

Referentiality Effect of Noun Phrases in the Acquisition of Relative Clauses in English*

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Although there is abundant research on the rule-based linguistic knowledge of second language learners, little attention has been paid to the psycholinguistic aspects of second language acquisition such as sentence processing. In the current study, I take an alternative view to the rule-based perspectives by examining whether there is any difference in the parsing mechanisms between native speakers and second language learners. The processing strategies of native speakers and learners are compared with respect to the processing of relative clause (RC) attachment ambiguities with a complex NP head. RC attachment preferences are distinguished by the referentiality in terms of the presence/absence of a definite article and the contrast of prepositions between *of* and *as*. Korean learners of English were asked to choose a preferred head of a RC on a written questionnaire. Results from two experiments show that while reponses from native speakers and learners diverged in one test, where referentiality was differentiated by the definite article, they converged in the other test, where a prepositions were a distinguishing factor. One of the potential sources of explanation of this discrepancy is based on the different syntactic categories between the two factors.

Key words: sentence processing, relative clause attachment, referentiality

1. Introduction

This article studied second language learners' parsing strategies compared to those of native speakers. Will the psycholinguistic sentence

*I acknowledge my gratitude for drawing my attention to relative clause attachment in L2 processing to Papadopoulou and Clahsen (2000), which was presented at the 20th Second Language Research Forum Conference at the University of Wisconsin-Madison, October, 2000. I also thank students in my classes who willingly participated in the experiment and Fred Perkins who kindly read and commented on this paper. I am responsible for the remaining errors.

processing mechanisms be similar between native speakers and second language learners? When more than one permissible attachment site is available within the current thematic processing domain, how does the processor choose between them? It has been reported that relative clauses tend to modify a head which is referential, if there is more than one possible head (Gilboy, Sopena, Clifton, & Frazier, 1995; Ioga, 1995). Do second language learners choose a referential NP as the preferable head of a relative clause (RC)? To answer these questions structurally ambiguous sentences involving attachment preferences were examined.

Cross-linguistically, there have been a great number of studies which show sentences containing a complex NP followed by a relative clause produce ambiguous interpretations in deciding the head (antecedent) of the relative clause, as illustrated in (1) (Carreiras & Clifton, 1993; Cuetos & Mitchell, 1988; Mitchell, Cuetos, & Zagar, 1990).

- (1) In the end Thomas brought the shawl of wool [that was very expensive.]

For the particular sentence (1), while 21% of native speakers of English attached the relative clause low to the second NP (*wool*), no native speakers of Spanish did so. That is, the latter group attached the relative clause high to the first NP (*the shawl*) without exceptions. Similar findings were made from native speakers of German and Dutch (Gibson et al, 1996).

Interestingly, Gilboy, Sopena, Clifton, and Frazier (1995) found that the average scores of low attachment to NP2 increased from 26% to 55% (of 16 subjects) for native speakers of English when the NP2 was introduced by a definite article *the*, making *the wool*. Gilboy et al. also found that relative clause attachment preferences depend on different types of NP (see Fernandez, 1995 concerning this issue) and these NPs were differentiated only by the presence/absence of a definite article within them. The idea is that adding a determiner to an NP with which it is associated would increase referentiality (Butler, 2002; Gilboy et al., 1995; Heubner, 1979; Ioga, 1995, Liu & Gleason, 2002).

It can be said that one of the functions of the relative clause is to identify the intended reference of the NP that it modifies. Gilboy et al. (1995) propose that parsers will prefer hosts which are referential.

- (1) Referentiality Principle: the heads of some maximal projections are referential in the sense that they introduce discourse entities (e.g. participants in events described in the discourse) into a discourse model (at least temporarily), or correspond to already existing discourse entities. Restrictive modifiers (e.g. restrictive relative clauses) preferentially seek hosts which are referential in this sense (p. 136).

According to the Referentiality Principle, more NP2 assignment will be given when a determiner precedes the NP2 than when it does not. Ioga (1995) successfully replicated Gibloy et al.'s study with Spanish native speakers and Hemforth, Konieczny and Scheepers (1996) worked with German native speakers.

Another point that referentiality of the NPs relates to the contrast of prepositions in the sentences, as illustrated in (2).

- (2) a. I was told that [the coach of the skater] who was on TV yesterday had been fired.
 b. Kathy excelled [as the secretary of the manager] who was responsible for Personnel.

For the particular sentence (2a), where the complex NP contained *of*, the participants in Gilbooy et al. (1995) who were native speakers of English showed 5% of proportion choice of NP2. In contrast, for the particular sentence (2b), where complex NP was embedded as the complement of *as*, the proportion choice of NP2 recorded as much as 89% (of 16 subjects). According to Gilbooy et al. (1995), the available interpretation for the change of proportions of NP2 choice from (2a) to (2b) is that while one reading can involve referential NP2, another reading may involve nonreferential NP2 (e.g., *the inspector-assistant*). In the latter case, the less preference for NP2 as host can be expected. If this is the case, introducing the complex NPs under *as* (*hired as assistant of the inspector*) will make NP1 nonreferential and NP2 referential. With this, the number of NP2 response will be increased obeying the referentiality principle. Therefore, referentiality can be specified by the types of NP as illustrated in sentences (1) and (2).

All of these results which show that a referential NP is preferentially modified by the relative clause deal with the parsing mechanisms of the

native speakers of the languages under investigation. For a clearer picture of this issue, it is worthwhile to observe the parsing strategy of second language learners and find out any differences, if any, between native language processing and second language processing.

Based on the written questionnaire study of Gilboy et al. (1995) which showed that English native speakers exhibit referentiality effect in the interpretation of relative clause sentences, this paper set the goal of examining the referentiality effect in second language processing, more specifically, by Korean adult learners of English. Korean does not employ the same process of expressing referentiality as in English, which uses different kinds and the presence/absence of determiners. For this reason, Korean learners will make an interesting suggestion on the referentiality issue of NPs in terms of RC attachment among other second language learner groups. I want to find whether the different NP2 preference pattern observed from native speakers of English can also be found from second language learners.

The research question of this study is whether second language learners will prefer a more referential NP as the head of a relative clause for different sentence types as native speakers of English do. For that purpose, in this study, referentiality will be examined in two ways: presence/absence of the definite article (Type A) and contrast between *of* and *as* (Type B). Below follow the details of these two different sentence types.

1.1. Type A

There were two different kinds in type A. One kind, type A (+det), included a determiner introducing NP2, the other type, type A (-det), without it. Substance NPs, like *the sweater of (the) wool* were included in type A items. This is to test whether NP types can influence the relative clause attachment preferences. Referentiality principle predicts that the lack of a determiner makes an NP nonreferential. Therefore, in the sense of referentiality, the preference for NP2 choice as host of the relative clause will be influenced by the presence/lack of the determiner introducing the NP2.

1.2. Type B

Type B also consisted of two kinds: Type B (of) and Type B (as). The former kind contained *the NPI-of-the-NP2* (e.g. *the assistant of the inspector*), and the form of complex NP of the latter type was *as-the NPI-of-the-NP2*. The reason for dividing type B into (of) and (as) in the present study is that native speakers of English showed low preference for NP2 in type B (of), whereas the NP2 response in type B (as) substantially increased, 35% vs. 81 % in average proportion (Gilboy et al., 1995).

2. The Study

2.1. Participants

Participants in this study were 160 undergraduate students who were taking English courses at a university in Seoul at the time of testing. Forty students out of 160 were equally distributed in 4 groups, because the materials consisted of 4 versions of a questionnaire. As will be mentioned below in the materials section, there were 4 versions of the questionnaire, distributing 40 students per version.

All of the participants began formal training in English after they entered middle school: their proficiency was supposed to be around the intermediate level.¹⁾

Results by native English speakers were borrowed from the findings of Gilboy et al. (1995). Seventy-two undergraduates at the University of Massachusetts at Amherst had worked on the test sentences which second language learners in this study used, eighteen speakers being

1) An anonymous reviewer pointed out that first, there was no way of knowing the exact proficiency level of the participants by the fact that they started to learn English after they had entered middle school. Secondly, the reviewer wondered to what level of learners the results of this research could be generalized. For the first point, although there was no separate test conducted to measure the proficiency level of the participants at the time of testing, their reported standardized test scores before the test were under 700 of TOEIC test, which could suggest that their proficiency was around intermediate. For the second point, it is necessary to make it clear that the intent of this research is not to generalize to the all population of second language learners. It is not possible or desirable for any kind of second language research. Therefore, I don't see any serious problem to confine to realm of generalization of the findings based on a particular level of learners.

distributed equally throughout the 4 versions of the questionnaire. In addition to the sentence types used in this study, other types of sentences were tested by native English speakers in Gilboy et al. (1995). However, they were excluded from this study, because results from the excluded types are irrelevant to the interest of the current study.

2.2. Materials

As stated above, sentences in each type appeared in two forms. NP2 in Type A sentences appeared either with a definite article or without one. Complex NPs in Type B contained either *of* or *as*. Since an individual subject should see one form of items in each type, and each item should be tested equally often in each form, 4 versions of the questionnaire (2×2=4) were constructed. Across all four versions of the questionnaire, each sentence was tested equally often in each of its form.

Each questionnaire contained 18 test items and 40 distracters, making up 58 items in total. Among the 18 test items, 9 were Type A sentences and the other 9 constituted Type B sentences. The 40 distracters consisted of 10 sentences on Binding principle A (i.e. constraints on reflexive pronoun interpretation) and 30 sentences on subjacency. Half of the sentences on subjacency were grammatical, and the other half, ungrammatical.

All items in the 4 versions were targeted to test whether there was any difference in NP2 preferences based on the presence/absence of referentiality. Each item was followed by two choices intended to determine what the relative clause was taken to modify. For instance, one item was *The police arrested the chauffeur of the actor who was accused of dealing drugs*, and this item was followed by the two choices, *The chauffeur was accused of dealing drugs* and *The actor was accused of dealing drugs*. The first always specified modification of NP1, and the second, NP2.

Four versions of the test material and their example sentences are shown in table 1 and 2. Even though Type A and Type B were presented in the same version for the variation effect of testing, it is necessary to report the findings separately. In the analyses, the results of the referentiality effect based on the presence/absence of determiner will compose Analysis 1 and lexical difference between *of* and *as*, Analysis 2. This means that results of Type A will be reported in Analysis 1 and Type B, in Analysis

2. Sentences used in the test are provided in the Appendix.

2.3. Procedure

Each participant was given precise instructions about the characteristics of the experiment. Participants were encouraged to answer as quickly as possible, relying on their feeling, and not to go back and change their decision. Practice stimuli were given in order to familiarize the participants with the test format. The entire questionnaire took approximately 40 minutes to administer.

Table 1. Example sentences in each condition

Type	Example test item
Type A (+Det)	Yesterday they gave me the sweater of the cotton that was illegally imported.
Type A (-Det)	Yesterday they gave me the sweater of cotton that was illegally imported.
Type B (of)	The explosion deafened the assistant of the inspector who was near the warehouse.
Type B (as)	John was hired as assistant of the inspector who is in charge of public safety.

Table 2. The structure of each version used in the experiment

Version	Type
Version 1	Type A (+Det) + Type B (of)
Version 2	Type A (-Det) + Type B (of)
Version 3	Type A (+Det) + Type B (as)
Version 4	Type A (-Det) + Type B (as)

3. Results and Discussion of Analysis 1

In analysis 1, percentage of NP2 choice in relative clause attachment will be compared in different conditions: Whether NP2 was introduced by a determiner or not. When a determiner precedes NP2, it increases referentiality of the NP2 rather than the reverse case. Table 3 shows the mean percentage of NP2 choice in Type A by native speakers and second language learners.

Table 3. Mean percentage of NP2 choice in Type A.

	Type A (+Det)	Type A (-Det)
NS	55%	26%
NNS	18%	20%

Native speakers strongly preferred NP2 when it followed a determiner than when it did not (compare 55% vs. 26%). In other words, native speakers noticed the presence of the definite article and interpreted the NP2 in this situation as more referential, illustrated by a higher choice of NP2 in the Type A (+det) condition. For native speakers, an analysis of variance conducted on the mean percentage of choices of NP2, averaged over all forms of each sentence, indicated a significant difference among the means for the different types ($F(7, 71) = 41.75, p < .001$). Adding a determiner to NP2 in the Type A (+det) led to a dramatic increase in NP2 choice, from 26% to 55% (See Gilboy et al., 1995, p. 153). The claims about referentiality were clearly confirmed by native data.

In contrast, learners did not show any referentiality effect. The presence of the determiner did not affect the tendency of choosing NP2. They invariably chose NP2 at a very low rate, 18% for sentences in which the second NP of complex NP head was introduced by the determiner, and 20% for sentences in which it was not.

To see the general response pattern of second language learners with respect to Type A, an analysis of variance with definiteness (\pm determiner) and NP type (NP 1 or NP2) as independent variables and the number of NP choice as a dependent variable was conducted. There was no main effect of definiteness ($F(1, 156) = .035, p > .05$); the presence/absence of determiner did not affect NP2 choice. That is, referentiality effect was not found. However, there was a main effect of NP type ($F(1, 156) = 411.144, p < .05$). This means that NP1 was strongly preferred regardless of referentiality. In other words, learners processed NP1 as the preferable head of the relative clause in all conditions, even though NP1 is located farther from the relative clause than the NP2. This consistent strong preference for NP1 seems to oppose previous findings about second language processing, which claim that recency effect (i.e. NP2 preference) is the general parsing strategy among adult second language learners (see Papadopoulou & Clahsen, 2000). It is not clear why participants went out of the way to choose an element which had been processed earlier (and

closed early in parsing), and at the same time was located farther from the relative clause to attach. There was no interaction effect between referentiality and NP choice ($F(1, 156) = .311, p > .05$).

To summarize, the data in Type A construction show that while native speakers were sensitive to the referentiality effect by preferring the NP2 with a preceding definite article to the NP2 without, second language learners did not show this sensitivity.

4. Results and Discussion of Analysis 2

As illustrated in table 4, NP2 choice greatly increased as the complex NPs took the preposition *as* in both native and second language groups. As stated above, by putting the complex NPs as the complement of *as*, the referentiality of the NP1 has decreased and therefore, the referentiality of NP2 has correspondingly increased. Manipulation of the complex NPs by differing referentiality of the NPs has been effective on second language learners in Type B, while it was not in Type A. There is an asymmetry of referentiality effect in second language processing depending on how the referentiality is manifested in the sentences. I will come back to this issue in the next section.

Table 4. Mean percentage of NP2 choice in Type B.

	Type B (of)	Type B (as)
NS	35%	83%
NNS	34%	68%

As shown in table 4, embedding the complex NPs as a complement of *as* in type B (*as*) sentences, which was intended to make NP1 nonreferential, increased percentage of NP2 choices from 35% to 83% for native speakers and from 34% to 68% for learners.

For native speakers, an analysis of variance conducted on the mean percentages of choices of NP2, averaged over all forms of each sentence in analysis 2, indicated a significant difference among the means for the different sentence types ($F(7, 71) = 41.75, p < .001$) (See Gilboy et al., 1995 : 153).

To see the second language learners' behavior regarding Type B, an

analysis of variance with the preposition type (*of* or *as*) and NP type (NP 1 or NP2) as independent variables and the number of NP choice as a dependent variable was conducted. There was no main effect of the preposition type ($F(1, 156) = .000, p > .05$); the contrast between *of* and *as* did not affect NP2 choice. Also, there was no main effect of NP type ($F(1, 156) = .457, p > .05$). However, there was an interaction effect between the preposition type and NP type ($F(1, 156) = 106.256, p < .05$). This interaction effect overrides main effects. Therefore, the interpretation of the results of analysis of variance should indicate that any difference found must be attributed to the fact that NP1 was preferred in Type B (*of*) construction, while NP2 was preferred in Type B (*as*) construction. This means that the tendency of NP2 choice of learners is not different from that of native speakers.²⁾

To summarize, the data in Type B construction clearly confirm the claims that second language learners exhibit compatible results with native speakers.

5. General Discussion

Generally, the two experiments on testing referentiality show separate results between language groups based on sentence types. In experiment 1, native speakers and learners diverged, however, in experiment 2, converged.

In experiment 1, where the referentiality was tested by the presence/absence of the definite article before NP2, native speakers distinguished Type A (+det) from Type A (-det), showing higher preference for NP2 in the former than in the latter type. Native speakers interpreted an NP introduced by a definite article more referential, thus preferring it as a head NP of the relative clause, suggesting that they rely on referentiality. However, second language learners did not distinguish the presence/

2) It is interesting to note that removing the determiner from NP1 in type B (*as*) does not make any significant difference in choosing NP2 as host of the relative clause, 84% vs. 81% (Gilboy et al., 1995, p. 154). We can presume that NP1 must be nonreferential whether it is preceded by a determiner or not. Thus, to have balanced test items between the two types, sentences in type B (*as*) contained the determiner before NP1 as in type B (*of*) in the current study. And it does not contort the assumption that NP1 must be nonreferential in type B (*as*) in any case.

absence of the determiner consistently. It seems that learners were not aware of the presence/absence of the determiner, thus not having been influenced by it.

In experiment 2, however, native speakers and learners showed similar pattern of relative clause attachment preferences. Both groups strongly preferred NP2 in Type B (*as*) construction than in the other construction. It is questionable, even though the two experiments were testing the same thing, referentiality, that one experiment showed convergent results between language groups, the other, divergent results. Why is this so? One possible explanation would be that syntactic property of the factors which distinguish referentiality in the two experiments might cause different degrees of referentiality in second language processing. The distinguishing factor in experiment 1 was the determiner, which belongs to the functional category. A word in the functional category has no descriptive content and serves essentially grammatical functions. Hence, it does not possess explicit semantic information (Chomsky, 1995) in syntax theory. On the contrary, test sentences in experiment 2 were distinguished by the prepositions *of* and *as*, which are words in the lexical category. A word of the lexical category is associated with idiosyncratic descriptive property and thus contains semantic saliency. The syntactic behavior of a member of the lexical category is different from that of the functional category in terms of grammatical function (theta assignment and feature checking) (Chomsky, 1995; Radford, 1997)³.

It is possible that members of the lexical category involve more explicit and visible syntactic function than those in the functional category, therefore represent a higher degree of referentiality. The lexical preposition *as* can be a theta assigner and form its own thematic domain, making NP2 more referential.

Put differently, elements in the lexical category show a strong indicator of referentiality than elements in the functional category in regard to the relative clause attachment preference for second language learners.

3) A word in the functional category can be defined as a member which has no descriptive content and which serves an essentially grammatical function. A functional category is a category like INFL, COMP, D, T, AgrS, etc. whose members are functors (i.e. items with an essentially grammatical function). On the other hand, a word in the lexical category is contrasted with functional (and hence means nonfunctional). A lexical category is a category whose members are contentives (i.e. items with idiosyncratic descriptive content): hence, categories such as noun, verb, adjective or preposition are lexical categories in this sense (Radford, 1997, p. 508, p. 514).

Therefore, there was no difference between the two conditions in Type A (\pm determiner) with respect to second language processing, while there was significant difference between the two conditions in Type B (*of* vs. *as*). That is why while discrepant results were shown in Type A between native speakers and learners, a converging response pattern was shown in Type B. It is not out of track to assume that elements in functional category are less visible and more abstract, resulting in no referentiality effect, compared to the lexical elements which can be postulated with more explicit and distinct referentiality contrast.

6. Conclusion

Two types of sentences have been used to examine the referentiality effect in relative clause attachment preferences. It was hypothesized that more referential element would be preferred as the head of the relative clause and it was confirmed by the data of native speakers. Interestingly however, second language learners in this study showed split results according to the sentence types. While they were not sensitive enough to notice the presence/absence of the determiner, thus providing no referentiality effect, they distinguished complex NPs including *of* from *as*, showing referentiality effect in this case.

As shown in the previous studies, findings of the current paper suggest that referentiality effect does not apply to the same degree to all types of sentences within a language. Depending on the grammatical function of the distinguishing factor, whether it is a word in functional category or lexical category, second language learners showed a differentiated preference pattern with respect to relative clause interpretation.

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Appendix

Type A (\pm determiner)

1. In the garage we keep the table of (the) wood that John carved this Christmas holiday.
2. To my sister they gave the lamp of (the) alabaster that they polished until it looked like marble.
3. Yesterday they gave me the sweater of (the) cotton that was illegally imported.
4. In the end Tomas brought the shawl of (the) wool that was very expensive.
5. Maria made the belt of (the) leather that Pedro liked a lot.
6. Finally they placed the bell of (the) bronze that they brought from the foundry.
7. Yesterday we ate the cake of (the) rice that they sold us in the oriental shop.
8. The young actress admired the gown of (the) silk that was so beautiful.
9. The neighbor placed in the square the block of (the) stone that they bought in the quarry.

Type B (as)

1. John was hired as the assistant of the inspector who is in charge of public safety.
2. Janet worked as the chauffeur of the actor who the studio hired.
3. Kathy excelled as the secretary of the manager who was responsible for Personnel.
4. Marcie is as happy as the nurse of the surgeon who directed hospital scheduling.
5. Billy threw away his chance to become the assistant of the tailor who made garments for the British princess.
6. Rita failed as the advisor of the assistant who set internal policy.
7. Samuel was not content as the masseur of the skater who appears on commercials.
8. Jill started out as the consultant of the director who organizes cultural events.
9. Leslie is the translator of the ambassador who objects to phone

conferencing.

Type B (of)

1. The explosion deafened the assistant of the inspector who was near the warehouse.
2. The police arrested the chauffeur of the actor who was accused of dealing drugs.
3. Next month they will assign to the foreigner the secretary of the manager who works long hours in the office.
4. Most of the patients liked the nurse of the surgeon who just started to work in the hospital.
5. I was talking to the apprentice of the tailor who was in Paris for a while.
6. Tomorrow I have a date with the advisor of the assistant district attorney who they introduced to me at Mary's party.
7. I was told that the manager of the soccer who was on TV yesterday had been fired.
8. Yesterday I saw the consultant of the director who was upset because of the pitiful response to the latest sales promotion.
9. During the meeting the chief protocol tried to the translator of the ambassador who did not have an invitation to the party.

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