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Syntactic Ambiguity Resolution in First and Second Languages

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Abstract

정윤희. 2016. 12. 31. **제1언어와 제2언어의 중의문 해결 방안**. 이중언어학 65, 257-279. 이 연구는 제1언어와 제2언어의 언어처리 전략을 조사하기 위한 연구로서, 관계사절 중의문에 대한 해결 방안을 관찰하는 방법을 통해 한국어 화자와 영어 사용이 지배적인 상황에 놓인 영어와 한국어 능통 화자를 비교하고 있습니다. 연구에서는 한국어 지배적인 실험자들은 forward transfer를 보였고, 영어지배적인 실험 대상들은 backward transfer를 보였는데 이는 이 실험 대상들이 영어 지배적이든 한국어 지배적이든 상관없이 지배적인 언어의 분석전략을 사용했다는 것을 보여주고 있습니다. 이는 언어의 기간과 양이 실험자들의 분석전략 발달에 직접적으로 영향을 주었다는 것을 의미한다고 해석할 수 있다. 즉 이 연구를 통해 영어를 제2언어로 배우는 학습자들은 universal account로 설명될 수 없다고 볼 수 있다. 그리고 최근의 연구에서 언어우위성(language dominance)과 언어능숙도를 충분히 구별하고 있지 않다는 점을 지적할 수 있다. **(대구가톨릭대학교)**

【Key words】 언어처리전략(language processing), 제2언어 습득(second language acquisition), 언어변이(transfer), 해석(parsing), 관계사절 중의문 (relative clause attachment)

1. Introduction

Research into human language processing aims to discover how people reach the interpretations of sentences that they do, and to determine the

general attributes of the human ability to process language. A central component of this ability is the syntactic analysis of an incoming sentence, known as parsing, which occurs incrementally as words and phrases are perceived. Among the main issues in studies of language processing are the followings: Does a distinct processor specific to language exist? Are properties of human sentence processing universal or language-specific? How and when do non-grammatical factors contribute to the comprehension of sentences? To answer these questions it is necessary to study the parser's behavior when faced with temporary syntactic ambiguity. An additional set of questions arise when considering the parsing of a second language. Are the preferences and mechanisms in sentence processing carried over from the first language to the second language? Are parsing preferences in a second language acquirable at all? Answers to these questions will also inform out understanding of the human sentence processor and the extent to which it is universal or language-specific, and it is that the present study focuses on. One of the major questions in the study of language processing is whether sentence processing mechanisms are language-specific or are universal across languages. "Garden path" effects point to cognitive limitations imposed on the parsing mechanism, which would be expected to have uniform effects across languages (Frazier 1987, Rayner, Carlson, & Frazier 1983). Yet, recent studies of relative clause (RC) attachment preferences have shown not only clear cross-linguistic variation but also parsing differences between bilinguals and monolinguals (e.g., Cuetos & Mitchell, 1988; Dussias, 2003; Fernandez, 1999; Papadopoulou & Clahsen, 2003). Just as we may study whether and how second language learners can acquire the

target grammar, phonology, pragmatics, etc., so two questions arise about whether and how second language learners might acquire parsing preferences and strategies. First, there is the question of whether bilinguals are able to acquire different sentence processing strategies at all when L1 and L2 differ. If they can, a second question is what effects variables such as language proficiency, language exposure, and working memory capacity have on the acquisition of these parsing strategies. To this end, we will review the influence of language-specific properties and learner-based variables. One variable of such interests is proficiency, which may be related to language processing. The present study investigates the resolution of RC attachment ambiguities, comparing Korean-dominant and English-dominant groups in order to investigate questions of transfer of parsing preferences between Korean (L1) and English (L2), attainment of parsing preferences in a second language, and any correlation between attachment preference and L2 proficiency.

2. Cross-linguistic variation: The Relative Clause Attachment Ambiguity

Many comprehensive investigations of syntactic ambiguity resolution of monolinguals' sentence processing have been done. To examine the strategies and information that native speakers employ when resolving ambiguous constructions, several studies have been performed in a number of different languages (French (Baccino, De Vincenzi & Job, 2000), Dutch (Mitchell & Brysbaert, 1998), German (Hemforth, et al., 2000), Italian (Frenck-Mestre & Pynte, 2000), English (Cuetos & Mitchell, 1988), and Greek (Papadopoulou & Clahsen, 2003).

Universal sentence processing models have been postulated to account for why the human language parser seems to prefer one interpretation of an ambiguous sentence, where two or more alternative interpretations should be possible. This preference can be so strong that if the actual meaning of a sentence goes against the preference, a conscious reanalysis (a “garden path effect”) occurs. For instance, the sentence *Emily put the books on the table in the car* has two interpretations at the point where on the table has been processed but in the car has yet to be heard. Either the books have been put on the table, or the books on the table have been put somewhere that we will shortly discover. There is a very strong tendency for the parser to assign the prepositional phrase (PP) *on the table* as a complement of the verb *put*, and effectively discard the possibility that on the table represents a relative clause headed by the books (*the books on the table*). However, once the parser has committed to this interpretation, a subsequent PP has no way to attach to the syntactic structure. If a second PP is encountered, the prior decision must be reversed and the sentence reanalyzed such that on the table gets a relative clause reading (i.e., Emily put the books that were on the table in the car).

Frazier (1978, 1987), Frazier and Fodor (1978), and Rayner, Carlson, & Frazier (1983) have proposed a locality-based principle, Late Closure, which requires that incoming elements be attached to the lowest or smallest phrase currently being processed. For instance, this principle attempts to account for the parser’s preference given in (1a) to the one in (1b) across languages. In (1a), yesterday is attached to the lower clause, which is currently being processed at that point and so satisfies

Late Closure. In (1b), yesterday is instead attached to a higher clause, predicted to be disfavored by Late Closure.

1a). S1 [John told us S2 [that Mary died yesterday]]
1b). S1 [John told us S2 [that Mary died] yesterday]

This choice is derived from cognitive considerations, such as short-term working memory, which is presumed not to vary systematically across languages (even if it might vary somewhat across individuals). Therefore, Late Closure is hypothesized to be a universal principle of human sentence processing. However, evidence of cross-linguistic variation has been found in several studies; this weakens the universal account of human sentence processing. Cuetos & Mitchell (1988, 1991) found that clear cross-linguistic differences exist in processing strategies used in the resolving RC attachment ambiguity; i.e., the complex NP (NP-of-NP) followed by a relative clause as shown in (2).

2) Someone shot the servant of the actress who was on the balcony.
NP 1(High) NP2(Low) RC

This sentence is structurally ambiguous, since there are two potential host sites for the attachment of the RC, who was on the balcony. That is, the interpretation differs between attachment to the high NP (the actress was on the balcony), and to the low NP (the servant was on the balcony). In their seminal study of cross-linguistic parsing variations, Cuetos & Mitchell found that while English speakers' initial preference was for the low attachment interpretation (the servant), Spanish speakers

showed a preference to attach the relative clause to the higher noun (the actress). Subsequent off- and online studies conducted with monolinguals found a high attachment (HA) preference in Dutch (Brysbaert & Mitchell, 1996, 2000), French (Hemforth, Konieczny & Scheepers, 2000), and Greek (Papadopolou & Clahsen, 2003), and a low attachment (LA) preference in English (Cuetos & Mitchell, 1988) and Portuguese (Miyamoto, 1998). The accumulated evidence from these studies challenge the idea that RCs are parsed according to universal syntactic strategies like Late Closure, and, accordingly, several alternative hypotheses have been proposed, sharing the idea that while the parsing mechanisms may be universal, some syntactic processing strategies are language-specific, and that they therefore must be learned though experience with the target language.

Thus, parsing accounts can be categorized as either Universal or Experienced-based Accounts. Universal accounts would include the Construal Hypothesis (Frazier & Clifton, 1996, 1997), the Implicit Prosody Hypothesis (IPH) (Fodor, 1998, 2002), the Dual System with Anaphoric Binding and Syntactic Attachment (Hemforth, Konieczny & Scheepers, 2000a, b) and the Recency-Predicate Proximity Model (Gibson et al., 1996); Experience-based accounts include the Tuning Hypothesis (Cuetos, Mitchell & Corely, 1996). The Universal accounts' parsing models attribute the observed cross-linguistic differences to language-specific aspects of grammar, rather than to differences in the parser itself; for example, differences in prosody under the IPH, the regularity in using an overt relative pronoun in relative clause under the Dual System, and alternative syntactic representations of the genitive

relationship under the Construal Hypothesis. The Recency-Predicate Proximity Model assumes that the parser follows the structural rules of grammar, but that the weight of these rules with relation to each other can vary across languages. And the Tuning Hypothesis under the Experience-based Account assumes that while the parsing procedures may be universal, some syntactic processing strategies are language-specific and must be acquired through the experience with the target language. Under the Tuning Hypothesis, the parser prefers the analysis that has employed most frequently in the past, and the attachment preferences are decided based on previous experience with related structures.

Some researchers have investigated bilingual sentence processing (e.g., Dussias, 2003; Fernandez, 1995, 1999) and the most interest has been focused on whether bilinguals behave in the same way as monolinguals do when processing target language material. Similarly to first- and second-language acquisition studies, language-specific properties or variables have been considered in order to understand bilinguals' sentence processing features. Most of the attention has been focused the interaction between the first language and second language. In particular, how much L1 processing strategies influence those in the L2 where strategies for the two languages are distinct. With respect to the relationship between the parsing strategies in the L1 and in the L2, there are four main possibilities. First, a bilingual might use distinct strategies, such that the bilingual behaves like monolingual speakers of each language. Second, a bilingual might use the L1 strategy while processing both L1 and L2 ("transfer," or, more specifically, "forward transfer"); see Fernandez (1998), Frenck-Mestre (2002) for findings of this type. A third possibility

is that a bilingual might acquire processing strategies from the L2, but then apply them also to the L1 (“backward transfer”); Dussias (2003) reports findings of this type. A fourth possibility is that the parsing strategies adopted by a bilingual somehow blends the L1 and L2 parsing strategies, leading to behavior that matches neither L1 nor L2 strategies (Papadopoulou & Clahsen, 2003).

3. Study

The present study seeks to examine the effects of L1 and L2 processing strategies on proficient second-language learners of English, focusing on the resolutions of RC attachment ambiguities, by comparing native Korean speakers to second-language learners in both their first- and second-language. The goal of the study is to answer the following questions:

1) Is there a correlation between attachment preferences and English proficiency?
2) Are parsing preferences in Korean (L1) transferred to English (L2) in advanced second-language learners of English?

3.1 Participants

The two groups of study participants, all Korean native speakers, included 25 college students with minimal exposure to English and 28 English-dominant students. The English-dominant students range in age

from 14 to 17, and were exposed to English during their childhood. They currently attend the International School in Korea, where their formal education in Korea is conducted in English.

<Table1> Background information of English/Korean-dominant speakers

Group	Number of participants	Mean age of group (year-old)	Mean length of US residence (years)	Mean of length of English formal education (years)
English-dominant	28	16(14-17)	5.2(4-10)	10(10-11)
Korean-dominant	25	20(19-21)	0	0

The test subjects from the English-dominant group completed a language background questionnaire in which they rated their skills in reading, writing, understanding, and speaking as being better in English than in Korean. They reported using both English and Korean in their daily lives and in both formal and informal contexts. For instance, they use English for academic purposes (at school) and Korean and English with friends and family members (parents of L2 learners especially spoke Korean frequently at home). These participants had been exposed to English before puberty and had been in second-language contexts outside Korea for a mean of 5.2 years. The Korean-dominant group had learned English as Foreign language (EFL), but self-rated their abilities regarding written and oral expression at a level of 1-2 on a 5-point scale of proficiency for English and Native English speakers were also included in the study as a control group. All participants excepts for the native English speaker group also completed a proficiency test, which consisted

of one Cloze test in Korean and another in English, to measure their proficiency skills objectively. The English-dominant group demonstrated advanced skills (like that of native speakers) in English but not in Korean. However, the Cloze test in Korean (modeled on the English test) turned out to be an unreliable measure of Korean proficiency; only two students showed high proficiency in both English and Korean, while all other participants scored very low on the Korean Cloze test. Due to this, absolute results from the Korean Cloze test, and relative comparisons with the English Cloze test, cannot be used in the analysis, but it is nevertheless presumed that the subjects, all native speakers of Korean, are highly proficient in Korean. Table 2 shows the result of Korean and English proficiency test of English-dominant group. All groups were categorized by proficiency score.

<Table 2> The result of English and Korean proficiency test of English-dominant group

	*Advanced	Intermediate	Low
English	25	3	0
Korean	7	10	11

*Advanced: scored from 24-28 Intermediate: 19-23 Low: under 19

<Table 3> The result of English and Korean proficiencytest of Korean-dominant group

	*Advanced	Intermediate	Low
English	0	10	15
Korean	13	2	0

*Advanced: scored from 24-28 Intermediate: 19-23 Low: under 19

3.2 Material

The sentence below in (3) illustrates the Korean version of a structure with a RC attachment ambiguity, with a complex NP and a relative clause.

3) [balkoni-e iss-neun] yeobaeu-ui gae-lul nugunga chong-euro sso-ass-ta.
balcony-loc be-rel actress-pos dog-accsomeone gun-instrument shoot-past
[RC] NP2 NP1
(= Somebody shot the dog of the actress that was on the balcony)

Korean is a head-final language with SOV word order. It presents case markers or postpositions, which indicate the relationship between noun phrases, as shown in (3). The relative clause construction in Korean has an adnominal suffix at the end of the relative clause (e.g., *nun*), and a modifier comes before the modified element. Therefore, the relative order of the head noun and the relative clause in Korean is opposite to that in head-initial languages like English. In Korean, NP2 is closest to the RC, whereas in English, NP1 is closest to the RC. In (3), a "low attachment" would be the interpretation where the actress is on the balcony, associating the relative clause to the first noun encountered, and a "high attachment" is the interpretation where the dog is on the balcony.

According to the previous findings, English monolingual speakers will prefer low attachment (LA) in resolving relative clause attachment ambiguity. Korean monolingual speakers are expected to prefer high

attachment (HA), extrapolating from studies of parsing preferences of Japanese monolinguals (Fernandez & Hirose, 1997; Miyamoto, Gibson, Pearlmutter, Aikawa, & Miyagawa, 1999), given that Korean and Japanese are almost same in terms of sentence order.

The subjects were given a questionnaire with target sentences containing a relative clause, each followed by a comprehension question about the content of the target sentence. Each participant was given both English and Korean versions of the questionnaire, in order to assess the participants' preference of RC attachment in both languages. Examples are given below in (4) and (5). Each questionnaire had 15 items, consisting of 5 ambiguous target sentences and 10 fillers. Subjects were asked to pick the noun which they thought best answered the questions. They were not explicitly informed that the sentences might be ambiguous. Korean examples were presented to the subjects written in Hangul.

Example from English target sentences

4) The journalist interviewed the coach of the gymnast that was sick.
   Q: Who was sick? Coach _____ Gymnast _____
   Example from Korean target sentences. (presented in Korean to subjects but given here in transliteration of the Korean example into Roman characters)

5) cinju-ga noraehagoiss-nun haksaeng-uy sunsaengnim-ul chudaboass-ta.
   friend-sub sing-rel student-pos teacher-acc look-past
   The Friend looked at the student's teacher who was singing.
   Q: nuka noraehanunga (who was singing?)
   sunsaengnim (teacher) _____ haksaeng (student) _____

In addition to the 5 experimental items, 15 filler sentences were added. The filler sentences were similar in length to the target sentences and were disambiguated by number in the English questionnaire, like in (6), and by honorific suffix forms attached to the relative clauses and the thematic preposition with in Korean, like in (7). In (6a), for example, only the high attachment interpretation (the coaches were sick) is available because the verb in the relative clause requires a plural subject and only the higher noun is plural. In (7a), only the low attachment interpretation (the nephew was divorced) because the verb in the relative clause only modifies the noun with the thematic preposition with in Korean. But: In (7b), only the high attachment interpretation (the boss was studying) because the verb in the relative clause includes an honorific suffix that requires an "honorific" subject and only the higher noun (boss) is appropriate for use of that suffix.

Example from English fillers

6a) The journalist interviewed the coaches of the gymnast that were sick. (Forced High)

6b) The journalist interviewed the coach of the gymnasts that were sick. (Forced Low)

Example from Korean fillers

7a) bil-eun yihonul-han jokawaissnun sunsangnim-ege mal-hass-ta (Forced Low)
Bill-sub divorce-rel nephew-with teacher-to talk-past
'Bill talked to the teacher with nephew who divorced'
Who divorced? Nephew ( ) Teacher ( )

7b) Menige-ga gongbu-hagogesinun bise-uy sangsa-lul bogoiss-ta (Forced High)
Manager-sub study[honorific]-rel secretary-pos boss-obj see-past
'The manager saw the boss of the secretary who was studying[hon.]'
Who is studying? Secretary ( ) Boss ( )

Two versions of the Korean questionnaire were used in this study. The first version of the Korean questionnaire was essentially translated from the English version, but a second version was also created with different sentences, in order to avoid the possibility that interpretations chosen in one language could influence the interpretations chosen in the subsequent language. Initial results were obtained using the first (translated) questionnaire in Korean, but they unexpectedly revealed a low attachment preference in Korean, the same attachment preference expected for English. Further results were then obtained with the revised (novel) questionnaire; however, the results from the second version of the Korean test matched those obtained from the first version, as discussed below.

4. Results

Table 4 shows the results across all test items, broken down by attachment response and subject group (full results by item are included as an appendix). Recall that one of the primary research questions of this study was how and whether parsing preferences in Korean (L1) transfer to English (L2) for proficient-second language learners of English. The result from the attachment preference is positive. That is, it is significant

(the difference between the overall responses of the two different subject groups). The Korean-dominant subjects showed HA preference both in Korean and in English; they appear to have transferred the parsing preference from their L1 into their L2. On the other hand, the English-dominant subjects showed low attachment (LA) preference in English, like native monolingual speakers of English; these learners appear to have acquired the parsing preference of the target language. Surprisingly, however, the English-dominant subjects showed a LA preference in Korean as well, unlike the Korean-dominant speakers; having acquired the parsing preference in their L2 appears to have affected their preferences in their L1.

<Table 4> Results across all target sentences

English-dominant subjects

	Answer		Total
	High	Low	
English	31	109	140
	22.1%	77.9%	100.0%
Korean	24	116	140
	17.1%	82.9%	100.0%

Korean-dominant subjects

	Answer		Total
	High	Low	
English	104	21	125
	83.2%	16.8%	100.0%
Korean	109	16	125
	87.2%	12.8%	100.0%

(significant at $\alpha < .0$)

<Table 5> Results of filler sentences disambiguated by plural/singular (Forced Low) in English

	Answer	
	High-preference	Low-preference
English-dominant	19	150
	11.3%	88.7%
Korean-dominant	47	121
	28%	72%
Total	66	281
	19.1%	80.9%

<Table 6> Results of filler sentences disambiguated by plural/singular (Forced High) in English

	Answer	
	High-preference	Low-preference
English-dominant	82	20
	80.3%	19.7%
Korean-dominant	86	26
	84.3%	15.7%
Total	168	46
	78.5%	21.5%

<Table 7> Results of filler sentences disambiguated by honorifics in Korean (Forced High)

	Answer	
	High-preference	Low-preference
English-dominant	58	44
	56.8%	43.2%
Korean-dominant	100	0
	100%	0%
Total	164	60
	73.2%	26.8%

<Table 8> Results of filler sentences disambiguated by *with* in Korean (Forced Low)

	Answer	
	High-preference	Low-preference
English-dominant	39	130
	24%	76%
Korean-dominant	37	131
	22.5%	77.5%
Total	76	261
	22.6%	77.4%

Table 5, 6 and 7 show the results of filler sentences in English disambiguated by plural/singular. The results from the fillers in Korean with Korean-dominant participants showed that most subjects get the unambiguous sentences right. In other words when the sentences contained an honorific form in Korean forcing a HA reading, all Korean-dominant participants picked HA responses as well as with examples force LA (Table 7-8). However, the results from the fillers disambiguated by honorific forms in Korean for the English-dominant participants were inconsistent (Table 7). This might be due to the fact that construction doesn't exist in English, thus English-dominant speakers don't use/hear enough honorifics in their Korean. However, the English-dominant participants consistently picked the LA responses when a filler was forced to LA reading by with. The 5 participants in the monolingual English control group showed a LA preference in ambiguous relative clauses, as expected, and scored in the high proficiency range in the English cloze test.

Our data show clearly different processing strategies between Korean-dominant low-proficiency English speakers and proficient

English-dominant second-language learners. The basic finding here is that Korean-dominant speakers prefer high attachment, whereas English-dominant speakers show a preference for low attachment. That is, parsing mechanisms have been transferred from the stronger L2 towards the weaker L1. The results here suggest that parsing strategies are transferred from the dominant language to the non-dominant one, rather than from the L1 to the L2. That is, parsing preferences in both languages change as the second-language learners acquire proficiency in the second language.

5. Discussion

In this section, the conclusions reached above will be compared with other results from recent studies, some of which have reached similar or compatible conclusions. Several studies have shown that native-like parsing preferences in the L2 can be achieved and correlates with proficiency or exposure, with L1 preferences transferred to processing of the L2 at lower levels of proficiency. Fernandez (1999; 2003) examined RC attachment preferences for monolingual speakers of English and of Spanish and compared them to those of learners of Spanish and English, respectively. What she discovered was that the native speakers of English preferred low-attachment preference more than the learners and Spanish learners of English preferred high-attachment. She interprets this result as indicative of transfer of processing strategy from L1 to L2. Moreover, Fernandez found the correlations between proficiency in English and English-like attachment preferences. Frenck-Mestre (1997; 2002; 2005) also shows that parsing preference in the first language, English and

Spanish specifically, is transferred into the target language, French, on the basis of RC attachment preferences. Dussias (2001; 2003) similarly reports that participants' everyday exposure to the target language correlates with showing native-like L2 parsing preferences.

The results from the previous section showed a kind of reverse transfer, or language attrition, where parsing preferences from the L2 affected parsing in the L1. Other studies have reported cases of reverse transfer in other domains. For example, De Bot, Gommans and Rossing (1991) showed that Dutch immigrants' L1 proficiency in French decreased over time when they had infrequent contact with L1. Carson and Kuehn (1994) examined Chinese students in the US with different proficiency levels and report that L1 Chinese writing proficiency declined as L2 English proficiency increased. Within the domain of sentence processing, at least one study has also shown an effect similar to that found here. Su (2001) investigated L2 learners of English and Chinese at three different proficiency levels to see transfer patterns at the sentence processing level, and found effects of both forward transfer and backward transfer. Su experiments with a sentence translation based on Bates and MacWhinney's Competition Model and reports that, while the English learners of Chinese at a beginner level use L1 strategies in processing both their L1 and L2, backward transfer was observed from subjects at intermediate and advanced levels who employed L2 word order strategies in processing their L1. In the present study, Korean-dominant subjects showed a tendency for forward transfer when resolving RC ambiguities, while English-dominant subjects preferred a backward transfer. That is, these subjects, whether Korean- or English-dominant, used the same

parsing strategies in processing both languages, and they are the parsing strategies of their dominant language. This suggests that the length and quantity of exposure in their language experience directly relates to the development of their parsing preferences.

One conclusion we can reach here is that the parsing preferences of the second-language learners of English in this study is not explicable by the Universal Account, due to the fact that different parsing preferences are found within the same language. They are, however, generally compatible with the prediction of the Experience-Based Account, which accounts for development of parsing strategies through influence of differences in language experience.

One shortcoming of the present study is that it does not sufficiently differentiate language *proficiency* from language *dominance* – perhaps it is really language dominance that makes the difference. That is, perhaps parsing preferences match those in the dominant language, regardless of differences in proficiency. To explore this, another study would be required in the future, perhaps with subjects who all score high on proficiency tests, but differ in whether they are dominant in a HA language or dominant in a LA language.

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