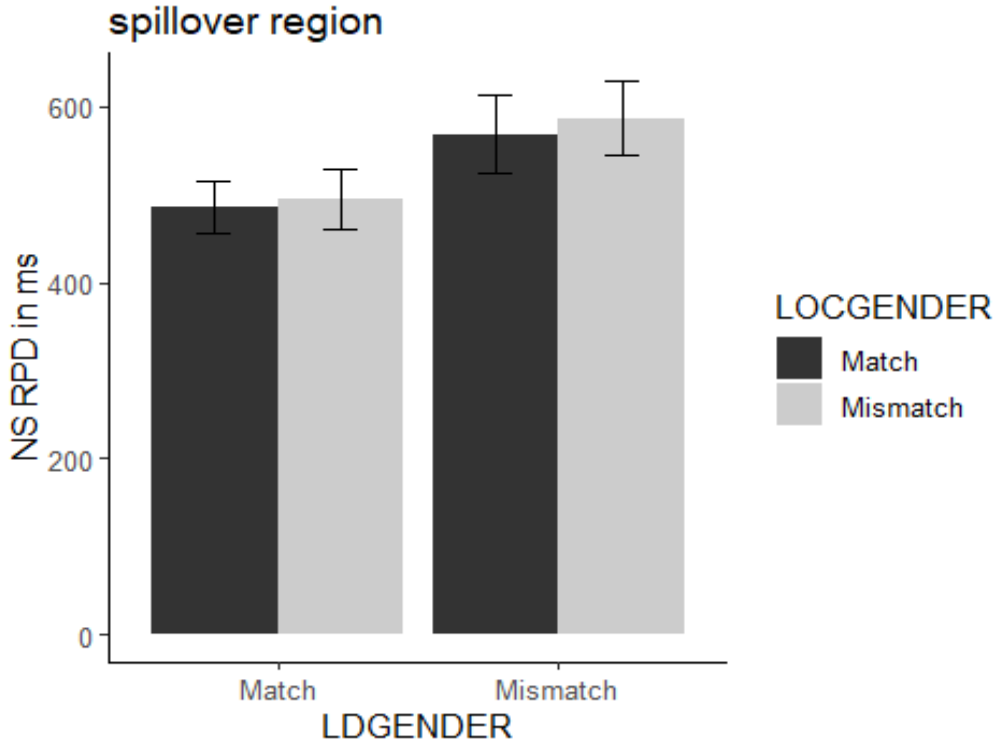
As in the pre-critical region, there were no reliable effects in any of the measures in the pronoun region.

Spillover region

First fixation durations and first-pass times did not show any reliable effects in this region. However, there was a reliable effect of the LD antecedents in regression-path times. As Figure 5.18 displays, the LD mismatch conditions (LDMM and DMM) showed longer regression-path times than the LD match conditions (DM and LMM). This indicates that the native speakers of

English considered the cues available with the LD antecedents and when the LD antecedents were not gender-matched, their eyes regressed more to the previous regions.

Figure 5.18. English native speakers' regression-path times of each condition in the spillover region of Experiment 6



Later processing

Table 5.54 provides a summary of the means for the native speakers' later measures. The statistical results are given in Table 5.55 (first fixation durations, first-pass times and regression-path times in the prefinal region), Table 5.56 (rereading times in all regions) and Table 5.57 (total viewing times in all regions).

Table 5.54. English native speakers' means (in milliseconds) and standard deviations for reading measures indicating later processing in Experiment 6

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
Rereading time	30 (118)	18 (82)	28 (106)	28 (112)
Total viewing time	409 (243)	417 (265)	488 (317)	438 (256)
Pronoun region				
Rereading time	49 (141)	52 (169)	54 (147)	44 (140)
Total viewing time	365 (221)	374 (231)	416 (255)	405 (263)
Spillover region				
Rereading time	120 (266)	130 (304)	179 (393)	180 (374)
Total viewing time	614 (353)	619 (378)	708 (431)	689 (396)
Prefinal region				
First fixation duration	220 (68)	228 (76)	218 (70)	222 (78)
First-pass time	362 (200)	358 (197)	359 (198)	353 (189)
Regression-path time	1446 (1281)	1376 (1204)	1607 (1420)	1543 (1333)
Rereading time	1075 (1306)	1001 (1222)	1217 (1453)	1147 (1335)
Total viewing time	525 (309)	519 (283)	535 (303)	549 (317)

Table 5.55. Summary of statistical analyses for English native speakers' first fixation durations, first-pass times and regression-path times in the prefinal region of Experiment 6

Prefinal region					
		Estimate	SE	*t*-value	*p*-value
First fixation durations	Intercept	-0.001	0.008	-0.153	0.879
	Local NP gender	-0.009	0.007	-1.182	0.241
	LD NP gender	0.009	0.008	1.185	0.241
	Local NP gender * LD NP gender	-0.006	0.014	-0.398	0.691
First-pass times	Intercept	-0.004	0.022	-0.174	0.863
	Local NP gender	0.003	0.012	0.203	0.840
	LD NP gender	0.001	0.012	0.087	0.931
	Local NP gender * LD NP gender	0.004	0.023	0.185	0.854
Regression-path times	Intercept	-0.002	0.041	-0.041	0.968
	Local NP gender	0.006	0.019	0.315	0.755
	LD NP gender	-0.044	0.019	-2.344	0.024 *
	Local NP gender * LD NP gender	0.003	0.036	0.092	0.927

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.56. Summary of statistical analyses for English native speakers' rereading times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 6

Rereading times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	0.004	0.025	0.138	0.891
	Local NP gender	0.044	0.037	1.194	0.242
	LD NP gender	-0.040	0.039	-1.025	0.309
	Local NP gender * LD NP gender	0.036	0.083	0.430	0.669
Pronoun region	Intercept	0.006	0.047	0.117	0.907
	Local NP gender	0.033	0.051	0.637	0.526
	LD NP gender	-0.019	0.053	-0.346	0.731
	Local NP gender * LD NP gender	-0.015	0.117	-0.128	0.899
Spillover region	Intercept	0.013	0.071	0.180	0.858
	Local NP gender	0.001	0.058	0.009	0.993
	LD NP gender	-0.120	0.064	-1.882	0.070 †
	Local NP gender * LD NP gender	0.060	0.116	0.518	0.606
Prefinal region	Intercept	0.012	0.121	0.097	0.923
	Local NP gender	-0.043	0.067	-0.643	0.526
	LD NP gender	-0.041	0.069	-0.598	0.553
	Local NP gender * LD NP gender	0.000	0.138	0.001	1.000

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.57. Summary of statistical analyses for English native speakers' total viewing times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 6

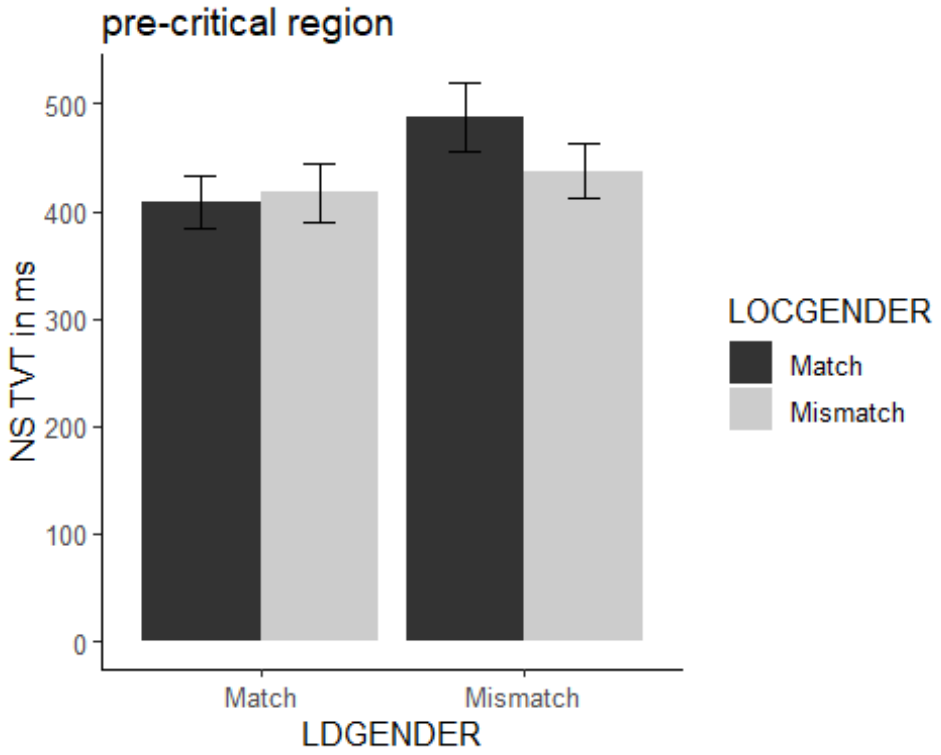
Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.004	0.023	-0.184	0.854
	Local NP gender	0.013	0.011	1.135	0.258
	LD NP gender	-0.041	0.012	-3.333	0.002 **
	Local NP gender * LD NP gender	-0.023	0.025	-0.918	0.363
Pronoun region	Intercept	-0.006	0.020	-0.309	0.758
	Local NP gender	0.004	0.014	0.292	0.772
	LD NP gender	-0.037	0.013	-2.907	0.005 **
	Local NP gender * LD NP gender	-0.022	0.026	-0.865	0.390
Spillover region	Intercept	0.004	0.030	0.143	0.887
	Local NP gender	0.000	0.012	0.011	0.991
	LD NP gender	-0.051	0.013	-3.993	0.000 ***
	Local NP gender * LD NP gender	0.012	0.023	0.548	0.586
Prefinal region	Intercept	-0.009	0.028	-0.306	0.761
	Local NP gender	-0.006	0.013	-0.493	0.626
	LD NP gender	-0.016	0.011	-1.383	0.172
	Local NP gender * LD NP gender	0.012	0.022	0.542	0.592

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

No reliable effects were found in rereading times in this region, but there was an effect of the LD antecedents in total viewing times. This reliable effect was attributed to the increased total viewing times of the LDMM condition where the LD antecedents were gender-mismatched but the local antecedents were gender-matched, as shown in Figure 5.19.

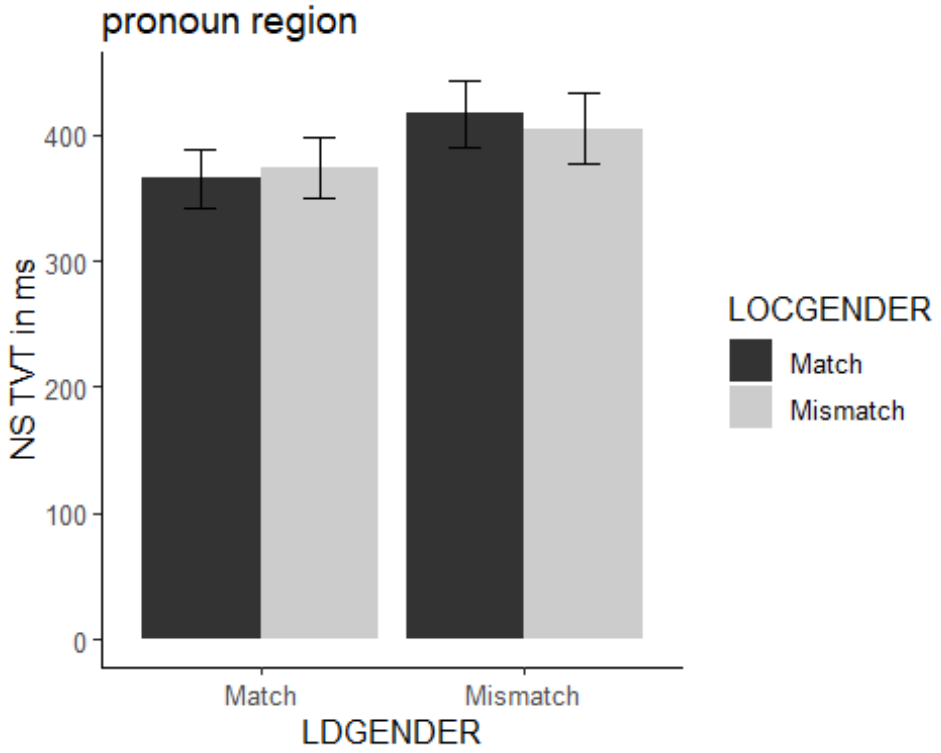
Figure 5.19. English native speakers' total viewing times of each condition in the pre-critical region of Experiment 6



Pronoun region

As in the pre-critical region, there was an effect of the LD antecedents in total viewing times in this region. As Figure 5.20 displays, the LD mismatch conditions (LDMM and DMM) showed longer total viewing times than the LD match conditions (DM and LMM). No effects were found in rereading times.

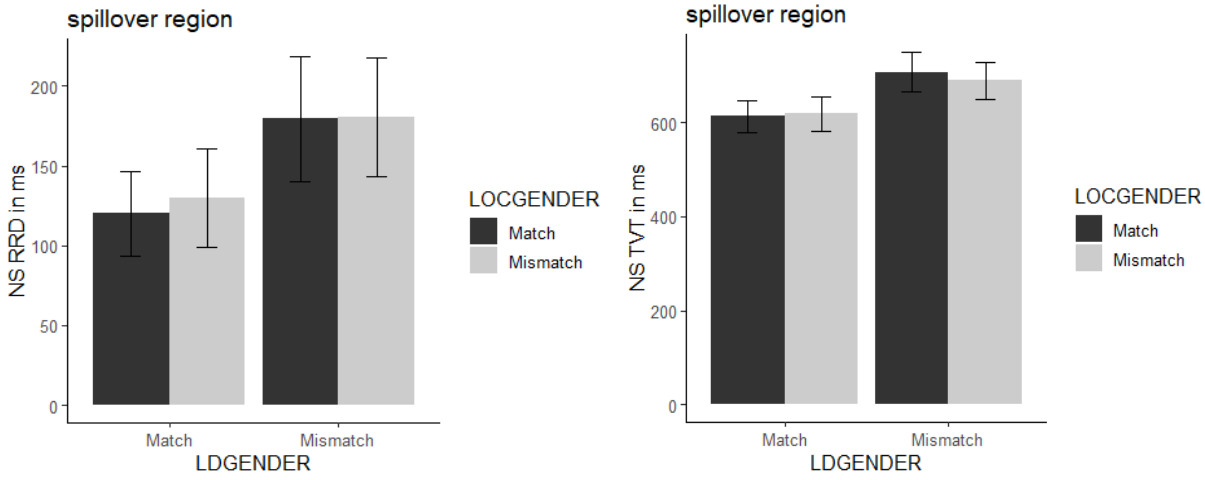
Figure 5.20. English native speakers' total viewing times of each condition in the pronoun region of Experiment 6



Spillover region

Reliable effects of the LD antecedents were found in both rereading times and total viewing times. Figure 5.21 shows that both rereading times and total viewing times were longer when the LD antecedents were gender-mismatched to the pronoun than when they were gender-matched.

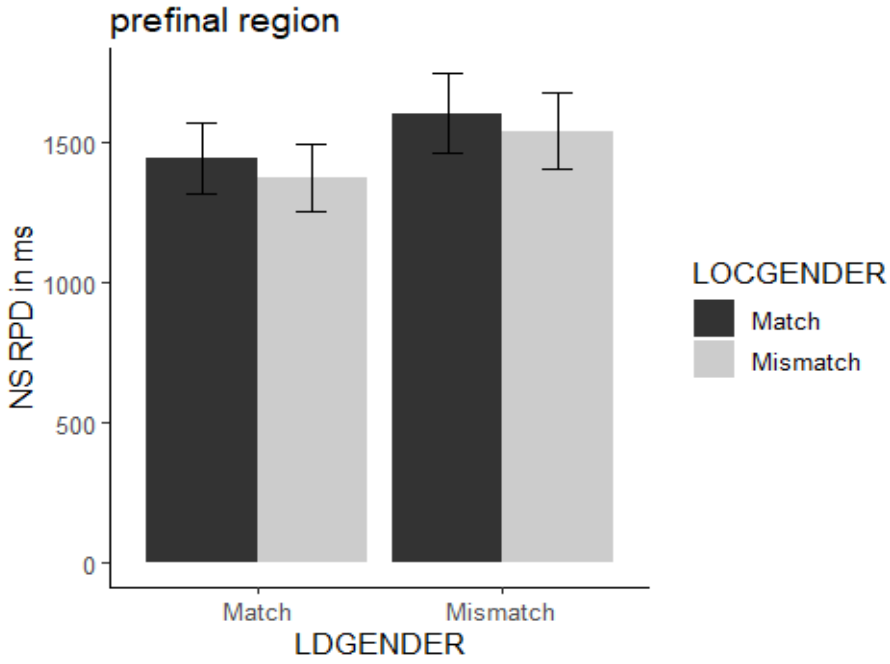
Figure 5.21. English native speakers' rereading times (left panel) and total viewing times (right panel) of each condition in the spillover region of Experiment 6



Prefinal region

There was a reliable effect of the LD antecedents in regression-path times in this region (see Figure 5.22), due to longer RTs of the LD mismatch conditions (LDMM and DMM) than the LD match conditions (DM and LMM). No other reliable effects were observed.

Figure 5.22. English native speakers' regression-path times of each condition in the prefinal region of Experiment 6



L2 LEARNERS

Early processing

A summary of the means of L2 learners' means for first fixation durations, first-pass times and regression times in the pre-critical, pronoun and spillover region is given in Table 5.58, and their statistical results are given in Table 5.59 (first fixation durations), Table 5.60 (first-pass times) and Table 5.61 (regression-path times).

Table 5.58. L2 learners' means (in milliseconds) and standard deviations for first fixation durations, first-pass times and regression-path times in each condition in the pre-critical, pronoun and spillover regions in Experiment 6

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
First fixation duration	253 (86)	255 (89)	252 (88)	259 (86)
First-pass time	406 (202)	415 (217)	409 (203)	404 (215)
Regression-path time	488 (286)	508 (324)	504 (310)	484 (284)
Pronoun region				
First fixation duration	233 (80)	239 (81)	235 (76)	231 (74)
First-pass time	299 (142)	315 (156)	317 (159)	321 (166)
Regression-path time	391 (233)	402 (253)	417 (268)	379 (215)
Spillover region				
First fixation duration	247 (79)	250 (79)	246 (76)	250 (79)
First-pass time	531 (307)	541 (304)	550 (312)	536 (299)
Regression-path time	719 (502)	751 (492)	809 (570)	803 (549)

Table 5.59. Summary of statistical analyses for L2 learners' first fixation durations in the pre-critical, pronoun and spillover regions of Experiment 6

First fixation duration					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.002	0.009	-0.225	0.823
	Local NP gender	-0.009	0.009	-1.087	0.280
	LD NP gender	-0.002	0.010	-0.180	0.859
	Local NP gender * LD NP gender	0.011	0.018	0.630	0.531
Pronoun region	Intercept	-0.000	0.011	-0.034	0.973
	Local NP gender	-0.001	0.009	-0.078	0.938
	LD NP gender	0.003	0.008	0.367	0.715
	Local NP gender * LD NP gender	-0.018	0.016	-1.115	0.269
Spillover region	Intercept	-0.000	0.009	-0.005	0.996
	Local NP gender	-0.010	0.008	-1.623	0.163
	LD NP gender	-0.003	0.008	-0.354	0.726
	Local NP gender * LD NP gender	0.015	0.015	1.047	0.299

Table 5.60. Summary of statistical analyses for L2 learners' first-pass times in the pre-critical, pronoun and spillover regions of Experiment 6

First-pass times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.010	0.020	-0.485	0.629
	Local NP gender	0.002	0.013	0.181	0.857
	LD NP gender	0.006	0.013	0.467	0.643
	Local NP gender * LD NP gender	-0.020	0.029	-0.678	0.503
Pronoun region	Intercept	-0.003	0.017	-0.184	0.854
	Local NP gender	-0.010	0.014	-0.700	0.489
	LD NP gender	-0.010	0.011	-0.893	0.382
	Local NP gender * LD NP gender	-0.015	0.023	-0.640	0.525
Spillover region	Intercept	0.002	0.022	0.100	0.920
	Local NP gender	-0.001	0.014	-0.069	0.946
	LD NP gender	-0.012	0.016	-0.803	0.427
	Local NP gender * LD NP gender	-0.003	0.025	-0.115	0.909

Table 5.61. Summary of statistical analyses for L2 learners' regression-path times in the pre-critical, pronoun and spillover regions of Experiment 6

Regression-path times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.013	0.024	-0.515	0.608
	Local NP gender	0.000	0.012	0.033	0.974
	LD NP gender	0.003	0.012	0.278	0.781
	Local NP gender * LD NP gender	-0.016	0.025	-0.639	0.526
Pronoun region	Intercept	-0.007	0.021	-0.334	0.739
	Local NP gender	0.007	0.017	0.448	0.657
	LD NP gender	0.002	0.014	0.146	0.885
	Local NP gender * LD NP gender	-0.029	0.024	-1.195	0.235
Spillover region	Intercept	0.001	0.029	0.016	0.987
	Local NP gender	-0.007	0.014	-0.518	0.607
	LD NP gender	-0.037	0.016	-2.354	0.025 *
	Local NP gender * LD NP gender	-0.015	0.026	-0.585	0.560

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Pre-critical region

There were no reliable effects in any of the early measures in this region.

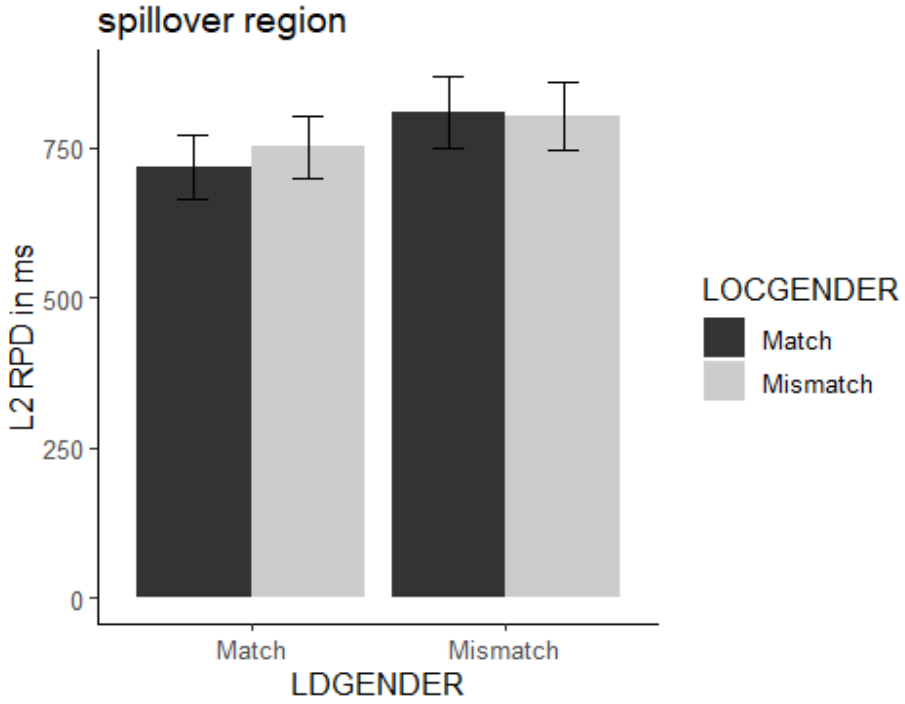
Pronoun region

As in the pre-critical region, no reliable effects were observed in any of the early measures in this region too.

Spillover region

No reliable effects were found in first fixation durations and first-pass times in this region. However, an effect of the LD antecedents was observed in regression-path times, due to the differences between the LD match conditions and the LD mismatch conditions (see Figure 5.23).

Figure 5.23. L2 learners' regression-path times of each condition in the spillover region of Experiment 6



Later processing

Table 5.62 provides a summary of L2 learners' means for the later measures. Their statistical results are given separately in Table 5.63 (first fixation durations in the prefinal region), Table 5.64 (rereading times in all regions) and Table 5.65 (total viewing times in all regions).

Table 5.62. L2 learners' means (in milliseconds) and standard deviations for reading measures indicating later processing in Experiment 6

	Condition			
	Double Match (DM)	Local Mismatch (LMM)	LD Mismatch (LDMM)	Double Mismatch (DMM)
Pre-critical region				
Rereading time	57 (189)	61 (227)	65 (223)	48 (173)
Total viewing time	639 (370)	634 (365)	682 (411)	679 (421)
Pronoun region				
Rereading time	63 (166)	68 (178)	86 (221)	47 (145)
Total viewing time	480 (296)	468 (276)	534 (355)	542 (359)
Spillover region				
Rereading time	133 (374)	163 (411)	221 (488)	214 (500)
Total viewing time	872 (547)	857 (513)	914 (565)	951 (587)
Prefinal region				
First fixation duration	241 (86)	237 (83)	243 (86)	238 (82)
First-pass time	500 (289)	486 (274)	503 (292)	500 (295)
Regression-path time	1715 (1445)	1559 (1291)	1872 (1734)	1913 (1735)
Rereading time	1193 (1447)	1044 (1270)	1325 (1666)	1349 (1645)
Total viewing time	658 (369)	647 (370)	670 (388)	675 (395)

Table 5.63. Summary of statistical analyses for L2 learners' first fixation durations, first-pass times and regression-path times in the prefinal region of Experiment 6

Prefinal region					
		Estimate	SE	*t*-value	*p*-value
First fixation durations	Intercept	0.000	0.009	0.048	0.962
	Local NP gender	0.008	0.008	0.920	0.360
	LD NP gender	-0.002	0.009	-0.185	0.854
	Local NP gender * LD NP gender	0.000	0.019	0.000	1.000
First-pass times	Intercept	-0.002	0.028	-0.057	0.954
	Local NP gender	0.007	0.014	0.522	0.605
	LD NP gender	-0.009	0.013	-0.681	0.499
	Local NP gender * LD NP gender	0.017	0.024	0.695	0.488
Regression-path times	Intercept	-0.002	0.042	-0.036	0.971
	Local NP gender	0.005	0.017	0.273	0.786
	LD NP gender	-0.038	0.017	-2.260	0.026 *
	Local NP gender * LD NP gender	0.058	0.035	1.662	0.104

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.64. Summary of statistical analyses for L2 learners' rereading times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 6

Rereading times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.001	0.030	-0.030	0.977
	Local NP gender	0.039	0.051	0.771	0.448
	LD NP gender	0.008	0.046	0.173	0.863
	Local NP gender * LD NP gender	0.016	0.105	0.149	0.883
Pronoun region	Intercept	0.000	0.040	0.001	0.999
	Local NP gender	0.081	0.055	1.468	0.146
	LD NP gender	0.036	0.054	0.661	0.511
	Local NP gender * LD NP gender	-0.149	0.109	-1.360	0.179
Spillover region	Intercept	-0.000	0.052	0.004	0.997
	Local NP gender	-0.014	0.065	-0.212	0.833
	LD NP gender	-0.158	0.066	-2.415	0.020 *
	Local NP gender * LD NP gender	-0.136	0.124	-1.102	0.273
Prefinal region	Intercept	0.010	0.130	0.074	0.942
	Local NP gender	-0.057	0.067	-0.852	0.399
	LD NP gender	-0.083	0.069	-1.208	0.232
	Local NP gender * LD NP gender	0.150	0.129	1.168	0.249

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

Table 5.65. Summary of statistical analyses for L2 learners' total viewing times in the pre-critical, pronoun, spillover and prefinal regions of Experiment 6

Total viewing times					
		Estimate	SE	*t*-value	*p*-value
Pre-critical region	Intercept	-0.003	0.028	-0.111	0.912
	Local NP gender	0.004	0.014	0.290	0.773
	LD NP gender	-0.018	0.013	-1.350	0.182
	Local NP gender * LD NP gender	-0.004	0.027	-0.163	0.871
Pronoun region	Intercept	-0.003	0.025	-0.111	0.912
	Local NP gender	0.005	0.016	0.306	0.762
	LD NP gender	-0.037	0.014	-2.578	0.013 *
	Local NP gender * LD NP gender	0.012	0.030	0.396	0.694
Spillover region	Intercept	0.001	0.031	0.044	0.965
	Local NP gender	-0.009	0.013	-0.692	0.494
	LD NP gender	-0.032	0.012	-2.606	0.011 *
	Local NP gender * LD NP gender	0.024	0.025	0.945	0.349
Prefinal region	Intercept	-0.003	0.031	-0.099	0.922
	Local NP gender	0.008	0.013	0.637	0.527
	LD NP gender	-0.012	0.013	-0.898	0.376
	Local NP gender * LD NP gender	0.028	0.024	1.133	0.265

* The number of asterisks besides the *p*-value indicates the level of significance at .001***, .01**, .05*, and .1†.

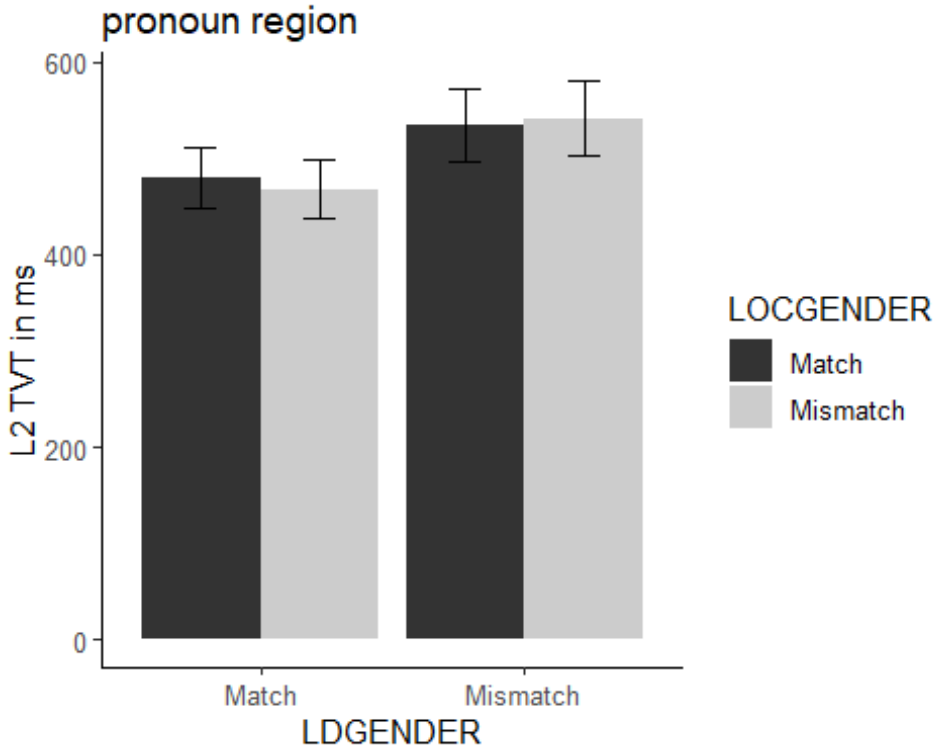
Pre-critical region

No reliable effects were found in rereading times and total viewing times in this region.

Pronoun region

As Figure 5.24 shows, there was an effect of the LD antecedents in total viewing times. This was due to the increased RTs of the LD mismatch conditions (LDMM and DMM) compared to those of the LD match conditions (DM and LMM). No differences among conditions were found in rereading times in this region.

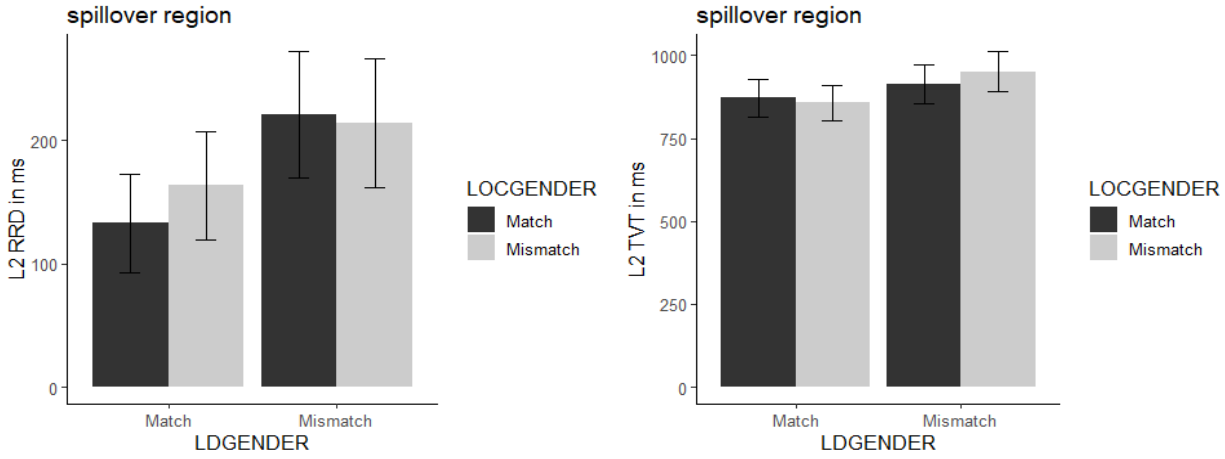
Figure 5.24. L2 learners' total viewing times of each condition in the pronoun region of Experiment 6



Spillover region

Both rereading times and total viewing times showed reliable effects of the LD antecedents in this region, as displayed in Figure 5.25. The RTs of the LD mismatch conditions were longer than those of the LD match conditions in both rereading times and total viewing times.

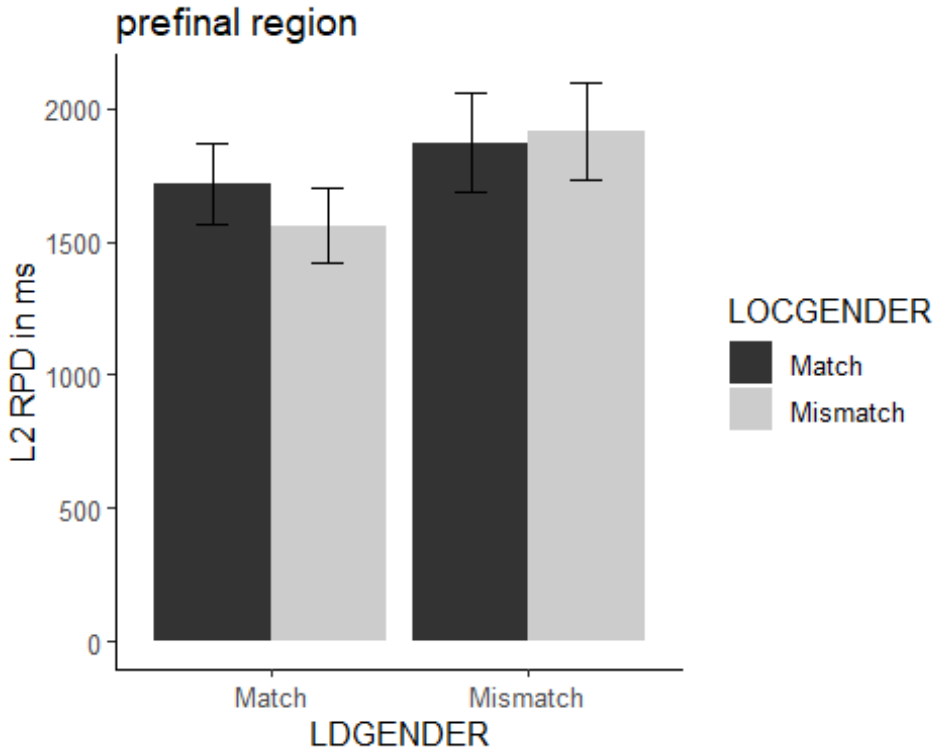
Figure 5.25. L2 learners' rereading times (left panel) and total viewing times (right panel) of each condition in the spillover region of Experiment 6



Pre-final region

As in the other regions, a reliable effect of the LD antecedents was observed in this region: regression-path times of the LDMM and the DMM conditions were longer than those of the DM and the LMM conditions, as Figure 5.26 shows. No reliable effects were found in other measures in this region.

Figure 5.26. L2 learners' regression-path times of each condition in the prefinal region of Experiment 6



5.2.3.4.Summary of results from Experiment 6

NATIVE SPEAKERS

Results of the early measures showed that there was one reliable effect of the LD antecedents in the spillover region. Regression-path times of the LD mismatch conditions were longer than those of the LD match conditions. No evidence for the effect of the local antecedents was found in the measures indexing the early processing. This suggests that the native speakers of English applied Pr B early while they processed the bound variable interpretation of a pronoun, as they did during their processing of a pronoun with a referential antecedent.

Results of the later measures showed the effect of the LD antecedents was continued until later. Total viewing times in the pre-critical, pronoun and spillover region as well as rereading

times in the spillover and prefinal region were longer when the gender of the LD antecedents did not match to the pronoun's gender than when it did. There were not any effects indexing interference from the local antecedents, which means that the native speakers considered only the LD antecedents even at the later processing stages.

To summarize, the results of the native speakers showed that they applied Pr B quickly after they read the pronoun and only the antecedents compatible to Pr B was considered afterwards. This shows that only the LD antecedents were activated during the antecedent search process and affected the native speakers' processing at all stages. The results therefore support the predictions made under the *BAIF hypothesis*, replicating the robust findings in L1-English pronoun processing literature. Table 5.66 summarizes the results of the native speakers. They are discussed further in 5.2.4 with the results of Experiment 5.

Table 5.66. Summary of English native speakers' statistically significant results from Experiment 6

Processing timing	Region of interest	Reading measure	Result
Early	Spillover region	Regression-path time	LDMM, DMM > DM, LMM
Late	Pre-critical region	Total viewing time	LDMM, DMM > DM, LMM
	Pronoun region		LDMM, DMM > DM, LMM
	Spillover region		LDMM, DMM > DM, LMM
	Spillover region	Rereading time	LDMM, DMM > DM, LMM
	Prefinal region		LDMM, DMM > DM, LMM

L2 LEARNERS

Results of the early measures in L2 learners' data were in line with those in native speakers' data. One reliable effect of the LD antecedents was observed in regression-path times in the spillover region. That is, regression-path times were shorter when the gender of the LD antecedents matched to the pronoun's gender than when it did not. This suggests that the L2

learners, just like the native speakers, were able to apply Pr B at the initial stages of English pronoun processing. This, however, was different from how they processed the pronoun with the referential antecedents, because when the antecedents were referential NPs, they considered the local antecedents as well as the LD antecedents in their early processing.

L2 learners' results of the later measures were identical to the native speakers' results. The results showed that the main effect of the LD antecedents' gender was found in the measures indexing the later processing. Regression-path times in the prefinal region, rereading times in the spillover region and total viewing times in the pronoun and spillover region were shorter in the LD match conditions (DM and LMM) than in the LD mismatch conditions (LDMM and DMM). However, there was no indication of the interference from the local antecedents. This suggests that only the LD antecedents were considered at later processing stages too.

In sum, the results showed that Pr B was utilized as an initial filter in L2 leaners' processing of the bound variable construal of an English pronoun and hence only the LD antecedents were visible to the parser until the meaning of the pronoun was finally resolved. This is not compatible to H4, which hypothesizes the existence of the transfer effect from Korean, because there is no indication that both LD and local antecedents are considered during their later parsing stages of processing as found in Experiment 4. Instead, the results are parallel to how the native speakers processed the bound variable interpretation of the pronoun, supporting the *BAIF hypothesis*. A summary of L2 learners' results is presented in Table 5.67, and the further discussion of them is provided in 5.2.4 when I revisit H4 together with the results of Experiment 5.

Table 5.67. Summary of L2 learners' statistically significant results from Experiment 6

Processing timing	Region of interest	Reading measure	Result
Early	Spillover region	Regression-path time	LDMM, DMM > DM, LMM
Late	Pronoun region	Total viewing time	LDMM, DMM > DM, LMM
	Spillover region		LDMM, DMM > DM, LMM
	Spillover region	Rereading time	LDMM, DMM > DM, LMM
	Prefinal region		LDMM, DMM > DM, LMM

5.2.4. Discussion of results from Experiment 5 and 6

The aim of Experiment 5 and 6 was to investigate whether the processing strategy engaged during Korean overt pronoun processing can influence how L1-Korean learners of English process English pronouns. It was hypothesized that L1-Korean L2-English learners will transfer their processing preferences of overt pronouns from Korean to English. This was based on the claim that a primary obstacle to the second language learning is the involvement of the pre-existing strategy for their native language comprehension during their non-native language parsing (Jegerskiy, VanPatten, & Keating, 2011; Sorace, 2006). If this hypothesis is correct, L1-Korean L2-English learners would process English pronouns more like the way they process Korean pronouns than like how the native speakers of English process English pronouns. In other words, they would consider both LD and local antecedents at the later stages of the antecedent search process, rather than considering the LD antecedents through the early application of Pr B at the initial stages.

The results of Experiment 5, where the English pronoun processing with the referential antecedent was examined, provided evidence suggesting the presence of an L1 transfer effect. In Experiment 5, the results of the native speakers showed a reliable effect of the LD antecedents, but not the effect of the local antecedents, in regression-path times in the spillover region. This suggests that the native speakers of English did not consider the local antecedents at the early

stages of processing because the local antecedents were filtered out by the early application of Pr B. However, at the later stages of processing, the effects of both LD and local antecedents were observed: first-pass times and total viewing times in the prefinal region were longer with the double match/mismatch conditions than with the single match conditions. This suggests that the native speakers considered the local antecedents as well as the LD antecedents at the later processing stages before they made final decision on how to interpret the pronoun. The findings of the native speakers therefore support the predictions of the *BADF hypothesis*. The results of the L2 learners were different from those of the native speakers: there was lack of evidence showing their early application of Pr B. The effects of the local antecedents as well as the LD antecedents were found in the early measures. For example, regression-path times in the pronoun and spillover region were longer in the LD mismatch conditions than in the LD match conditions, but at the same time, first-pass times in the pre-critical region were longer when the local antecedents were gender-matched to the pronoun than when they were not. This suggests that they considered both LD and local antecedents at the initial processing stages. The activation of the two antecedents were continued until they finally interpreted the pronoun. Such results of the L2 learners were not completely in line with their processing pattern of the Korean overt pronoun. However, they were similar in that both LD and local antecedents were activated during the antecedent search process, although the time-course activation of the two antecedents differed in Korean and English. Based on the similarity, the current results can suggest that there may be an L1-transfer in their pronoun processing patterns at least for the L2 learners whose native language was Korean. In future research, to address the L1-transfer effect more accurately, one more L2 group, whose pronoun processing pattern in their native language has

different characteristics from Korean pronoun processing pattern, will be added and their English pronoun processing patterns will be compared to each other.

The results of Experiment 6, where the English pronoun processing with the quantificational antecedent was examined, were incompatible with H4, unlike the results of Experiment 5. The results of the L2 learners in Experiment 6 did not show that they considered both LD and local antecedents during their antecedent search process of the bound variable construal of the English pronoun. If their English pronoun processing was affected by their processing pattern of the bound variable construal of Korean overt pronoun, the L2 learners should have considered the local antecedents as well as the LD antecedents as found in Experiment 4. Instead, they considered only the LD antecedents during parsing and this was observed with both early and later measures. This was parallel to the results of the native speakers in Experiment 6, who applied Pr B early in their processing and no interference from the local antecedents was observed in their subsequent processes, supporting the *BAIF hypothesis*.

There are some interesting findings in Experiment 5 and 6 that need further discussion. The results of the native speakers suggest that there may be a referential/quantification asymmetry for the pronoun processing. Studies in L1 acquisition have reported that there is a referential/quantificational asymmetry for the pronoun interpretation (e.g., Chien & Wexler, 1990; Elbourne, 2005). That is, children have difficulty in rejecting the local antecedents for the pronouns when the antecedents are referential NPs but not when the antecedents are quantificational NPs. However, it has not been investigated whether this asymmetry can be observed even in the pronoun processing in terms of how Pr B is applied online. There are studies testing the relative timing of syntactically-mediated variable binding and discourse-based

coreference assignment during pronoun resolution and hence they focused on whether variable binding is computed before coreference assignment (Cunnings, Patterson, & Felser, 2014; Koornneef, 2008), but they did not compare the role of Pr B during parsing in two different licensing mechanisms. The current results can contribute to this missing piece.

The results of Experiment 5 showed that Pr B acts as an early but defeasible filter during the native speakers' resolution of pronouns, such that Pr B-incompatible antecedents could play a role in later processing stages, when the antecedents are referential NPs. On the other hand, the results of Experiment 6 showed that Pr B acts as a filter that restricts memory retrieval only to the LD antecedents at all stages of processing when the antecedents are quantificational. The reason for this asymmetry can be found in two different licensing mechanisms. Since the referential antecedent can be licensed via both variable binding and coreference assignment, there is possibility for the local antecedents to be considered at later processing stages. However, there is no such possibility with the quantificational antecedent because the coreferential reading is not available. This may provide a way to account for why the L1 transfer effect was found with the referential antecedent but not with the quantificational antecedent. For the case where only the bound variable reading is possible, it might be easier for the L2 learners to consider only the Pr B-compatible antecedents. This is because they know that the local antecedent cannot be rescued using coreference assignment mechanism and thus they focus on the application of Pr B. However, when both bound variable and coreferential reading are available, they know that they need to consider both syntax and discourse during pronoun resolution. Integrating syntax and discourse raises L2 learners' processing difficulty and the increased difficulty consequentially makes the L2 learners rely more on how they process the pronoun in their native language.

Alternatively, the lack of suggestive evidence for the L1-transfer effect in Experiment 6 may be relevant to what was found with the Korean overt pronoun with the quantificational antecedents. As discussed earlier, it is possible that the current design of Experiment 4 has not captured the nature of overt pronoun processing with the quantificational antecedent in Korean properly. Therefore, future research with an updated experimental design will be required to find out the correct nature the pronoun processing with the quantificational antecedent in Korean, and comparison of its results with the current results from Experiment 6 will provide more accurate implications about the L1-transfer effect.

5.3. Conclusion

The objectives of Experiments 3 through 6 were to explore how the overt 3rd person pronouns are processed in Korean by native speakers of Korean and the possible L1-transfer effect in L1-Korean L2-English learners' processing of English pronouns. The results of Experiments 3 and 4 show that the overt pronoun in Korean is not fully constrained by Pr B during parsing and as a result, both Pr B-compatible and -incompatible antecedents are activated during the antecedent search process. Furthermore, the results show that the parser does not establish the referential dependencies between the pronoun and the two antecedents immediately. This suggests that the availability of the coreferential reading affects their processing of an overt pronoun in Korean but its effect is not observed immediately after the parser encounters the pronoun. Therefore, the results partially support the *coreferential reading effect hypothesis*, which predicts the activation of both LD and local antecedents from the initial parsing stages. One puzzling finding that requires further research is how the Korean speakers parse the overt pronoun with the quantificational antecedents. Because only the bound variable reading of the

pronoun is available with the quantificational antecedents, it was expected to find the referential/quantification asymmetry with respect to the application of Pr B during parsing. That is, we expected to see that the parser considers only the Pr B-compatible antecedents in the process of the pronoun's dependency formation. This was not borne out, and the reason for this unexpected finding is unclear. It may be related to the current design where the *wh*-phrase was used as one of the antecedents and its function may be different from what we expect to be. It is also possible that the finding is attributed to the status of *ku* as a demonstrative combined with a DP. Future research should address these issues.

The results of Experiments 5 and 6 show that L1-Korean L2-English learners' English pronoun processing pattern differs from how the native speakers of English process the English pronoun when the antecedents are referential NPs. The native speakers consider only the Pr B-compatible antecedents at the early stages of parsing and expanded their search limit to the Pr B-incompatible antecedents, as predicted by the *BADF hypothesis*. However, the L2 learners considered both Pr B-compatible and -incompatible antecedents at all stages of processing. This is parallel to their Korean overt pronoun processing pattern except when the dependencies between the pronoun and the antecedents are formed. On the contrary, when the antecedents are quantificational, no difference is observed between the L2 learners and the native speakers. Both groups show evidence for the early application of Pr B immediately after encountering the pronoun and hence only the Pr B-compatible antecedents are considered during parsing, which is consistent with the prediction of the *BAIF hypothesis*. Based on these results, we claim that L1-Korean L2-English learners' Korean overt pronoun processing pattern may have affected how they parsed English pronoun when it co-occurs with the referential antecedents but not with the quantificational antecedents. This seems to be attributed to the increased processing load in

parsing the sentence with the referential antecedents due to the availability of the coreferential reading.

CHAPTER 6: CONCLUSION

6.1. Motivation of the study and summary of the findings

The present dissertation aimed to seek answers to three questions, which can ultimately help understand human language system, in the domain of pronoun resolution. The first question was how the overt 3rd person pronouns in Korean, *ku* 'he/him' and *kunye* 'she/her', are interpreted and how their interpretations can be explained under the linguistic theory. The second question was how the overt 3rd person pronouns in Korean are processed focusing on the role of Pr B during parsing. The last question concerns how the properties of overt pronouns in Korean affect Korean-speaking English-learners' interpretation and processing of English pronouns. Six experiments – two offline experiments and four eye-movement monitoring experiments – were conducted to address these questions. In this last chapter, the major findings of each experiments are presented and discussed in terms of issues related to the questions.

In Experiment 1, two offline tasks were conducted to investigate the interpretations assigned to the overt pronouns in Korean, focusing on how they can be explained under Reinhart's framework. We created two contrasting hypotheses. First was that the overt pronoun in Korean have both bound variable and coreferential readings but Rule I does not apply. Second was that the overt pronoun in Korean does not have bound variable readings and therefore Rule I is irrelevant. The results of Korean TVJT provided evidence for the first hypothesis such that both bound variable and coreferential readings are available with *kunye* and the bound variable construal of *kunye* is subject to Pr B but Rule I is inoperative. That is, Korean speakers allowed *kunye* with the local referential antecedents but not with the local quantificational antecedents. The results of Korean SIT showed that the coreferential reading is primary and preferred to the bound variable reading when *kunye* takes a LD antecedent. However, there were some puzzling

findings that can hardly be explained. The local quantificational NPs, which were expected to be rejected as antecedents of *kunye*, were allowed to some degree. This raises the question about the status of *kunye* – if *kunye* is the actual counterpart of English pronouns. The answer to this question is negative given that there were some instances of the apparent Pr B violation even with the bound variable reading of *kunye*. Following previous studies claiming its special status, we claimed that *ku*/*kunye* can have a structure of a demonstrative combined with a DP. However, we believe that *ku/kunye* can also have a pronominal status based on the findings that the Korean speakers tended to reject *kunye* construed as the local quantificational antecedents. Taken together, we concluded that the two contrasting grammars are available with *ku/kunye* and there may be two groups of speakers who have one grammar over the other, as suggested in Han, Lidz and Musolino (2007).

Experiments 3 and 4 employed an eye movement monitoring task to examine the way Korean speakers apply Pr B when processing an overt pronoun in Korean under a more natural reading situation. We hypothesized that Pr B constrains the antecedent retrieval process of the overt pronoun in Korean but Pr B-incompatible antecedents are additionally available during parsing due to the suspension of Rule I. This hypothesis gives rise to two specific predictions. We expected to see that the parser is considering both LD and local antecedents when the antecedents are referential NPs. On the contrary, only the LD antecedents was expected to be accessible to the parser when the antecedents are quantificational or *wh*-phrase (i.e., when only the bound variable reading of *kunye* would be allowed). The results showed that the parser constructed anaphoric dependencies of *kunye* with both LD and local referential antecedents. However, the parser did not immediately form the dependencies, but the dependency formation was delayed until later. The results also showed that the parser did not distinguish the antecedent

type, meaning that the same pattern was found with the quantificational antecedents. The results suggest that structure building in Korean may be delayed until a clause-final verb is reached as claimed in the *head-driven model* (Pritchett, 1992). However, this may not be the case, given that a number of studies showed that the parsing in Korean can be incremental (Koh, 1997; Kwon & Sturt, 2013). The results also showed that the referential/quantification asymmetry was not reflected in the processing of *kunye*. This may be related to the status of *kunye* which is different from the typical usages of non-emphatic pronouns in English.

Lastly, Experiments 2, 5 and 6 investigated how L1-Korean L2-English learners interpreted/processed English pronouns, focusing on whether the properties of Korean overt pronouns can have impact on their English pronoun interpretation/processing. The experimental designs were parallel to the ones testing Korean. Two offline tasks testing English were conducted in Experiment 2, and an online English reading task where their eye movements were monitored was employed in Experiments 5 and 6. The hypothesis was that L1-Korean L2-English learners' interpretation/processing of English pronouns will be affected by how they interpreted/processed the overt pronoun in Korean. The results of Experiment 2 showed that there was similarity between how they interpreted pronouns in English and in Korean. They did not reject the construal of the English pronoun as the local referential antecedent, as they did with *kunye*. In their judgments of *kunye*, the coreference assignment was used primarily and thus they allowed *kunye* with the local referential antecedents. It appears that their primary use of the coreferential reading in Korean may be at work even when they interpret English pronouns. Consequentially, they were more likely to allow the English pronoun with the clause-mate referential antecedent unlike native speakers of English.

The results of Experiments 5 and 6 showed that their processing pattern of *him/her* was different from that of the native speakers of English but resembled how they processed *kunye*, when the antecedents were referential NPs but not when they were quantificational. In other words, the L2 learners were establishing dependencies of the English pronouns with both LD and local referential antecedents immediately after they encountered the pronouns, while the native speakers were considering the dependency only with the LD antecedents. The L2 learners' processing pattern in English was not perfectly parallel to their processing pattern in Korean, because they differed in when the two antecedents were activated during parsing, but they were similar in that both LD and local referential antecedents were activated during the search. For the quantificational antecedents, however, both L2 learners and native speakers of English considered the LD antecedents from the initial parsing stages.

The results provided contrasting evidence regarding the role of L1 during pronoun processing. The L2 learners' English pronoun processing pattern appears to be affected by their Korean processing pattern with the referential antecedents but not with the quantificational antecedents. This may be due to the different role of Pr B with referential vs. quantificational antecedents. When only the bound variable reading is possible (i.e., the pronoun construed as the quantificational antecedent), it might be easier for the L2 learners to apply Pr B. It is because only Pr B is relevant to account for the bound variable reading. However, when both bound variable and coreferential readings are possible (i.e., the pronoun construed as the referential antecedent), there are other things to consider such as Pr B, Rule I, discoursal/contextual cues. This will increase the processing difficulty and the increased difficulty can make the L2 learners rely on their L1. Alternatively, the lack of suggestive evidence for the L1-transfer effect with the quantificational antecedents may be related to how the Korean overt pronoun with the

quantificational antecedent is processed. As discussed earlier, we did not find why Pr B does not fully constrain the processing of *kunye* with the quantificational antecedent. It may be the case that the quantificational antecedents that we tested in Korean do not exclude the availability of the coreferential reading and therefore the experimental items in Korean are not comparable to those in English.

To conclude, the results of this dissertation provide some important implications for multiple issues including the status of Korean overt pronoun, the processing pattern of Korean overt pronoun in relation to the general parsing model, and L1-transfer effect in L2 acquisition/processing. This dissertation offers evidence that the two analyses are available with the Korean overt pronoun – one as a pronoun and the other as a DP (a demonstrative + an NP [+human, (+feminine)]. With regard to the general parsing model, the results provide evidence towards the *head-driven model* where the parser waits to build the structure until it encounters the head of the clause. Lastly, the results suggest that there may be L1-transfer effect in pronoun interpretation/processing but a different research design would be necessary to confirm it.

6.2. Limitations and directions for the further study

There are some limitations for the present dissertation, as most of the empirical experimental studies have their own limitations. First of all, the acceptance rates in Korean TVJT rarely went above 80% for any condition. This was surprising because we expected to see their acceptance to be at ceiling at least for *kunye* with the LD antecedents. It is not clear why such results were obtained, but it was proposed that the infrequent use of *kunye* in daily conversation could have affected their judgments. However, there was no independent evidence to support this claim. In order to explore it, we need to test other anaphoric expressions like a reflexive *caki* 'self' or a

null pronoun *pro* and compare their acceptance rates with those of *kunye*. Their distributions are similar to *kunye* such that they are construed as LD antecedents, but they are more frequently used in colloquial speech. Therefore, the comparison of their results with the results of *kunye* will inform us if the infrequent use of *kunye* is indeed the reason for the degraded judgments. Moreover, the comparison of the three anaphors will advance our understanding of the division of labor in Korean binding system.

There were also unexpected results from Experiments 3 and 4 where Korean speakers' processing of *kunye* with different types of antecedents was investigated. It was predicted that both LD and local antecedents would be accessible for the referential antecedents, but for the quantificational antecedents, only the LD antecedents would. This prediction was based on the previous findings that the quantificational antecedents are more sensitive to syntactic constraints than the referential antecedents during parsing, which is also reported in the present experiments testing English pronoun processing. Unlike this prediction, the results showed that Korean speakers considered both LD and local antecedents during the antecedent retrieval of *kunye*, regardless of whether the antecedent is referential or quantificational. It is not clear why such results were found, but the answer may be found with the experimental items. In Experiment 3, the two antecedents were the same as names. However, in Experiment 4, the two antecedents were not exactly the same: the first antecedent was a quantificational NP (*enu* 'every' + NP) and the other was a *wh*-phrase (*etten* 'which' + NP). Just like in English, *etten* 'which' can easily be D-linked (discourse linked), that implies the existence of a set of entities, and *etten* can also be construed as an indefinite 'some'. It is uncertain whether such properties of *etten* have affected the current results, but the results might have been different if the second antecedent did not have

etten. This possibility will be explored in the future study by including the experimental sentence with the antecedents using the same quantifier like "every girl said that every woman …".

One of the main objectives of this dissertation was to address the L1-transfer effect in pronoun interpretation and processing. The results of Experiments 2 suggested that L1-Korean L2-English learners' interpretation of English pronouns may be affected by their interpretation of Korean overt pronouns, because they had problems in rejecting the local referential NP as the antecedent of the English pronoun as well as the Korean overt pronoun. The results of Experiment 5 also suggested that their processing of English pronoun with the referential antecedents may have been affected by the way how they processed the overt pronoun in Korean since both LD and local antecedents were considered during parsing in English, like in Korean. Although the presence of L1-transfer effect was suggested based on the similarities between their pronoun interpretation/processing in Korean and in English, there may not be the transfer effect from their L1 at all. It is because the similarities between the two do not necessarily mean that the properties of the Korean overt pronoun influence how they interpret/process the English pronoun. The effect will be addressed better in a different research design that is frequently used to assess the L1-transfer effect. We will need an additional L2 group whose pronouns in their L1 do not work the same way as in Korean overt pronouns and compare their English pronoun interpretation/processing with the results of L1-Korean L2-English group. If the two groups' performance diverges, we can claim for the L1 effect but otherwise, we may need to find other ways to interpret the results.

Related to this issue, another thing needs to be discussed. In this dissertation, the source of transfer was assumed to be the overt pronouns in Korean. It was because we assumed that the overt pronoun is what native speakers of Korean identify as the Korean counterpart of the

English pronoun. However, this may not be the case since there are other anaphoric expressions available in Korean. They may find the Korean counterpart to be the null pronoun or the long-distance reflexive *caki*, because both of them have the similar distribution to the English pronoun. Therefore, to address the L1-transfer better in pronoun interpretation/processing with L1-Korean L2-English learners, we will need to expand our investigation to these other anaphoric expressions.

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APPENDIX A. ITEMS FOR EXPERIMENTS 1 AND 2

1. Truth Value Judgment Task in Experiment 1 (Korean TVJT)

Only the sentences used as target sentences are presented.

Referential antecedents/ local binding interpretation

어느 아이나 신혜가 그녀를 대단하다고 여겼다고 말했다.

어느 선생님이나 지선이가 그녀를 소개했다고 말했다.

어느 모델 친구나 예원이가 그녀를 예쁘게 꾸몄다고 말했다.

어느 여비서나 채연이가 그녀를 깎아내렸다고 들었다.

어느 간호사나 주희가 그녀를 힘들게 했다고 말했다.

어느 여배우나 지현이가 그녀를 위로했다고 말했다.

어느 친구나 효주가 그녀를 자랑했다고 들었다.

어느 여직원이나 사랑이가 그녀를 과대평가했다고 말했다.

어느 여학생이나 지수가 그녀를 스케치했다고 말했다.

어느 여성 회원이나 원희가 그녀를 기만했다고 들었다.

어느 안무가나 지은이가 그녀를 잘 표현한다고 들었다.

어느 이모나 서영이가 새 카메라로 그녀를 잘 찍었다고 말했다.

어느 여자 상무님이나 하선이가 그녀를 책임자로 추천했다고 들었다.

어느 아줌마나 유리가 큰 우산으로 그녀를 가렸다고 들었다.

어느 선수나 다미가 그녀를 과신했다고 들었다.

어느 코디나 효리가 책에 그녀를 자세히 묘사했다고 들었다.

Quantificational antecedents/ local binding interpretation

신혜가 어느 아이나 그녀를 대단하다고 여겼다고 말했다.

지선이가 어느 선생님이나 그녀를 소개했다고 말했다.

예원이가 어느 모델 친구나 그녀를 예쁘게 꾸몄다고 말했다.

채연이가 어느 여비서나 그녀를 깎아내렸다고 들었다.

주희가 어느 간호사나 그녀를 힘들게 했다고 말했다.

지현이가 어느 여배우나 그녀를 위로했다고 말했다.

효주가 어느 친구나 그녀를 자랑했다고 들었다.

사랑이가 어느 여직원이나 그녀를 과대평가했다고 말했다.

지수가 어느 여학생이나 그녀를 스케치했다고 말했다.

원희가 어느 여성 회원이나 그녀를 기만했다고 들었다.

지은이가 어느 안무가나 그녀를 잘 표현한다고 들었다.

서영이가 어느 이모나 새 카메라로 그녀를 잘 찍었다고 말했다.

하선이가 어느 여자 상무님이나 그녀를 책임자로 추천했다고 들었다.

유리가 어느 아줌마나 큰 우산으로 그녀를 가렸다고 들었다.

다미가 어느 선수가 그녀를 과신했다고 들었다.

효리가 어느 코디나 책에 그녀를 자세히 묘사했다고 들었다.

Referential antecedents/ LD binding interpretation

신혜가 어느 아이나 그녀를 대단하다고 여겼다고 말했다.

지선이가 어느 선생님이나 그녀를 소개했다고 말했다.

예원이가 어느 모델 친구나 그녀를 예쁘게 꾸몄다고 말했다.

채연이가 어느 여비서나 그녀를 깎아내렸다고 들었다.

주희가 어느 간호사나 그녀를 힘들게 했다고 말했다.

지현이가 어느 여배우나 그녀를 위로했다고 말했다.

효주가 어느 친구나 그녀를 자랑했다고 들었다.

사랑이가 어느 여직원이나 그녀를 과대평가했다고 말했다.

지수가 어느 여학생이나 그녀를 스케치했다고 말했다.

원희가 어느 여성 회원이나 그녀를 기만했다고 들었다.

지은이가 어느 안무가나 그녀를 잘 표현한다고 들었다.

서영이가 어느 이모나 새 카메라로 그녀를 잘 찍었다고 말했다.

하선이가 어느 여자 상무님이나 그녀를 책임자로 추천했다고 들었다.

유리가 어느 아줌마나 큰 우산으로 그녀를 가렸다고 들었다.

다미가 어느 선수가 그녀를 과신했다고 들었다.

효리가 어느 코디나 책에 그녀를 자세히 묘사했다고 들었다.

Quantificational antecedents/ LD binding interpretation

어느 아이나 신혜가 그녀를 대단하다고 여겼다고 말했다.

어느 선생님이나 지선이가 그녀를 소개했다고 말했다.

어느 모델 친구나 예원이가 그녀를 예쁘게 꾸몄다고 말했다.

어느 여비서나 채연이가 그녀를 깎아내렸다고 들었다.

어느 간호사나 주희가 그녀를 힘들게 했다고 말했다.

어느 여배우나 지현이가 그녀를 위로했다고 말했다.

어느 친구나 효주가 그녀를 자랑했다고 들었다.

어느 여직원이나 사랑이가 그녀를 과대평가했다고 말했다.

어느 여학생이나 지수가 그녀를 스케치했다고 말했다.

어느 여성 회원이나 원희가 그녀를 기만했다고 들었다.

어느 안무가나 지은이가 그녀를 잘 표현한다고 들었다.

어느 이모나 서영이가 새 카메라로 그녀를 잘 찍었다고 말했다.

어느 여자 상무님이나 하선이가 그녀를 책임자로 추천했다고 들었다.

어느 아줌마나 유리가 큰 우산으로 그녀를 가렸다고 들었다.

어느 선수나 다미가 그녀를 과신했다고 들었다.

어느 코디나 효리가 책에 그녀를 자세히 묘사했다고 들었다.

2. Sentence Interpretation Task in Experiment 1 (Korean SIT)

Pronouns with local antecedents

나는 선아가 그녀를 칭찬했다고 들었다. 나는 주리도 그랬다고 들었다.

나는 유리가 실수로 그녀를 바늘로 찔렀다고 말했다. 나는 혜리도 그랬다고 말했다.

나는 수아가 담요로 그녀를 감쌌다고 말했다. 나는 민주도 그랬다고 말했다.

나는 혜진이가 마음속으로 그녀를 응원했다고 생각한다. 나는 윤주도 그랬다고 생각한다.

나는 윤영이가 그녀를 원망했다고 들었다. 나는 진희도 그랬다고 들었다.

나는 은경이가 그녀를 과소평가하고 있다고 생각한다. 나는 윤희도 그렇다고 생각한다.

나는 예지가 꿈 속에서 그녀를 죽였다고 들었다. 나는 연수도 그랬다고 들었다.

나는 은미가 그녀를 변화시키려고 노력하고 있다고 말했다. 나는 혜정이도 그렇다고 말했다.

나는 효연이가 그녀를 조각했다고 생각한다. 나는 보아도 그랬다고 생각한다.

나는 연아가 그녀를 속였다고 생각한다. 나는 연재도 그랬다고 생각한다.

나는 태연이가 노래로 그녀를 만족시켰다고 생각한다. 나는 지영이도 그랬다고 생각한다.

나는 수영이가 그녀를 너무 자랑스러워했다고 말했다. 나는 효진이도 그랬다고 말했다.

나는 선영이가 그녀를 분장했다고 말했다. 나는 인영이도 그랬다고 말했다.

나는 진실이가 있지도 않은 일로 그녀를 괴롭혔다고 말했다. 나는 다빈이도 그랬다고 말했다.

나는 주희가 호신용 스프레이로 그녀를 보호했다고 말했다. 나는 가연이도 그랬다고 말했다.

나는 혜연이가 그녀를 상처주고 있다고 생각한다. 나는 나영이도 그렇다고 생각한다.

Pronouns with LD antecedents

선아는 내가 그녀를 칭찬했다고 들었다. 주리도 내가 그랬다고 들었다.

유리는 내가 실수로 그녀를 바늘로 찔렀다고 말했다. 혜리도 내가 그랬다고 말했다.

수아는 내가 담요로 그녀를 감쌌다고 말했다. 민주도 내가 그랬다고 말했다.

혜진이는 내가 마음속으로 그녀를 응원했다고 생각한다. 윤주도 내가 그랬다고 생각한다.

윤영이는 내가 그녀를 원망했다고 들었다. 진희도 내가 그랬다고 들었다.

은경이는 내가 그녀를 과소평가하고 있다고 생각한다. 윤희도 내가 그렇다고 생각한다.

예지는 내가 꿈 속에서 그녀를 죽였다고 들었다. 연수도 내가 그랬다고 들었다.

은미는 내가 그녀를 변화시키려고 노력하고 있다고 말했다. 혜정이도 내가 그렇다고 말했다.

효연이는 내가 그녀를 조각했다고 생각한다. 보아도 내가 그랬다고 생각한다.

연아는 내가 그녀를 속였다고 생각한다. 연재도 내가 그랬다고 생각한다.

태연이는 내가 노래로 그녀를 만족시켰다고 생각한다. 지영이도 내가 그랬다고 생각한다.

수영이는 내가 그녀를 너무 자랑스러워했다고 말했다. 효진이도 내가 그랬다고 말했다.

선영이는 내가 그녀를 분장했다고 말했다. 인영이도 내가 그랬다고 말했다.

진실이는 내가 있지도 않은 일로 그녀를 괴롭혔다고 말했다. 다빈이도 내가 그랬다고 말했다.

주희는 내가 호신용 스프레이로 그녀를 보호했다고 말했다. 가연이도 내가 그랬다고 말했다.

혜연이는 내가 그녀를 상처주고 있다고 생각한다. 나영이도 내가 그렇다고 생각한다.

3. Truth Value Judgment Task in Experiment 2 (English TVJT)

Only the sentences used as target sentences are presented.

Referential antecedents/ local binding interpretation

Every girl said that Jessica thought highly of her.

Every uncle heard that Dan painted him.

Every ballerina heard that Aubrey stared at her in the mirror.

Every actress said that Emma comforted her with a glass of wine.

Every receptionist said that Anita overestimated her.

Every student said that Natalie sketched her.

Every member heard that Kevin praised him.

Every aunt said that Allison photographed her with a brand-new camera.

Every teacher said that John introduced him to the class.

Every guy heard that Charles underestimated him.

Every man said that Ken protected him from any further losses.

Every girl said that Ellie shot her using a toy gun for fun.

Every teller heard that Alan nominated him as a candidate.

Every niece heard that Lillian recorded her using a camcorder.

Every friend said that Sam cheered him up with a beer

Every soldier heard that Watson defended him well.

Quantificational antecedents/ local binding interpretation

Jessica said that every girl thought highly of her.

Dan heard that every uncle painted him.

Aubrey heard that every ballerina stared at her in the mirror.

Emma said that every actress comforted her with a glass of wine.

Anita said that every receptionist overestimated her.

Natalie said that every student sketched her.

Kevin heard that every member praised him.

Allison said that every aunt photographed her with a brand-new camera.

John said that every teacher introduced him to the class.

Charles heard that every guy underestimated him.

Ken said that every man protected him from any further losses.

Ellie said that every girl shot her using a toy gun for fun.

Alan heard that every teller nominated him as a candidate.

Lillian heard that every niece recorded her using a camcorder.

Sam said that every friend cheered him up with a beer.

Watson heard that every soldier defended him well.

Referential antecedents/ LD binding interpretation

Jessica said that every girl thought highly of her.

Dan heard that every uncle painted him.

Aubrey heard that every ballerina stared at her in the mirror.

Emma said that every actress comforted her with a glass of wine.

Anita said that every receptionist overestimated her.

Natalie said that every student sketched her.

Kevin heard that every member praised him.

Allison said that every aunt photographed her with a brand-new camera.

John said that every teacher introduced him to the class.

Charles heard that every guy underestimated him.

Ken said that every man protected him from any further losses.

Ellie said that every girl shot her using a toy gun for fun.

Alan heard that every teller nominated him as a candidate.

Lillian heard that every niece recorded her using a camcorder.

Sam said that every friend cheered him up with a beer.

Watson heard that every soldier defended him well.

Quantificational antecedents/ LD binding interpretation

Every girl said that Jessica thought highly of her.

Every uncle heard that Dan painted him.

Every ballerina heard that Aubrey stared at her in the mirror.

Every actress said that Emma comforted her with a glass of wine.

Every receptionist said that Anita overestimated her.

Every student said that Natalie sketched her.

Every member heard that Kevin praised him.

Every aunt said that Allison photographed her with a brand-new camera.

Every teacher said that John introduced him to the class.

Every guy heard that Charles underestimated him.

Every man said that Ken protected him from any further losses.

Every girl said that Ellie shot her using a toy gun for fun.

Every teller heard that Alan nominated him as a candidate.

Every niece heard that Lillian recorded her using a camcorder.

Every friend said that Sam cheered him up with a beer

Every soldier heard that Watson defended him well.

4. Sentence Interpretation Task in Experiment 2 (English SIT)

Pronouns with LD antecedents

Lucy heard that Tim recorded her using a camcorder. Stacy heard that Tim did so too.

Elaine heard that John thought highly of her. Cecile heard that John did so too.

Layla heard that Paul covered her with a blanket. Abigail heard that Paul did so too.

Stella heard that Bill stared at her in the mirror. Adeline heard that Bill did so too.

Christopher thought that Gianna hated him. Nathan thought that Gianna did so too.

Jack said that Avery introduced him to the class. Tom said that Avery did so too.

Tony thought that Julie overestimated him. Vincent thought that Julie did so too.

James said that Allison photographed him with a brand-new camera. Kevin said that Allison did so too.

APPENDIX B. ITEMS FOR EXPERIMENTS 3, 4 AND 5, 6

1. Materials for Experiments 3 and 4 (Korean reading task)

EXPERIMENT 3

Local gender match/ LD gender match

미란이는 수업 시간에 주리가 뾰족한 바늘로 그녀를 실수로 찔렀다고 말했다.

예원이는 마사지 샵에서 수정이가 향기로운 오일로 그녀를 부드럽게 마사지했다고 말했다.

혜리는 계곡에서 소정이가 한 바가지의 물로 그녀를 완전히 적셨다고 말했다.

지은이는 미술 시간에 수지가 부드러운 찰흙으로 그녀를 완벽하게 표현했다고 말했다.

보영이는 캠핑장에서 유미가 커다란 이불로 그녀를 따뜻하게 감쌌다고 말했다.

여정이는 이번 여행에 혜선이가 새로 산 카메라로 그녀를 예쁘게 찍었다고 말했다.

설현이는 연습실에서 은지가 벽에 붙은 거울로 그녀를 뚫어지게 쳐다보았다고 말했다.

유리는 녹화 중에 서현이가 연습생 시절에 그녀를 지나치게 미워했다고 말했다.

보미는 지난 번에 혜원이가 졸업 앨범에서 그녀를 어렵게 찾았다고 말했다.

희진이는 매일 아침 태희가 체육관에서 그녀를 혹독하게 훈련시켰다고 말했다.

신혜는 잠에서 깨서 지영이가 꿈 속에서 그녀를 심하게 괴롭혔다고 말했다.

서현이는 점심을 먹다가 효린이가 조용히 그녀를 손가락으로 가리켰다고 말했다.

은채는 문화 센터에서 현경이가 다양한 방법으로 그녀를 예쁘게 그렸다고 말했다.

수정이는 회의 중에 나래가 적극적으로 그녀를 책임자로 추천했다고 말했다.

민지는 화실에서 미란이가 미술 연필로 그녀를 빠르게 스케치했다고 말했다.

효리는 인터뷰에서 나영이가 새로 쓴 책에 그녀를 자세히 묘사했다고 말했다.

세희는 휴가지에서 윤경이가 비디오 카메라로 그녀를 오랫동안 녹화했다고 말했다.

혜진이는 포장마차에서 은주가 여러가지 일로 그녀를 정말 많이 힘들게 했다고 말했다.

민서는 인터뷰에서 정민이가 알람시계로 그녀를 매일 아침 깨웠다고 말했다.

민정이는 저번 주에 세현이가 학교 교실에서 그녀를 큰 목소리로 자랑했다고 말했다.

지선이는 어제 밤 효은이가 맛있는 음식으로 그녀를 최선을 다해 위로했다고 말했다.

윤경이는 지난 주말 민서가 술에 취해 그녀를 최고라고 생각한다고 말했다.

진희는 마음 속으로 수아가 메이크업으로 그녀를 완전히 변신시켰다고 생각했다.

수진이는 잠들기 전 혜리가 호신술로 그녀를 치한으로부터 지켰다고 생각했다.

선미는 집에 돌아와 효연이가 장난감 총으로 그녀를 계속해서 쐈다고 말했다.

국주는 사진을 보며 혜진이가 포토샵으로 그녀를 완전히 고쳤다고 말했다.

승연이는 어제 밤 가연이가 튼튼한 가방으로 그녀를 재빨리 방어했다고 말했다.

지민이는 미팅이 끝나고 유리가 생각보다 그녀를 정말 많이 과대평가하고 있다고 생각했다.

유라는 술자리에서 태연이가 예상했던 것보다 그녀를 심하게 과소평가하고 있다고 말했다.

수지는 공원에서 보영이가 커다란 우산으로 그녀를 완벽하게 가렸다고 말했다.

정민이는 저번 주에 서령이가 물불 가리지 않고 그녀를 힘차게 응원했다고 들었다.

나영이는 모임에서 승연이가 내기 도박으로 그녀를 완전히 망가뜨렸다고 얘기했다.

Local gender mismatch/ LD gender match

미란이는 수업 시간에 준호가 뾰족한 바늘로 그녀를 실수로 찔렀다고 말했다.

예원이는 마사지 샵에서 재석이가 향기로운 오일로 그녀를 부드럽게 마사지했다고 말했다.

혜리는 계곡에서 승준이가 한 바가지의 물로 그녀를 완전히 적셨다고 말했다.

지은이는 미술 시간에 성수가 부드러운 찰흙으로 그녀를 완벽하게 표현했다고 말했다.

보영이는 캠핑장에서 명수가 커다란 이불로 그녀를 따뜻하게 감쌌다고 말했다.

여정이는 이번 여행에 동현이가 새로 산 카메라로 그녀를 예쁘게 찍었다고 말했다.

설현이는 연습실에서 현무가 벽에 붙은 거울로 그녀를 뚫어지게 쳐다보았다고 말했다.

유리는 녹화 중에 희철이가 연습생 시절에 그녀를 지나치게 미워했다고 말했다.

보미는 지난 번에 지환이가 졸업 앨범에서 그녀를 어렵게 찾았다고 말했다.

희진이는 매일 아침 민호가 체육관에서 그녀를 혹독하게 훈련시켰다고 말했다.

신혜는 잠에서 깨서 현석이가 꿈 속에서 그녀를 심하게 괴롭혔다고 말했다.

서현이는 점심을 먹다가 현철이가 조용히 그녀를 손가락으로 가리켰다고 말했다.

은채는 문화 센터에서 규형이가 다양한 방법으로 그녀를 예쁘게 그렸다고 말했다.

수정이는 회의 중에 재우가 적극적으로 그녀를 책임자로 추천했다고 말했다.

민지는 화실에서 우석이가 미술 연필로 그녀를 빠르게 스케치했다고 말했다.

효리는 인터뷰에서 영석이가 새로 쓴 책에 그녀를 자세히 묘사했다고 말했다.

세희는 휴가지에서 승준이가 비디오 카메라로 그녀를 오랫동안 녹화했다고 말했다.

혜진이는 포장마차에서 광희가 여러가지 일로 그녀를 정말 많이 힘들게 했다고 말했다.

민서는 인터뷰에서 호진이가 알람시계로 그녀를 매일 아침 깨웠다고 말했다.

민정이는 저번 주에 익준이가 학교 교실에서 그녀를 큰 목소리로 자랑했다고 말했다.

지선이는 어제 밤 규형이가 맛있는 음식으로 그녀를 최선을 다해 위로했다고 말했다.

윤경이는 지난 주말 민규가 술에 취해 그녀를 최고라고 생각한다고 말했다.

진희는 마음 속으로 정우가 메이크업으로 그녀를 완전히 변신시켰다고 생각했다.

수진이는 잠들기 전 현호가 호신술로 그녀를 치한으로부터 지켰다고 생각했다.

선미는 집에 돌아와 희준이가 장난감 총으로 그녀를 계속해서 쐈다고 말했다.

국주는 사진을 보며 현석이가 포토샵으로 그녀를 완전히 고쳤다고 말했다.

승연이는 어제 밤 종석이가 튼튼한 가방으로 그녀를 재빨리 방어했다고 말했다.

지민이는 미팅이 끝나고 종수가 생각보다 그녀를 정말 많이 과대평가하고 있다고 생각했다.

유라는 술자리에서 승훈이가 예상했던 것보다 그녀를 심하게 과소평가하고 있다고 말했다.

수지는 공원에서 상철이가 커다란 우산으로 그녀를 완벽하게 가렸다고 말했다.

정민이는 저번 주에 성진이가 물불 가리지 않고 그녀를 힘차게 응원했다고 들었다.

나영이는 모임에서 성준이가 내기 도박으로 그녀를 완전히 망가뜨렸다고 얘기했다.

Local gender match/ LD gender mismatch

근석이는 수업 시간에 주리가 뾰족한 바늘로 그녀를 실수로 찔렀다고 말했다.

원준이는 마사지 샵에서 수정이가 향기로운 오일로 그녀를 부드럽게 마사지했다고 말했다.

현우는 계곡에서 소정이가 한 바가지의 물로 그녀를 완전히 적셨다고 말했다.

준한이는 미술 시간에 수지가 부드러운 찰흙으로 그녀를 완벽하게 표현했다고 말했다.

동훈이는 캠핑장에서 유미가 커다란 이불로 그녀를 따뜻하게 감쌌다고 말했다.

지훈이는 이번 여행에 혜선이가 새로 산 카메라로 그녀를 예쁘게 찍었다고 말했다.

태민이는 연습실에서 은주가 벽에 붙은 거울로 그녀를 뚫어지게 쳐다보았다고 말했다.

민호는 녹화 중에 서현이가 연습생 시절에 그녀를 지나치게 미워했다고 말했다.

성주는 지난 번에 혜원이가 졸업 앨범에서 그녀를 어렵게 찾았다고 말했다.

준형이는 매일 아침 태희가 체육관에서 그녀를 혹독하게 훈련시켰다고 말했다.

성호는 잠에서 깨서 지영이가 꿈 속에서 그녀를 심하게 괴롭혔다고 말했다.

철민이는 점심을 먹다가 효린이가 조용히 그녀를 손가락으로 가리켰다고 말했다.

철우는 문화 센터에서 현경이가 다양한 방법으로 그녀를 예쁘게 그렸다고 말했다.

기석이는 회의 중에 나래가 적극적으로 그녀를 책임자로 추천했다고 말했다.

종수는 화실에서 미란이가 미술 연필로 그녀를 빠르게 스케치했다고 말했다.

준호는 인터뷰에서 나영이가 새로 쓴 책에 그녀를 자세히 묘사했다고 말했다.

민수는 휴가지에서 윤경이가 비디오 카메라로 그녀를 오랫동안 녹화했다고 말했다.

기홍이는 포장마차에서 은주가 여러가지 일로 그녀를 정말 많이 힘들게 했다고 말했다.

철수는 인터뷰에서 정민이가 알람시계로 그녀를 매일 아침 깨웠다고 말했다.

기원이는 지번 주에 세현이가 학교 교실에서 그녀를 큰 목소리로 자랑했다고 말했다.

성준이는 어제 밤 효은이가 맛있는 음식으로 그녀를 최선을 다해 위로했다고 말했다.

영철이는 지난 주말 민서가 술에 취해 그녀를 최고라고 생각한다고 말했다.

민기는 마음 속으로 수아가 메이크업으로 그녀를 완전히 변신시켰다고 생각했다.

종덕이는 잠들기 전 혜리가 호신술로 그녀를 치한으로부터 지켰다고 생각했다.

지호는 집에 돌아와 효연이가 장난감 총으로 그녀를 계속해서 쐈다고 말했다.

종호는 사진을 보며 혜진이가 포토샵으로 그녀를 완전히 고쳤다고 말했다.

승철이는 어제 밤 가연이가 튼튼한 가방으로 그녀를 재빨리 방어했다고 말했다.

우빈이는 미팅이 끝나고 유리가 생각보다 그녀를 정말 많이 과대평가하고 있다고 생각했다.

영호는 술자리에서 태연이가 예상했던 것보다 그녀를 심하게 과소평가하고 있다고 말했다.

재호는 공원에서 보영이가 커다란 우산으로 그녀를 완벽하게 가렸다고 말했다.

현석이는 저번 주에 서령이가 물불 가리지 않고 그녀를 힘차게 응원했다고 들었다.

남석이는 모임에서 승연이가 내기 도박으로 그녀를 완전히 망가뜨렸다고 얘기했다.

Local gender mismatch/ LD gender mismatch

근석이는 수업 시간에 준호가 뾰족한 바늘로 그녀를 실수로 찔렀다고 말했다.

원준이는 마사지 샵에서 재석이가 향기로운 오일로 그녀를 부드럽게 마사지했다고 말했다.

현우는 계곡에서 승준이가 한 바가지의 물로 그녀를 완전히 적셨다고 말했다.

준한이는 미술 시간에 성수가 부드러운 찰흙으로 그녀를 완벽하게 표현했다고 말했다.

동훈이는 캠핑장에서 명수가 커다란 이불로 그녀를 따뜻하게 감쌌다고 말했다.

지훈이는 이번 여행에 동현이가 새로 산 카메라로 그녀를 예쁘게 찍었다고 말했다.

태민이는 연습실에서 현무가 벽에 붙은 거울로 그녀를 뚫어지게 쳐다보았다고 말했다.

민호는 녹화 중에 희철이가 연습생 시절에 그녀를 지나치게 미워했다고 말했다.

성주는 지난 번에 지환이가 졸업 앨범에서 그녀를 어렵게 찾았다고 말했다.

준형이는 매일 아침 민호가 체육관에서 그녀를 혹독하게 훈련시켰다고 말했다.

성호는 잠에서 깨서 현석이가 꿈 속에서 그녀를 심하게 괴롭혔다고 말했다.

철민이는 점심을 먹다가 현철이가 조용히 그녀를 손가락으로 가리켰다고 말했다.

철우는 문화 센터에서 규형이가 다양한 방법으로 그녀를 예쁘게 그렸다고 말했다.

기석이는 회의 중에 재우가 적극적으로 그녀를 책임자로 추천했다고 말했다.

종수는 화실에서 우석이가 미술 연필로 그녀를 빠르게 스케치했다고 말했다.

준호는 인터뷰에서 영석이가 새로 쓴 책에 그녀를 자세히 묘사했다고 말했다.

민수는 휴가지에서 승준이가 비디오 카메라로 그녀를 오랫동안 녹화했다고 말했다.

기홍이는 포장마차에서 광희가 여러가지 일로 그녀를 정말 많이 힘들게 했다고 말했다.

철수는 인터뷰에서 호진이가 알람시계로 그녀를 매일 아침 깨웠다고 말했다.

기원이는 지번 주에 익준이가 학교 교실에서 그녀를 큰 목소리로 자랑했다고 말했다.

성준이는 어제 밤 규형이가 맛있는 음식으로 그녀를 최선을 다해 위로했다고 말했다.

영철이는 지난 주말 민규가 술에 취해 그녀를 최고라고 생각한다고 말했다.

민기는 마음 속으로 정우가 메이크업으로 그녀를 완전히 변신시켰다고 생각했다.

종덕이는 잠들기 전 현호가 호신술로 그녀를 치한으로부터 지켰다고 생각했다.

지호는 집에 돌아와 희준이가 장난감 총으로 그녀를 계속해서 쐈다고 말했다.

종호는 사진을 보며 현석이가 포토샵으로 그녀를 완전히 고쳤다고 말했다.

승철이는 어제 밤 종석이가 튼튼한 가방으로 그녀를 재빨리 방어했다고 말했다.

우빈이는 미팅이 끝나고 종수가 생각보다 그녀를 정말 많이 과대평가하고 있다고 생각했다.

영호는 술자리에서 승훈이가 예상했던 것보다 그녀를 심하게 과소평가하고 있다고 말했다.

재호는 공원에서 상철이가 커다란 우산으로 그녀를 완벽하게 가렸다고 말했다.

현석이는 저번 주에 성진이가 물불 가리지 않고 그녀를 힘차게 응원했다고 들었다.

남석이는 모임에서 성준이가 내기 도박으로 그녀를 완전히 망가뜨렸다고 얘기했다.

EXPERIMENT 4

Local gender match/ LD gender match

어느 여자나 어제 어떤 소녀가 뾰족한 연필로 그녀를 세게 찔렀냐고 물었다.

어느 소녀나 친구에게 어떤 여배우가 사진 속에서 그녀를 매우 빠르게 알아보았냐고 물었다.

어느 이모나 어제 밤에 어떤 여자가 큰 카메라로 그녀를 몰래 찍었냐고 물었다.

어느 여동생이나 대화 중에 어떤 고모가 새 캠코더로 그녀를 예쁘게 촬영했냐고 물었다.

어느 여학생이나 지하철에서 어떤 아줌마가 안경 너머로 그녀를 뚫어지게 쳐다보았냐고 물었다.

어느 아줌마나 키즈까페에서 누구 막내딸이 장난감 총으로 그녀를 정확히 겨냥했냐고 물었다.

어느 신부나 결혼식에서 어떤 여자가 사람들 앞에서 그녀를 많이 칭찬했냐고 물었다.

어느 딸이나 수업이 끝나고 누구 엄마가 반에서 그녀를 가장 예쁘다고 했냐고 물었다.

어느 엄마나 잠들기 전 어떤 딸이 상담 중에 그녀를 심하게 비난했는지 궁금해했다.

어느 할머니나 그저께 어떤 아가씨가 경찰서에서 그녀를 자세히 묘사했는지 궁금해했다.

어느 여자나 화실에서 어떤 여학생이 미술 숙제로 그녀를 스케치북에 그렸는지 궁금해했다.

어느 아가씨나 버스에서 어떤 아줌마가 들고있던 가방으로 그녀를 세게 쳤는지 궁금해했다.

어느 할머니나 지하철에서 어떤 여자가 갑자기 그녀를 신문으로 가렸는지 궁금해했다.

어느 아줌마나 까페에서 어떤 여학생이 손거울로 그녀를 살짤살짝 보았는지 궁금해했다.

어느 고모나 잠이 깬 후 어떤 여자가 미용실에서 그녀를 예쁘게 꾸몄는지 궁금해했다.

어느 소녀나 지난 주말에 누구 여동생이 새총으로 그녀를 잘못해서 쐈는지 궁금해했다.

어느 여가수나 차에서 어떤 여배우가 촬영 후에 그녀를 많이 미워하게 됐는지 궁금해했다.

어느 여기자나 취재가 끝나고 어떤 숙녀가 공원에서 그녀를 멋지게 스케치했는지 알게 되었다.

어느 수녀님이나 식당에서 어떤 여자 아이가 장난으로 그녀를 크게 불렀는지 알고 있었다.

어느 이모나 병원에서 어떤 여자 간호사가 검사 중에 그녀를 티 안나게 괴롭혔는지 알고 있었다.

어느 여자 아이나 명절에 어떤 고모가 가발로 그녀를 완전히 변신시켰는지 알고 있었다.

어느 여자 직원이나 회사에서 어떤 사모님이 물을 끼얹어 그녀를 흠뻑 적셨냐고 물어보았다.

어느 여배우나 미팅에서 어떤 여학생이 새로 나온 포토샵으로 그녀를 완전히 고쳤냐고 물어보았다.

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어느 여자 아이나 유치원에서 어떤 아줌마가 장기자랑에서 그녀를 많이 응원했는지 물어보았다.

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어느 아가씨나 술집에서 어떤 아줌마가 커다란 막대기로 그녀를 안전하게 지켰냐고 물었다.

어느 아줌마나 백화점에서 어떤 여직원이 마네킹을 이용해 그녀를 위험에서 구했냐고 물었다.

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Local gender mismatch/ LD gender match

어느 여자나 어제 어떤 소년이 뾰족한 연필로 그녀를 세게 찔렀냐고 물었다.

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어느 이모나 어제 밤에 어떤 남자가 큰 카메라로 그녀를 몰래 찍었냐고 물었다.

어느 여동생이나 대화 중에 어떤 삼촌이 새 캠코더로 그녀를 예쁘게 촬영했냐고 물었다.

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어느 아줌마나 키즈까페에서 누구 큰아들이 장난감 총으로 그녀를 정확히 겨냥했냐고 물었다.

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어느 남자 아이나 유치원에서 어떤 아저씨가 장기자랑에서 그녀를 많이 응원했는지 물어보았다.

어느 아빠나 차에서 어떤 아들이 생각보다 그녀를 많이 대단하게 여기는지 물어보았다.

어느 총각이나 술집에서 어떤 아저씨가 커다란 막대기로 그녀를 안전하게 지켰냐고 물었다.

어느 아저씨나 백화점에서 어떤 남자직원이 마네킹을 이용해 그녀를 위험에서 구했냐고 물었다.

어느 꼬마 신사나 어제 밤 어떤 남자가 쇼에서 그녀를 막대기로 가리켰는지 알고 있었다.

2. Materials for Experiments 5 and 6 (English reading task)

EXPERIMENT 5

Local gender match/ LD gender match

John remembered that Mark had taught him a new song on the guitar.
Bob recalled that Ben had told him that the training would be easy.
Ben reported that Bob had criticized him for big delays at the start.
Roger thought that David had treated him a lot more fairly that day.
Mary wished that Emma had introduced her to the stars of the show.
Diana suspected that Jenny had blamed her for the mud on the carpet.
Laura was happy that Helen had reserved her a seat on the train home.
Lydia realized that Susan had locked her in the new place by mistake.
Gary heard that Adam had described him as dull but good at the job.
Adam was stunned that Gary had rewarded him with a very big pay rise.
Paul was sure that Matt had poked him in the arm with a pen.
Matt wished that Paul had warned him about the egg and spoon race.
Jane was grateful that Kara had cooked her a meal as a special treat.
Kara remembered that Jane had bought her a new pen for good luck.
Ann was cross that Sue had reminded her about the ghost in the tower.
Laura was sure that Jenny had owed her some money for rent and bills.
Ben was glad that Dan had assigned him the biggest role in the play.
David wished that Kevin had helped him with the weeds along the path.
Gary dreamed that Fred had discharged him on the day of the operation.
Alan recalled that Sean had taught him a new verse with silly words.
Emma was sorry that Lila had baked her a huge sponge cake with icing.
Helen knew that Susan had served her the wrong wine with the meal.
Kara thought that Kate had educated her on the pitfalls of being new.
Susan hoped that Helen had awarded her the prize for the best pie.
Mike remembered that Paul had added him to the guest list for the party.
Ken was unaware that Rob had made him a huge sandwich for lunch.
Sam was relieved that Ian had reminded him about the deadline for the paper.

Jimmy was shocked that Harry had blamed him for the recent car accident.
Hannah was surprised that Sophie had baked her fresh bread rolls for breakfast.
Stacy recalled that Cathy had warned her about the teachers in the school.
Emily reported that Grace had pricked her with a sharp pencil by mistake.
Megan was shocked that Diane had shot her with a toy gun on purpose.

Local gender mismatch/ LD gender match

John remembered that Kate had taught him a new song on the guitar.
Bob recalled that Amy had told him that the training would be easy.
Ben reported that Ann had criticized him for big delays at the start.
Roger thought that Jenny had treated him a lot more fairly that day.
Mary wished that John had introduced her to the stars of the show.
Diana suspected that Roger had blamed her for the mud on the carpet.
Laura was happy that Peter had reserved her a seat on the train home.
Lydia realized that Simon had locked her in the new place by mistake.
Gary heard that Dana had described him as dull but good at the job.
Adam was stunned that Rory had rewarded him with a very big pay rise.
Paul was sure that Beth had poked him in the arm with a pen.
Matt wished that Lynn had warned him about the egg and spoon race.
Jane was grateful that John had cooked her a meal as a special treat.
Kara remembered that Mark had bought her a new pen for good luck.
Ann was cross that Bob had reminded her about the ghost in the tower.
Laura was sure that Roger had owed her some money for rent and bills.
Ben was glad that Ann had assigned him the biggest role in the play.
David wished that Jenny had helped him with the weeds along the path.
Gary dreamed that Lisa had discharged him on the day of the operation.
Alan recalled that Beth had taught him a new verse with silly words.
Emma was sorry that Adam had baked her a huge sponge cake with icing.
Helen knew that James had served her the wrong wine with the meal.
Kara thought that Bill had educated her on the pitfalls of being new.

Susan hoped that Duane had awarded her the prize for the best pie.
Mike remembered that Tina had added him to the guest list for the party.
Ken was unaware that Jen had made him a huge sandwich for lunch.
Sam was relieved that Ann had reminded him about the deadline for the paper.
Jimmy was shocked that Julie had blamed him for the recent car accident.
Hannah was surprised that George had baked her fresh bread rolls for breakfast.
Stacy recalled that David had warned her about the teachers in the school.
Emily reported that Peter had pricked her with a sharp pencil by mistake.
Megan was shocked that Gavin had shot her with a toy gun on purpose.

Local gender match/ LD gender mismatch

Jane remembered that Mark had taught him a new song on the guitar.
Ann recalled that Ben had told him that the training would be easy.
Sue reported that Bob had criticized him for big delays at the start.
Laura thought that David had treated him a lot more fairly that day.
Mark wished that Emma had introduced her to the stars of the show.
David suspected that Jenny had blamed her for the mud on the carpet.
Simon was happy that Helen had reserved her a seat on the train home.
Peter realized that Susan had locked her in the new place by mistake.
Lisa heard that Adam had described him as dull but good at the job.
Emma was stunned that Gary had rewarded him with a very big pay rise.
Kate was sure that Matt had poked him in the arm with a pen.
Beth wished that Paul had warned him about the egg and spoon race.
Bill was grateful that Kara had cooked her a meal as a special treat.
Sean remembered that Jane had bought her a new pen for good luck.
Joe was cross that Sue had reminded her about the ghost in the tower.
James was sure that Jenny had owed her some money for rent and bills.
Sue was glad that Dan had assigned him the biggest role in the play.
Laura wished that Kevin had helped him with the weeds along the path.
Mary dreamed that Fred had discharged him on the day of the operation.

Sara recalled that Sean had taught him a new verse with silly words.
Brad was sorry that Lila had baked her a huge sponge cake with icing.
Chris knew that Susan had served her the wrong wine with the meal.
Ryan thought that Kate had educated her on the pitfalls of being new.
Peter hoped that Helen had awarded her the prize for the best pie.
Joan remembered that Paul had added him to the guest list for the party.
Pam was unaware that Rob had made him a huge sandwich for lunch.
Kat was relieved that Ian had reminded him about the deadline for the paper.
Anita was shocked that Harry had blamed him for the recent car accident.
Daniel was surprised that Sophie had baked her fresh bread rolls for breakfast.
Steve recalled that Cathy had warned her about the teachers in the school.
Scott reported that Grace had pricked her with a sharp pencil by mistake.
Colin was shocked that Diane had shot her with a toy gun on purpose.

Local gender mismatch/ LD gender mismatch

Jane remembered that Kate had taught him a new song on the guitar.
Ann recalled that Amy had told him that the training would be easy.
Sue reported that Ann had criticized him for big delays at the start.
Laura thought that Jenny had treated him a lot more fairly that day.
Mark wished that John had introduced her to the stars of the show.
David suspected that Roger had blamed her for the mud on the carpet.
Simon was happy that Peter had reserved her a seat on the train home.
Peter realized that Simon had locked her in the new place by mistake.
Lisa heard that Dana had described him as dull but good at the job.
Emma was stunned that Rory had rewarded him with a very big pay rise.
Kate was sure that Beth had poked him in the arm with a pen.
Beth wished that Lynn had warned him about the egg and spoon race.
Bill was grateful that John had cooked her a meal as a special treat.
Sean remembered that Mark had bought her a new pen for good luck.
Joe was cross that Bob had reminded her about the ghost in the tower.

James was sure that Roger had owed her some money for rent and bills.
Sue was glad that Ann had assigned him the biggest role in the play.
Laura wished that Jenny had helped him with the weeds along the path.
Mary dreamed that Lisa had discharged him on the day of the operation.
Sara recalled that Beth had taught him a new verse with silly words.
Brad was sorry that Adam had baked her a huge sponge cake with icing.
Chris knew that James had served her the wrong wine with the meal.
Ryan thought that Bill had educated her on the pitfalls of being new.
Peter hoped that Duane had awarded her the prize for the best pie.
Joan remembered that Tina had added him to the guest list for the party.
Pam was unaware that Jen had made him a huge sandwich for lunch.
Kat was relieved that Ann had reminded him about the deadline for the paper.
Anita was shocked that Julie had blamed him for the recent car accident.
Daniel was surprised that George had baked her fresh bread rolls for breakfast.
Steve recalled that David had warned her about the teachers in the school.
Scott reported that Peter had pricked her with a sharp pencil by mistake.
Colin was shocked that Gavin had shot her with a toy gun on purpose.

EXPERIMENT 6

Local gender match/ LD gender match

Every woman in the house asked which girl had painted her with a brush.
Every girl asked which actress had identified her in the picture last night.
Every aunt heard which woman had photographed her secretly from a distant car.
Every sister heard which aunt had taught her silly words while drinking beers.
Every actress asked which lady had recorded her using a camcorder without permission.
Every lady asked which girl had targeted her using a toy gun for fun.
Every niece recalled which aunt had praised her in front of other relatives.
Every daughter recalled which mother had picked her as the prettiest in class.
Every mother heard which daughter had blamed her for the bad diet at home.

Every girl heard which woman had disliked her quite a lot for a while.

Every actress asked which girl had sketched her for assignments in the art class.

Every woman heard which lady had cut her with a razor blade accidentally.

Every wife heard which bride had pleased her quite well during the wedding.

Every queen recalled which princess had surprised her the most in the ceremony.

Every waitress recalled which lady had upset her with the bad news last night.

Every princess recalled which queen had seen her on a TV show broadcasted yesterday.

Every boyfriend remembered which uncle had recorded him in a play on tape.

Every husband asked which son had covered him with a warm blanket in a tent.

Every uncle remembered which nephew recognized him in one photo in the album.

Every groom remembered which waiter had locked him out of the venue by mistake.

Every brother remembered which boy had amused him with funny looking pictures yesterday.

Every boxer recalled which doctor had reminded him about the news in the room.

Every doctor wondered which uncle had called him a chicken before the surgery yesterday.

Every frat boy knew which boy had sprayed him with insect repellent before the game.

Every boy heard which linebacker had blamed him for the car crash.

Every uncle mentioned which waitor had poured him a glass of wine at the restaurant.

Every man described which salesman had helped him be a Santa for the party.

Every boy described which man had tried to kill him in the dream.

Every dad mentioned which maintenance man had covered him in paint by accident.

Every actor recalled which man shot him in the dream last night.

Every dad reported which policeman shot him at the crime scene.

Every salesman wondered which taylor had called him the best for the wedding.

Local gender mismatch/ LD gender match

Every woman in the house asked which boy had painted her with a brush.

Every girl asked which actor had identified her in the picture last night.

Every aunt heard which man had photographed her secretly from a distant car.

Every sister heard which uncle had taught her silly words while drinking beers.

Every actress asked which gentleman had recorded her using a camcorder without permission.

Every lady asked which boy had targeted her using a toy gun for fun.

Every niece recalled which uncle had praised her in front of other relatives.

Every daughter recalled which father had picked her as the prettiest in class.

Every mother heard which son had blamed her for the bad diet at home.

Every girl heard which man had disliked her quite a lot for a while.

Every actress asked which boy had sketched her for assignments in the art class.

Every woman heard which gentleman had cut her with a razor blade accidentally.

Every wife heard which groom had pleased her quite well during the wedding.

Every queen recalled which prince had surprised her the most in the ceremony.

Every waitress recalled which gentleman had upset her with the bad news last night.

Every princess recalled which king had seen her on a TV show broadcasted yesterday.

Every boyfriend remembered which aunt had recorded him in a play on tape.

Every husband asked which daughter had covered him with a warm blanket in a tent.

Every uncle remembered which niece recognized him in one photo in the album.

Every groom remembered which waitress had locked him out of the venue by mistake.

Every brother remembered which girl had amused him with funny looking pictures yesterday.

Every boxer recalled which nurse had reminded him about the news in the room.

Every doctor wondered which aunt had called him a chicken before the surgery yesterday.

Every frat boy knew which girl had sprayed him with insect repellent before the game.

Every boy heard which cheerleader had blamed him for the car crash.

Every uncle mentioned which waitress had poured him a glass of wine at the restaurant.

Every man described which salesgirl had helped him be a Santa for the party.

Every boy described which woman had tried to kill him in the dream.

Every dad mentioned which maintenance woman had covered him in paint by accident.

Every actor recalled which woman shot him in the dream last night.

Every dad reported which policewoman shot him at the crime scene.

Every salesman wondered which seamstress had called him the best for the wedding.

Local gender match/ LD gender mismatch

Every man in the house asked which girl had painted her with a brush.

Every boy asked which actress had identified her in the picture last night.

Every uncle heard which woman had photographed her secretly from a distant car.

Every brother heard which aunt had taught her silly words while drinking beers.

Every actor asked which lady had recorded her using a camcorder without permission.

Every gentleman asked which girl had targeted her using a toy gun for fun.

Every nephew recalled which aunt had praised her in front of other relatives.

Every son recalled which mother had picked her as the prettiest in class.

Every father heard which daughter had blamed her for the bad diet at home.

Every boy heard which woman had disliked her quite a lot for a while.

Every actor asked which girl had sketched her for assignments in the art class.

Every man heard which lady had cut her with a razor blade accidentally.

Every husband heard which bride had pleased her quite well during the wedding.

Every king recalled which princess had surprised her the most in the ceremony.

Every waiter recalled which lady had upset her with the bad news last night.

Every prince recalled which queen had seen her on a TV show broadcasted yesterday.

Every girlfriend remembered which uncle had recorded him in a play on tape.

Every wife asked which son had covered him with a warm blanket in a tent.

Every aunt remembered which nephew recognized him in one photo in the album.

Every bride remembered which waiter had locked him out of the venue by mistake.

Every sister remembered which boy had amused him with funny looking pictures yesterday.

Every ballerina recalled which doctor had reminded him about the news in the room.

Every nurse wondered which uncle had called him a chicken before the surgery yesterday.

Every sorority girl knew which boy had sprayed him with insect repellent before the game.

Every girl heard which linebacker had blamed him for the car crash.

Every aunt mentioned which waitor had poured him a glass of wine at the restaurant.

Every woman described which salesman had helped him be a Santa for the party.

Every girl described which man had tried to kill him in the dream.

Every mom mentioned which maintenance man had covered him in paint by accident.

Every actress recalled which man shot him in the dream last night.

Every mom reported which policeman shot him at the crime scene.

Every salesgirl wondered which taylor had called him the best for the wedding.

Local gender mismatch/ LD gender mismatch

Every man in the house asked which boy had painted her with a brush.

Every boy asked which actor had identified her in the picture last night.

Every uncle heard which man had photographed her secretly from a distant car.

Every brother heard which uncle had taught her silly words while drinking beers.

Every actor asked which gentleman had recorded her using a camcorder without permission.

Every gentleman asked which boy had targeted her using a toy gun for fun.

Every nephew recalled which uncle had praised her in front of other relatives.

Every son recalled which father had picked her as the prettiest in class.

Every father heard which son had blamed her for the bad diet at home.

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