The processing of subject-predicate dependency in Japanese

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In this study, three self-paced reading experiments were conducted to investigate what kind of encoding information affects the processing of subject-predicate dependency in Japanese. Previous studies on the processing of subject-predicate dependency in English nested structures showed locality effects. In Japanese, however, not all subject-predicate dependencies are sensitive to the distance between the two elements. For example, Nakatani (2009) showed that when the matrix subject contains a negative polarity item (NPI) in nested structures, the linear distance between the matrix subject and its predicate increases the cost of associating them, whereas when the matrix subject is a referential NP, there was no significant difference in the reading times at the matrix predicate. Both distant-sensitive and distant-insensitive cases were found in previous studies. However, it is still not clear what type of subject-predicate dependencies are subject to locality effects, so in the present study, we examined locality effects, using different types of matrix subjects.

In Experiment 1, we used the sentences which include "*dare-mo*" ("wh+*mo*" '*nobody*'), or "*dare-mo-ga*" ("wh+*mo*+nominative case marker (NOM) '*ga*' " '*everyone*'), as in (1). Both phrases are universal quantifiers, and contain a wh phrase "*dare*" 'who'. Also, "wh+*mo*" is an NPI, whereas "wh+*mo*+NOM" is not an NPI. The results showed that the reading times in distant condition were slower than local condition in both "wh+*mo*" and "wh+*mo*+NOM" conditions at the matrix predicate region (main effects of DISTANCE and SUBJECT-TYPE were significant; $p < .01$, $p < .05$). At the spill-over region (next region of the matrix predicate), the interaction of DISTANCE and SUBJECT-TYPE was significant ($p < .01$), suggesting that "wh+*mo*" (NPI) cause more processing difficulty than "wh+*mo*+NOM" (non-NPI) as shown in Figure 1. The locality effects were also found in non-NPI condition, even though NPI phrase "wh+*mo*" needs to be licensed in the same clause whereas "wh+*mo*+NOM" phrase does not require licensing. This leads us to a question regarding the wh phrase, and in the following experiment, we investigated whether the locality effects found in Experiment 1 were the characteristics of wh-marked subjects in general.

Experiment 2 was conducted to investigate whether the processing of subject-predicate dependency which has wh "*dare*" and a NOM '*ga*' in matrix subject ("wh+*mo*+NOM") differs from the processing of non-wh subject ("referential NP+NOM"), using the sentences like (2). The results showed that there was locality effects in both wh conditions and referential NP conditions at the matrix predicate region (only the main effect of DISTANCE was significant; $p < .05$, without an interaction with SUBJECT-TYPE) (Figure 2). Experiment 2 showed processing difficulties in the nested structures no matter whether the subject was a wh or a non-wh phrase. In this experiment, the matrix predicate, which is the critical region, was negative, and it might cause extra processing difficulty, so we conducted another experiment to confirm that this effect was found in the subject-predicate dependency regardless of the predicate type.

In Experiment 3, the matrix predicate was changed to negative predicate from affirmative predicate, as shown in (3). Statistical analysis revealed that only the main effect of DISTANCE was significant ($p < .01$), showing the locality effects in both wh conditions and non-wh (referential NP) conditions at the matrix predicate even when the matrix predicate is affirmative (Figure 3).

To sum up, In Experiment 1, we showed the case where the greater processing difficulty occurred in the integration when the matrix subject was an NPI and contained a wh phrase in nested structures. The different results between NPI subject and non-NPI subject in the spill-over region may come from the different encoding information in the input (NPI vs. non-NPI). Experiments 2 and 3 showed that the locality effects were observed in nested structures, regardless of the wh states and of the predicate types. The results of the referential NP cases are not consistent with the previous studies (e.g., Nakatani, 2009). The apparent inconsistency may come from the fact that our stimuli contain the demonstrative "*sono*" 'the' in the embedded subject phrases. When the demonstrative is attached to a referential NP, the encoding information may differ from the bare referential NP phrases, which could result in less reactivation of the matrix subject at the embedded predicate, and lead locality effects at the matrix predicate. This will be a subject of future investigation.

Examples ＆Figures

(1) Experiment 1

a. Distant/NPI Condition:

Wh+*mo* / [the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / believe-not-past-because …

'Nobody believed that the waitress hit the regular customer at the restaurant…'

b. Distant/Non-NPI Condition:

Wh+*mo* -nom / [the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / believe-not-past-because …

'Everyone didn't believe that the waitress hit the regular customer at the restaurant…'

c. Local/NPI Condition:

[the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / **Wh+*mo*** / believe-not-past-because …

'Nobody believed that the waitress hit the regular customer at the restaurant…'

d. Local/Non-NPI Condition:

[the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / **Wh+*mo* -nom** / believe-not-past-because …

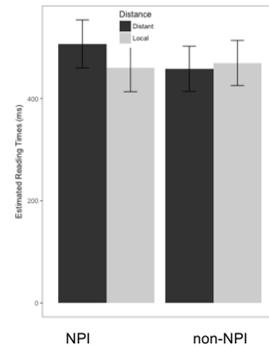'Everyone didn't believe that the waitress hit the regular customer at the restaurant…'

Figure 1. Experiment 1

(2) Experiment 2:

a. Distant/Wh Condition:

Wh+mo-nom / [the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / believe-not-past-because …

'Everyone didn't believe that the waitress hit the regular customer at the restaurant…'

b. Distant/Non-Wh Condition:

cook-nom / [the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / believe-not-past-because …

'The cook didn't believe that the waitress hit the regular customer at the restaurant.'

c. Local/Wh Condition:

[the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / **Wh+mo -nom** / believe-not-past-because …

'Everyone didn't believe that the waitress hit the regular customer at the restaurant…'

d. Local/Non-Wh Condition:

[the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / **cook-nom** / believe-not-past-because …

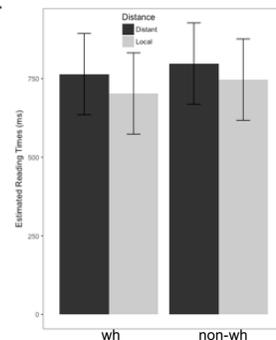'The cook didn't believe that the waitress hit the regular customer at the restaurant…'

Figure 2. Experiment 2

(3) Experiment 3:

a. Distant/Wh Condition:

Wh+mo-nom / [the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / believe-past-because …

'Everyone believed that the waitress hit the regular customer at the restaurant…'

b. Distant/Non-Wh Condition:

cook-nom / [the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / believe-past-because …

'The cook believed that the waitress hit the regular customer at the restaurant...'

c. Local/Wh Condition:

[the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / **Wh+mo-nom** / believe-past-because …

'Everyone believed that the waitress hit the regular customer at the restaurant…'

d. Local/Non-Wh Condition:

[the waitress-nom / restaurant-loc / regular customer-acc / hit-past-comp] / **cook-nom** / believe-past-because …

'The cook believed that the waitress hit the regular customer at the restaurant…'
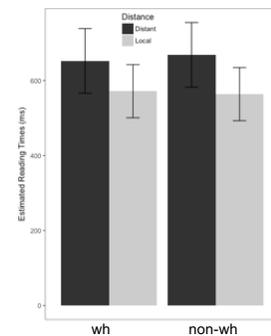

Figure 3. Experiment 3

References

Nakatani, K. (2009) Is the nesting effect caused by structural complexity or structural frequency? A case study of Japanese NPI processing. *Poster Presented at the 22nd Annual CUNY Conference on Human Sentence Processing*, University of California, Davis.