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Influence of L1 and L2 on L3 Sentence Processing: Evidence from Ambiguity Resolution in First, Second, and Third Language Processing*

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Abstract
This study provides a set of cross-linguistic data on the resolution of relative clause attachment ambiguity by Japanese (JNS), Chinese (CNS), and Mongolian native speakers (MNS) in their respective languages using a set of cross-translated sentences. We compared the processing biases of Chinese and Mongolian second language (L2) speakers of Japanese (CJ and MJ) and Mongolian-Chinese third language (L3) Japanese learners, whose first language (L1) is Mongolian and L2 is Chinese, with those of L1 speakers of the three languages. The results for the three L1 groups (JNS, MNS, and CNS) showed that JNS and MNS have a high-attachment preference, while CNS were found to have a low-attachment preference. The results for the L2 group showed that MJ prefer high attachment, but not as strongly as JNS, and CJ prefer low attachment, but not as strongly as CNS. These results indicate the influence of L1 on L2 preference. The results for the L3 group indicate the influence of processing biases from both L1 and L2 on L3 sentence processing. This L3 group showed a high-attachment preference, but JNS and MJ both have statistically significantly stronger high-attachment preferences than L3, which indicates the influence of L2. While there is still a significant difference between the CJ and L3 groups, the L3 group prefer high attachment, which indicates the influence of their L1. We further discuss the relationship between the similarity of sentence processing bias and the influence of the language that learners already know.

Keywords: *parsing strategy, syntactic ambiguity resolution, prenominal relative clauses, second language learners*

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1 Introduction

In recent years, scientific interest within the field of second language (L2) structural processing has turned to the sentence processing of a third language (L3) in multilingual learners. The present study focuses on the influence of L1 and L2 on an L3 by investigating ambiguity resolution in relative clause attachment in L3 learners.

The relative clause (RC) attachment ambiguity, shown in (1)[1], is one of the most heavily studied types of structurally ambiguities in L2 processing studies. In English, when the post-nominal RC *who was on the balcony* is processed, there are two potential attachment sites in the phrase structure tree that has been computed so far—either the servant or the actress could be on the balcony.

(1) Someone shot the servant of the actress [$_{RC}$ who was on the balcony].

Native speakers of English are known to preferentially attach the RC to the immediately preceding noun phrase (NP) *the actress*, which is lower than the NP *the servant* in the phrase structure tree as shown in Figure 1. This attachment of the RC to *the actress* is thus called *low attachment*, whereas attachment of the RC to *the servant* would be called *high attachment*. This is explained by locality preferences, according to which the closest candidate site to the phrase being attached is favored (e.g., Frazier, 1987; Gibson, 1998; Kimball, 1973).

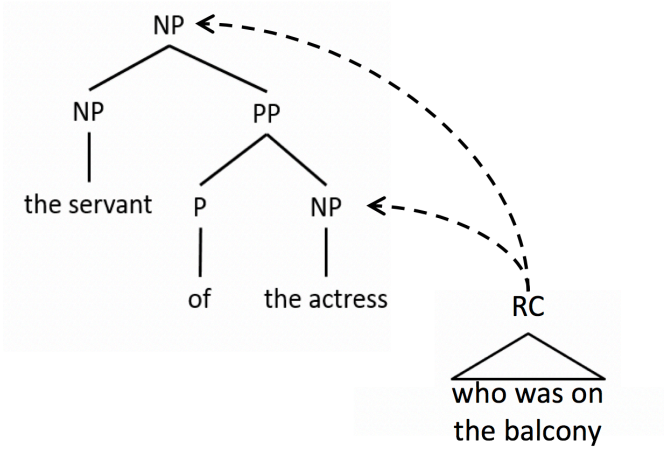

Figure 1: English RC attachment ambiguity for the sentence shown in Example (1)

It is also known that there are cross-linguistic differences in attachment preference (e.g., Cuetos & Mitchell, 1988). For example, English, Norwegian, Romanian, and Swedish speakers (Ehrlich, Fernández, Fodor, Stenshoel & Vinereanu, 1999) tend to choose the closest NP, in this case *the actress*, as the nominal modified by the RC ('head noun' in the following). However, native speakers of languages such as Bulgarian (Sekerina, Fernández & Petrova, 2003), Dutch (Brysbaert & Mitchell, 1996), French (Zagar, Joel Pynte & Rativeau, 1997), German (Hemforth, Konieczny & Scheepers, 2000), Greek (Papadopoulou & Clahsen, 2003), Hindi (Vasishth, Agnihotri, Fernández & Bhatt, 2004), Italian (De Vincenzi & Job, 1993), Brazilian and European Portuguese (Costa, Maia, Fernández & Lourenco-Gomes, 2006), and

[1] The phrase structure in the paper contains only the full phrase level for reasons of simplicity.

Spanish (Cuetos & Mitchell, 1988) tend to interpret the higher NP, in this case *the servant*, as the head noun of the RC in their respective native languages.

Studies in L2 sentence processing have utilized these cross-linguistic variations in RC attachment preference to investigate how the processing biases in the L1 influence L2 sentence processing biases. To date, the results are mixed: some have found evidence for the influence of L1 ambiguity resolution biases on L2 sentence processing (e.g., Fernandez, 2003; Frenck-Mestre & Pynte, 1997; Frenck-Mestre, 1997, 2002), while others have failed to find an effect of learners' L1 processing preference on their L2 parsing (e.g., Papadopoulou & Clahsen, 2003; Roberts, Marinis, Felser & Clahsen, 2004). Rah (2010) investigated transfer effects in two groups of German learners of French for the same constructions and indicated that language dominance was a more reliable indicator of cross-linguistic transfer tendencies than length of exposure to a foreign language.

Most studies on this topic have looked at L1, L2, and even L3 processing differences within head-initial languages such as English, Spanish, and French, where the RCs follow the head noun. Since the entire noun phrase including both potential attachment sites has already been read and processed when the ambiguity is introduced by encountering the RC, the parser has a choice between the alternative attachment sites as shown in Figure 1.

In contrast, languages such as Japanese, Mongolian, and Chinese have the property that the modifier RCs come before the noun that is modified. In languages with prenominal relative clauses such as Japanese (2), the nature of the online processing of an RC-modification ambiguity is essentially different from that of post-nominal RCs, considering the order in which the input is received.

(2)

Dareka-ga	[$_{RC}$ barukonii-ni	iru]	joyuu-no	mesitukai-o	utta.
Someone-NOM[2]	balcony-LOC	was	actress-GEN	servant-ACC	shot

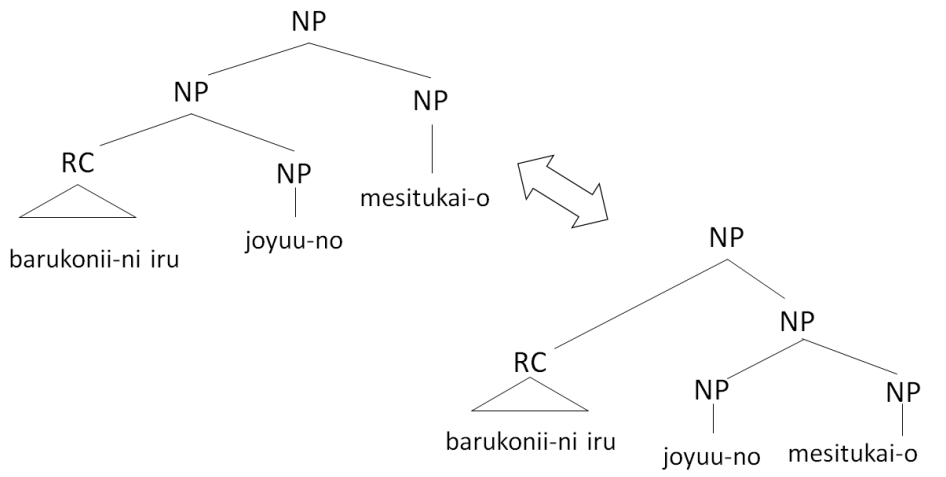

Figure 2: Japanese RC association ambiguity for the sentence shown in Example (2)

[2] Glosses: ACC accusative, DAT dative, GEN genitive, LOC location, NOM nominative, TOP topic. In Table 1 and 2, glosses in brackets are not displayed by all languages, in Table 2, NOM/TOP encode the categories of Japanese and Mongolian respectively.

First, the RC precedes the two possible candidates for its head noun (i.e., RC + NP1-GEN + NP2), as in (2) [$_{RC}$*barukonii-ni iru] [$_{NP}$jyoyuu-no] [$_{NP}$mesitukai-o]*. Second, when the first noun is read, it is the only candidate available for the RC head at this point. The appearance of the second potential noun causes ambiguity in this sentence. If a parser interpreted the RC as modifying the second noun, the parser would have to revise the initial analysis. As shown in Figure 2, RC is the sister of the NP *joyuu-no* in the initial analysis. However, the structure would be changed when the parser interprets the RC as modifying the accusative NP *mesitukai-o*, making the genitive NP and accusative NP sisters. Summarizing the above, the head of the entire NP becomes available only after the second NP is read, which indicates that languages with this order of input presumably require reanalysis to achieve the high-attachment interpretation. This could result in a lesser degree of variation in the ambiguity resolution bias among languages with prenominal relative clauses. Nonetheless, previous studies have demonstrated that the preference can vary between prenominal relative clause languages. For example, Turkish and Chinese speakers prefer low attachment (LA) (Kırkıcı, 2004; Nazik, 2010; Shen, 2006 etc.), while Japanese native speakers settle with high attachment (HA) (Kamide & Mitchell, 1997; Miyamoto, Nakamura, & Takahashi, 2004 etc.). With respect to this eventual high-attachment preference in Japanese, it is still under debate when the reanalysis occurs and why it happens.

The present study has three goals. The first goal is to investigate the processing bias in the RC attachment ambiguity in Japanese, Mongolian, and Chinese by using a set of cross-translated sentences. This is the first cross-linguistic study that tests RC-modification ambiguities in three different languages with prenominal relative clauses using a common set of items. We can thus provide a more precise picture of the cross-linguistic differences in the processing preference among the three languages. Our second goal is to examine whether any differences we find in L2 processing can be explained by differences in the comprehenders' L1 processing biases, thus supporting the idea of transfer of the L1 processing bias. The third goal is to look into the influence of L1 and L2 processing biases on L3 processing and the potential elements that induce the influence of the already known languages on the L3.

2 Experiment 1: L1 judgment in Japanese, Mongolian, and Chinese

A set of off-line questionnaire studies was conducted to examine the RC-modifier ambiguity resolution bias of native speakers of Japanese (JNS, N = 25), Mongolian (MNS, N = 23), and Chinese (CNS, N = 20) in processing their respective native languages. The assumption is that if speakers have no particular attachment bias, their choices between low attachment and high attachment would be at the level of chance.

2.2 Material

All experiments were composed of 16 target sentences such as the one shown in Table 1, and 32 fillers with unrelated structures. All items are translationally equivalent between the two languages and were pre-normed to be plausible in either of the two interpretations in each culture, as discussed in Section 2.3.

Table 1: Sentence example used in off-line tasks

Japanese	youmei-ni	natta	danseikyouin-no	oneesan-wa	totemo	kireida.
Mongolian	ner	aldarshigsan	Eregtaibagshi-in	Egq-en	mash	goybaina
Chinese	you	mingqi-de	nanjiaoyuan-de	jiejie	feichang	piaoliang
Gloss	famous-DAT	became(-GEN)	male teacher-GEN	sister-TOP	very	is_pretty
‘The sister of the male teacher who became well-known is very pretty.’						

In each trial, the participants first read the target sentence and were then asked to answer a question that followed, such as *Dare-ga yumei-ni natta-ka?* ‘*Who became famous?*’, by choosing one of the two options (e.g., A. *danseikyouin* ‘*male teacher*’ or B. *oneesan* ‘*sister*’). In addition, comprehension questions were asked after each of the filler items to ensure participants’ attentiveness. All participants performed at or above 95% accuracy on the comprehension questions.

2.3 Norming test

Even though the experimental sentences in the two languages are direct translations of each other, there might still be some difference in plausibility or naturalness deriving from the differences between the two cultures.

In order to guarantee that there was no plausibility bias between the two interpretations of each experimental sentence, 20~24 native speakers of the three languages respectively, who did not participate in the main survey, rated the naturalness of the propositions corresponding to each of the RC attachment interpretations of each item using a 5-point Likert scale (1 = *unnatural* to 5 = *natural*). For example, the two sentences used to norm the item shown in Table 1 are shown in Table 2.

Table 2: An example item pair for the norming test

a.	High noun as head noun of the RC			
Japanese	danseikyouin-no	oneesan-ga	youmei-ni	natta
Mongolian	Eregtaibagshi-in	igq-gen	neraldarshigsan	baina
Chinese	nanjiaoyuan-de	jiejie	youmingqi	le
Gloss	male teacher-GEN	sister-NOM/TOP	famous-DAT	became
	‘The sister of the male teacher became well-known.’			
b.	Low noun as head noun of the RC			
Japanese	dannseikyouin-ga	youmei-ni	natta	
Mongolian	Eregtaibagshi	neraldarshigsan	baina	
Chinese	nanjiaoyuan	youmingqi	le	
Gloss	male teacher(-NOM)	famous-DAT	became	
	‘The male teacher became well-known.’			

Analysis of the ratings for the two conditions revealed no significant difference in the probability of interpretation of both low- and high-attachment versions of each sentence ($p > .1$ for all pairs).

2.4 Results

In this task, we asked participants to choose between two interpretations, so we can assume that if speakers had no particular attachment bias, their choices between low and high attachment would be at the level of chance.

The results of Experiment 1 are presented in Figure 3. Japanese native speakers chose high attachment significantly more often than the chance level (Wilcoxon signed rank test: JNS: $Z = 3.85$, $p < .001$), whereas Chinese native speakers showed a significant low-attachment bias (CNS: $Z = 2.67$, $p < .001$). These results support previous results that found Japanese native speakers prefer high attachment while Chinese native speakers prefer low attachment. On the other hand, we also find for the first time that Mongolian native speakers prefer the high-attachment interpretation (MNS: $Z = 3.05$, $p < .001$) in this data, similar to the preference of Japanese native speakers. We further compared the data using the linear mixed effect (LME) model, with the speaker group as a fixed factor and participants and items as random factors (Japanese-Mongolian-Chinese translational equivalent pairs were considered as the same items). The results showed that the preferences of Chinese native speakers reading Chinese (CNS) differed significantly from the preferences of both Japanese speakers reading Japanese (JNS) ($\beta = 2.06$, $SE = 0.52$, $Z = 3.96$, $p < .001$) and Mongolian speakers reading Mongolian (MNS) ($\beta = 2.83$, $SE = 0.61$, $Z = 4.57$, $p < .001$). However, there was no statistically significant difference between the preferences of MNS and JNS.

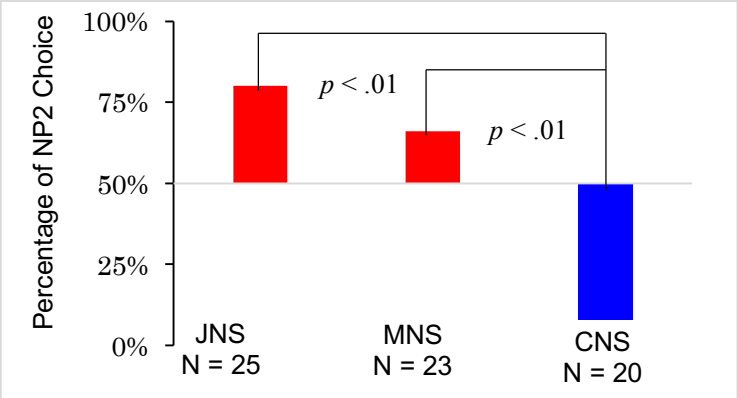

Figure 3: L1 attachment preference in native speakers of Japanese, Mongolian, and Chinese

3 Experiment 2: L2 processing of Japanese by Mongolian and Chinese native speakers

To investigate the effects of the properties of native language processing on L2 processing, we took advantage of the difference in RC attachment bias between Mongolian and Chinese native speakers who learn Japanese as their L2.

Both Japanese and Mongolian language native speakers have a high-attachment bias, which we reported above. Chinese native speakers have a preference for the low-attachment interpretation when resolving structural RC ambiguity. Therefore, our predictions were as

follows: In the process of RC ambiguity resolution in Japanese as an L2, Mongolian L2 learners should prefer the high-attachment interpretation due to the influence of their L1 processing preference. Chinese L2 learners of Japanese, on the other hand, should prefer the low-attachment interpretation if they are influenced by their L1 processing bias.

3.1 Method

Nineteen Mongolian L2 learners of Japanese (MJ) and 21 Chinese L2 learners of Japanese (CJ) were assigned the Japanese version of the questionnaire used in Experiment 1. The results were compared with the results from the Japanese, Mongolian and Chinese native speakers in Experiment 1. The proficiency of all L2 speakers was either N3 or N2, based on the Japanese-language proficiency test, which has five levels from N1 to N5, the easiest level being N5 and the most difficult N1.

3.2 Results

The comprehension accuracy of all participants in the two learner groups was higher than 90%, based on the responses to the filler sentences. Here, we describe the results of Mongolian L2 learners of Japanese and Chinese L2 learners of Japanese, respectively, and summarize them at the end.

3.2.1 Results of Mongolian L2 learners of Japanese

The results showed that Mongolian L2 learners of Japanese prefer high attachment at a rate that significantly exceeds the chance level (NP2: 69%) ($Z = 2.01$, $p < .01$). We further compared these results with those from Experiment 1 using the LME model, with the speaker group as a fixed factor and participants and items as random factors. Analysis showed the high-attachment bias in Mongolian L2 learners of Japanese was not as strong as that of Japanese native speakers, with a marginally significant difference between the two ($\beta = -0.83$, $SD = 0.48$, $Z = -1.71$, $p = .08$). The fact that the percentage of NP2 which indicates high-attachment in Japanese native speakers was higher, as shown in Figure 4, which might indicate that the Mongolian L2 learners of Japanese have not yet attained target-like processing even though their native language and target language have the same attachment preference.

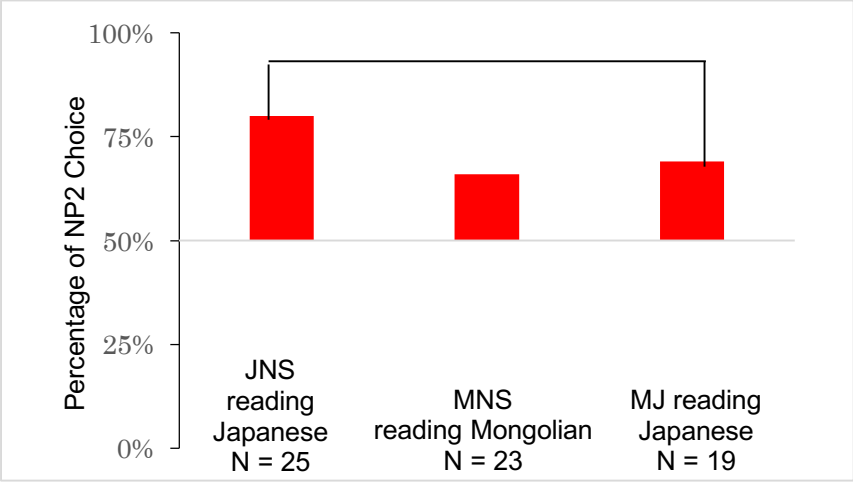

Figure 4: Attachment biases for Mongolian L2 learner of Japanese

To verify that the difference is caused by the influence of L1 processing bias on L2 processing, the next section analyzes the data from Chinese native speakers learning Japanese.

3.2.2 Results of Chinese L2 learners of Japanese

As displayed in Figure 5, the results showed that the Chinese L2 speakers of Japanese have a low-attachment bias that significantly exceeded the chance level ($Z = 2.35$, $p < .01$). We further compared these results with those from Experiment 1 using the LME model as in 3.2.1. We found that the observed bias in Chinese L2 readers of Japanese (CJ) was not as strong as that of Chinese native speakers who read Chinese: there was a significant difference between Chinese native speakers reading Chinese (CNS) and Chinese learners of Japanese (CJ) who read Japanese ($\beta = -2.73$, $SE = 0.57$, $Z = -4.79$, $p < .001$). We also confirmed that Chinese learners of Japanese were more likely to choose a low-attachment reading compared to Japanese native speakers reading Japanese ($\beta = -3.69$, $SE = 0.63$, $Z = -5.84$, $p < .001$). The results indicated that the attachment preference in these L2 learners is a hybrid between that of L1 Chinese and L1 Japanese readers.

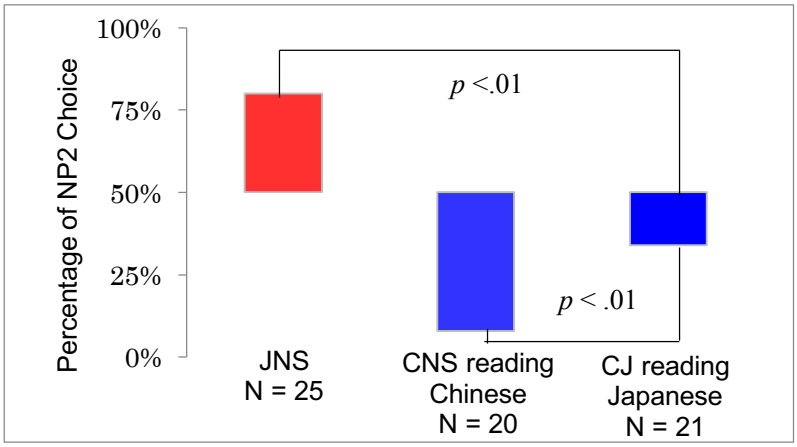

Figure 5: Percentage of NP2 choice in three groups

3.2.3 Comparison of the two learner groups

To examine the relationship between processing-bias similarity and processing-bias influence from L1 to L2, we focused on the comparison between the Japanese native speakers and the two L2 learner groups. The results showed that there was a significant difference between CJ and JNS ($\beta = 2.74$, $SE = 0.56$, $Z = 4.84$, $p < .001$), as well as between CJ and MJ ($\beta = 1.85$, $SE = 0.49$, $Z = 3.74$, $p < .001$), while the difference between MJ and JNS was not significant, as shown in figure 6.

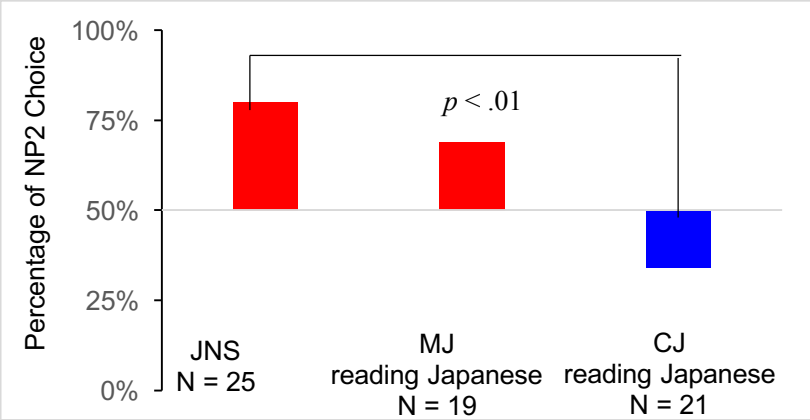

Figure 6: Attachment biases among learner groups

3.3 Summary of the results in the two learner groups

The experimental results from the two groups of Japanese learners whose L1s are Mongolian and Chinese respectively, indicate that the processing bias from each L1 is inherited in the learner's L2 processing.

4. Experiment 3: L3 processing of Japanese by Mongolian-Chinese bilingual learners

To investigate the influence of both L1 and L2 on L3 sentence processing, we surveyed Mongolian-Chinese bilingual learners of Japanese (MCJ). We examined their processing of structural RC ambiguity in Japanese using a questionnaire survey. Our predictions were as follows: 1) If L1 predominantly influences L3 processing, Mongolian biases would appear and MCJ would prefer the high-attachment interpretation, similar to Mongolian native speakers learning Japanese (MJ); there would be a significant difference in processing preference between MCJ and CJ. 2) If L2 predominantly influences L3 processing, MCJ would strongly prefer the low-attachment interpretation, similar to CJ; there would be a significant difference in processing preference between MCJ and MJ.

4.1 Method

Twenty-four Mongolian-Chinese L3 learners of Japanese (MCJ) were assigned the Japanese version of the questionnaire used in Experiment 1. The proficiency of all L3 speakers was either N3 or N2 based on the Japanese language proficiency test, which has five levels from N1 to N5, with N5 being the easiest level and N1 the most difficult. Mongolian native speakers in China are mostly bilingual in Mongolian and Chinese, because Mongolian is their native language, and Chinese is the official language of China. Chinese is acquired in units of lessons of 5 days per week, 45 minutes per day, from the first grade of elementary school until entering university. There are also many opportunities to use Chinese in non-school environments, such as through television programs and other media. After entering university, students often switch between the languages depending on the situation, such as using Chinese in public places and Mongolian in private places. All other education is conducted in Mongolian.

We assumed participants' capabilities in both languages to be similar to those of native language speakers based on their entrance test results. When a Mongolian speaker in Inner

Mongolia Autonomous Region participates in a college entrance examination, they must take language tests in both Chinese and Mongolian. Perfect scores on these tests are 150 points, but it is required of all students to get more than 100 points on both tests. All participants in the study were sophomores at Inner Mongolia University. The students had a high level of cognitive and academic language skills. In addition, in order to ensure that the level of their knowledge of one of the languages was not particularly low, Can-Do-Statement tests were conducted in Mongolian and Chinese. The Can-Do-Statement test is a test to examine what tasks can be done in foreign languages with respect to four skills (reading, writing, listening, talking) by the learner's self-report. In this research, we asked each experiment participant to evaluate the contents of each item according to three categories: *possible*, *incompatible*, and *impossible*. All participants were ranked at or near the highest level for all items in both Chinese and Mongolian tests. An analysis based on the Wilcoxon signed-rank test indicated no significant difference in test results between the two languages ($Z = .16$, $p = .74$). Based on this result, we proceeded with the experiment on the premise that the participants were equally fluent in both languages.

4.2 Results

The comprehension accuracy of all participants in this group was higher than 90.4% based on the responses to the filler sentences.

As displayed in Figure 7, the results showed that the MCJ learners have a high-attachment preference that significantly exceeds the chance level (56%) ($Z = 2.15$, $p = .03$). We further compared the results of MCJ with those of Japanese native speakers and two learner groups using the LME model as was done in 3.2.1. The results showed that the clear bias of MCJ was not as strong as that of either JNS or MJ. MJ showed a stronger preference for NP2 than MCJ did ($\beta = 0.64$, $SE = 0.35$, $Z = 1.78$, $p = .07$). In addition, the JNS preference for NP2 was significantly stronger than the MCJ preference ($\beta = 1.44$, $SE = 0.44$, $Z = 3.26$, $p < .01$). This result showed that MCJ are influenced by Chinese, so their preference for high attachment was weaker than that of MJ and JNS. On the other hand, the results also showed that the MCJ preference for NP2 was significantly stronger than that of the CJ ($\beta = -1.42$, $SE = 0.46$, $Z = -2.43$, $p < .01$). This suggests that the MCJ may also be influenced by the processing bias of their native Mongolian language.

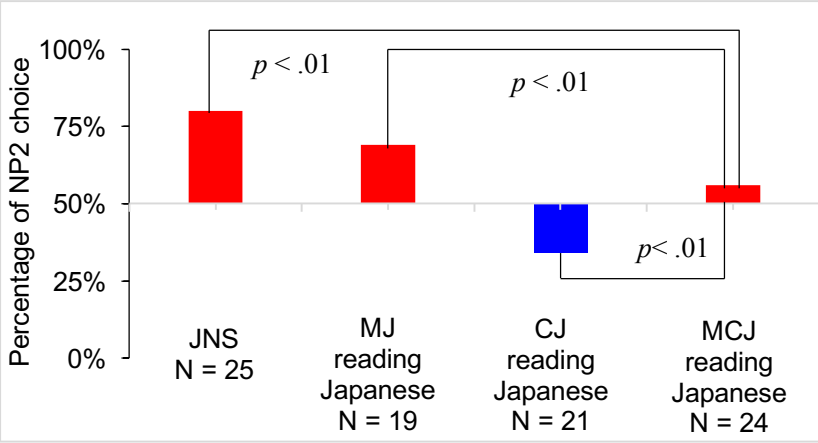

Figure 7: Attachment biases among L3 learner group

To summarize the above results, MCJ are strongly influenced by Mongolian processing biases when resolving RC structural ambiguity in the Japanese language. However, they are also influenced by Chinese, and there was an interpretive difference between the MCJ and Mongolian native speakers learning Japanese as an L2. A significant difference in the choice of NP2 between MCJ and CJ indicates that L3 sentence processing is influenced by the L1. These results indicate L3 processing is also influenced to some degree by the L2, given the significant difference in the choice of interpretations seen between MCJ and MJ. There may be at least two reasons why the influence of Mongolian on MCJ L3 sentence processing is greater than that of Chinese: 1) The syntactic similarity between the target language and the learned language may be a factor. Compared to Chinese, there are many similarity of syntactic features between Mongolian and Japanese like word order, case markers. 2) There is a possibility that the influence of languages that match with the interpretation bias of the L3 is stronger, and the influence of languages that do not match is weaker. We will address these issues in the future.

5. Conclusion

The purpose of this research was to examine the processing bias for structurally ambiguous syntax of relative clauses in Japanese, Mongolian, and Chinese and to consider the influence of the L1 on L2 processing. Furthermore, it also aimed to investigate the influences of the L1 and L2 on L3 sentence processing.

First, in the questionnaire survey that examined L1 sentence processing, the results clearly showed that Japanese and Mongolian have a high-attachment preference, while Chinese has a preference for low attachment. Particularly for Mongolian, this is the first time this has been shown in the empirical data, and it is considered to be new knowledge for the field of sentence processing research. Next, in the questionnaire survey that examined L2 sentence processing, Japanese L2 learners with Mongolian as the L1 were found to prefer the high-attachment interpretation, while Japanese L2 learners with Chinese as their L1 preferred the low-attachment interpretation, which supports the influence of an L1 in L2 processing. Finally, in a survey of Mongolian-Chinese bilingual learners of Japanese, this group showed a stronger preference for the high-attachment interpretation than Chinese native learners of Japanese, but their preference was weaker than that of Mongolian native learners of Japanese, which also suggests that these bilingual learners were influenced not only by their Mongolian L1, but also by the biases of their Chinese L2. In other words, this survey showed that the sentence processing of an L3 is influenced by both of the already-known languages. This may be evidence that the more similar the processing features of the target language and the known language, the stronger the influence will be. The results for L3 sentence processing not only suggest a relationship between sentence processing and similarity of processing features between languages but also add a new direction to L3 sentence processing research.

References

Brysbaert, M., & Mitchell, D. C. (1996). Modifier attachment in Dutch: Deciding between gardenpath, construal and statistical tuning accounts of parsing. In Workshop on Computational Models of Human Syntactic Processing, held at NIAS, Wassenaar.

Costa, A., Maia, M., Fernández, E., & do Carmo Lourenço-Gomes, M. (2006). Early and late preferences in relative clause attachment in Brazilian and European Portuguese. *Interaction*, 1(F2), 1.

Cuetos, F., & Mitchell, D. C. (1988). Cross-linguistic differences in parsing: Restrictions on the use of the Late Closure strategy in Spanish. *Cognition*, 30, 73-105.

De Vincenzi, M., & Job, R. (1993). Some observations on the universality of the late-closure strategy. *Journal of Psycholinguistic Research*, 22(2), 189-206.

Ehrlich, K., Fernández, E., Fodor, J. D., Stenshoel, E., & Vinereanu, M. (1999). Low attachment of relative clauses: New data from Swedish, Norwegian and Romanian. In Poster presented at the 12th Annual CUNY Conference, New York.

Fernández, E. M. (2003). *Bilingual sentence processing: Relative clause attachment in English and Spanish.* John Benjamins Publishing Company.

Frazier, L. (1987). Sentence processing: a tutorial review. In M. Coltheart (Ed.), *Attention and Performance* XII (pp. 559-586). Hillsdale, NJ: Lawrence Erlbaum.

Frenck-Mestre, C. (1997). Examining second language reading: An on-line look. In A. Sorace, C. Heycock, & R. Shillcock (Eds.), *Proceedings of the GALA 1997 Conference on Language Acquisition* (pp. 474-478). Edinburgh: Human Communications Research Center.

Frenck-Mestre, C. (2002). An on-line look at sentence processing in the second language. In R. R. Heredia & J. Altarriba (Eds.), *Bilingual sentence processing* (pp. 217-236). New York: Elsevier.

Gibson, E. (1998). Linguistic complexity: locality of syntactic dependencies. *Cognition*, 68, 1-76.

Hemforth, B., Konieczny, L., & Scheepers, C. (2000). *Syntactic attachment and anaphor resolution: The two sides of relative clause attachment*. Cambridge: Cambridge University Press.

Kamide, Y., & Mitchell, D. C. (1997). Relative clause attachment: Nondeterminism in Japanese parsing. *Journal of Psycholinguistic Research*, 26, 247-254.

Kimball, J. (1973). Seven principles of surface structure parsing in natural language. *Cognition*, 2, 15-47.

Miyamoto, E. T., Nakamura, M., & Takahashi, S. (2004). Processing of relative clauses in Japanese with two attachment sites. In K. Moulton & M. Wolf (Eds.), *Proceedings of NELS* 34 (pp. 441-452). Amherst, MA: GLSA Publications.

Papadopoulou, D., & Clahsen, H. (2003). Parsing strategies in L1 and L2 sentence processing: A study of relative clause attachment in Greek. *Studies in Second Language Acquisition*, 25, 501-528.

Rah, A. (2010). Transfer in L3 sentence processing: Evidence from relative clause attachment ambiguities. *International Journal of Multilingualism*, 7 (2), 147-161.

Roberts, L., Marinis, T., Felser, C. & Clahsen, H. (2004). Antecedent priming at gap positions in children's sentence processing. Poster at the 17th Annual CUNY Conference on Human Sentence Processing, Maryland, March 2004.

Sekerina, I. A., Fernández, E. M., & Petrova, K. A. (2003). Relative clause attachment in Bulgarian. In *The proceedings of the 12th annual workshop on formal approaches to Slavic linguistics. The Ottawa meeting* (pp. 375-394).

Shen, X.J. (2006). Late assignment of syntax theory: evidence from Chinese and English. Doctoral Dissertation. The University of Exeter.

Vasishth, S., Agnihotri, R. K., Fernández, E. M., & Bhatt, R. (2004). Relative clause attachment in Hindi: Effects of RC length and RC placement. Poster presented at the 10th Annual Conference on Architectures and mechanisms for Language Processing (AMLaP), Aix-en-Provence, France.

Zagar, D., Pynte, J., & Rativeau IV, S. (1997). Evidence for early closure attachment on first pass reading times in French. *The Quarterly Journal of Experimental Psychology*: *Section A*, 50 (2), 421-438.