

An Experimental Investigation into Scope Rigidity in Japanese*

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Abstract

This paper investigates the question of whether or not scope rigidity is a feature of the grammar of Japanese. Using a Truth Value Judgment Task experiment, we tested the judgments of 256 native speakers of Japanese on sentences containing both a subject and object quantifier. We conclude that scope rigidity does indeed have a role to play in the grammar of Japanese, but that other factors, such as the choice of quantifier can interact with scope rigidity, allowing for more readings than just the one provided by the surface scope.

Keywords: Japanese, scope, quantification, Truth Value Judgment Task.

1. Introduction

1.1. *Scope Rigidity in Japanese*

Scope ambiguity can be readily illustrated using an example from English:

- (1) Someone criticized every person.
(✓some>every, ✓every>some)

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Sentences of this type, containing an existential and a universal quantifier are classically ambiguous, with one reading, the surface scope reading, in which there is a single person criticizing everyone else, and the inverse reading in which the universal takes the wider scope, and for each person there is a unique critic.

As widely noted in the literature (Kuroda, 1970; Kuno, 1973; Hoji 1985), scope is rigid in Japanese and the scope ambiguity attested in (1) does not occur in the corresponding Japanese sentence:

- (2) a. Dareka-ga hitobito daremo-o hihanshi-ta
someone-NOM people every-ACC criticize-PST
'Someone criticized every person.'
(✓some>every, *every>some)
- b. [Hitobito daremo-o]_i dareka-ga t_i hihanshi-ta.
people every-ACC someone-NOM criticize-PST
'Someone criticized every person.'
(✓some>every, ✓every>some)

In (2a), it is shown that only the surface scope reading is possible for the sentence. The inverse reading, where the quantified object takes scope over the quantified subject is not available. To obtain that reading, scrambling must take place, shown in (2b), where the object has overtly moved to a position at the left periphery of the sentence.

The relative scope of quantified elements is calculated based upon asymmetric c-command. That is, a quantifier takes scope over everything within its c-command domain. In English, the ambiguity is accounted for by LF quantifier raising (QR), which allows the object to move into a position c-commanding the subject. However, Japanese does not take advantage of this mechanism, and only those scope readings reflected by the surface c-command relation of quantifiers is obtained; scope is calculated before, rather than at, LF.

Because of scope rigidity in Japanese, the relative scope of quantified items can be employed as a test of syntactic structure: the available scope reading for a given sentence immediately makes clear the relative c-command relation between quantified elements.

1.2. Challenges to the Rigid Analysis

Recently, there have been challenges made to the claim that scope rigidity is indeed a property of the grammar of Japanese. Futagi (2004) notes the following ambiguous example, whose ambiguity is previously cited by Shoji (1986) and Harada and Noguchi (1992):

- (3) Taro-wa Hanako-dake-to asob-eru.
Taro-TOP Hanako-only-with play-able
'It is possible that Taro plays only with Hanako.' (can>only)
'Hanako is the only person Taro can play with.' (only>can)

This sentence has two possible readings, the first of which being the case where the modal *eru* takes the wider scope over the particle *dake*, making a claim that it is possible that Taro plays only with Hanako, but not ruling out other playmates. Conversely, *dake* can take the wider scope, yielding a reading where Hanako is the only possible playmate for Taro.

While one could attempt to make the argument that the scope of quantified elements might behave differently than the scope of something like a modal, this example still raises a challenge for the claim that Japanese is a scope rigid language. The expectation under scope rigidity is that only one of these readings should obtain, not both. Thus, two questions can be posed for further investigation: (i) how robust is the scope rigidity phenomenon for quantified elements in Japanese? That is, in a case such as (2), with a quantified subject and a quantified object, how pronounced is the effect of scope rigidity? (ii) does scope rigidity depend upon the choice of quantifiers in Japanese? It is these questions that we put to the test using an experimental approach.

The paper is organized as follows: in section 2, we provide a general description of the Truth Value Judgment Task (TVJT) as a means of extracting subtle semantic judgments from native speakers, followed by a more detailed explanation of our implementation of TVJT in section 3. Our experimental results are summarized in section 4, with a discussion of the implications of those findings in section 5. Finally, section 6 provides a brief conclusion and summary of further questions.

2. Truth Value Judgment Task

2.1. The Method

To test scope judgments from a large population, we make use of a Truth Value Judgment Task (TVJT), as described in Crain and Thornton (1998). This method, designed originally for use with children, allows for judgments to be collected in a rich context with little functional load on the participants. This method calls for two experimenters: one telling a story using a series of small toys and props, and another playing the role of a puppet, Mickey Mouse in our case, who watches the story, and then provides a one-sentence summary of the action which took place. The task for participants is to judge whether or not Mickey's statement was true or false in the given context.

In a situation where the stimulus sentence is potentially ambiguous, it can be presented with a story that is compatible with only one of the two readings. For example, sentence (2a) could be presented with a scenario in which there is a group of eight people, shown to be comprised of four critic-criticized pairs (the inverse scope reading). If a participant were to say that sentence (2a) was false in such a scenario, we would conclude that the inverse scope reading is not available to that participant. If the participant answers that the sentence is true, then we would conclude that the inverse scope reading is available. Conversely, the same sentence (2a) could be presented with a scenario in which there is one single person criticizing a large group. Here, a response of "false" would indicate that the surface scope reading is not available. Only if the sentence were true in both scenarios could we conclude that it was ambiguous.

2.2 Implementation

To apply this methodology for adults, we have made some modifications. Firstly, while the original protocol made use of live action presentations for each participant, we video-taped the interactions between the experimenters, focusing on the telling of the story and keeping the experimenter holding the Mickey puppet out of frame. This is not only more appropriate for adult participants, who might view a live performance of the scenarios as childish, but by using recorded scenarios, we ensure that all participants see and hear exactly the same stimulus.

Moreover, we further reduced the role of the experimenter with the puppet by presenting the statement to be evaluated as a printed subtitle on screen, rather than having it spoken aloud. This was done to minimize the effect of intonation upon the judgment of the stimuli. We assume that participants will invoke the Gricean maxim of quality, and expect that Mickey's statement is intended to be a true one. Upon seeing the printed stimulus, participants will assign to the sentence an intonational pattern which is most compatible with judging the sentence to be true in the given scenario.

Finally, while the original protocol is meant to be implemented with one participant at a time, we carried out our experiments in groups of four to six, with one experimenter monitoring the group and controlling the video clips and screen presentations while another delivered the instructions. This does result in the loss of the opportunity to directly follow up on each participant's answer as they work through the stimuli, but it was judged to be a worthwhile choice in that it allowed for many more participants to be surveyed. Justifications for each response were gathered in writing, and all participants were verbally debriefed as a group at the end of the experiment.

3. Experiment Design

3.1. Stimuli

To test the questions posed at the end of section 1, we constructed sentences pairing four different quantifiers (*daremo* 'every', *minna* 'every', *subete* 'all', *futa-* 'two') with the existential quantifier *dareka* ('some'). The four quantifiers were placed in object position, in order to determine whether they could scope over *dareka* in the subject position, similar to the sentence shown in (2a). As a control, stimuli were also prepared in which *dareka* was in the object position, with the other four quantifiers each appearing in subject positions. Crossing the four different quantifiers with two different syntactic positions yields eight different experimental conditions, outlined in Table 1.

To test the judgments, participants were shown a scenario in which three boys are playing in a park with three girls. They play a variety of hide-and-seek in which all the boys hide around the park, and all the girls must seek. By the end of the scenario, each girl has found a boy, and all stand paired,

emphasizing that each girl found a different boy, as shown in Figure 1. The full paradigm of test sentences is shown below in examples (4) through (7). For the stimuli in (7), corresponding to Conditions 7 and 8 where the numeral *futa-* was used, the scenario was slightly modified. In this case, only two of the girls catch one boy each; the scenario ends with one girl not having found a boy, and one boy still in hiding, as shown in Figure 2.

Condition	Subject	Object	Target Scope
1	daremo	dareka	daremo > dareka
2	dareka	daremo	daremo > dareka
3	minna	dareka	minna > dareka
4	dareka	minna	minna > dareka
5	subete	dareka	subete > dareka
6	dareka	subete	subete > dareka
7	futa-	dareka	futa- > dareka
8	dareka	futa-	futa- > dareka

Table 1: Summary of experiment conditions



Figure 1: End state of hide-and-seek scenario (Conditions 1-6)



Figure 2: End state of hide-and-seek scenario (Conditions 7 and 8)

- (4) a. On'nanoko daremo-ga dareka otokonoko-o tsukamae-ta.
 girl every-NOM some boy-ACC catch-PST
 'Every girl caught some boy.' (Expecting true)
 b. Dareka on'nanoko-ga otokonoko daremo-o tsukamae-ta.
 some girl-NOM boy every-ACC catch-PST
 'Some girl caught every boy.' (Expecting false)
- (5) a. On'nanoko minna-ga dareka otokonoko-o tsukamae-ta.
 girl every-NOM some boy-ACC catch-PST
 'Every girl caught some boy.' (Expecting true)
 b. Dareka on'nanoko-ga otokonoko minna-o tsukamae-ta.
 some girl-NOM boy every-ACC catch-PST
 'Some girl caught every boy.' (Expecting false)
- (6) a. Subete-no on'nanoko-ga dareka otokonoko-o tsukamae-ta.
 all-GEN girl-NOM some boy-ACC catch-PST
 'All the girls caught some boy.' (Expecting true)
 b. Dareka on'nanoko-ga subete-no otokonoko-o tsukamae-ta.
 some girl-NOM all-GEN boy-ACC catch-PST
 'Some girl caught all the boys.' (Expecting false)
- (7) a. Futa-ri-no on'nanoko-ga dareka otokonoko-o tsukamae-ta.
 two-CL-GEN girl-NOM some boy-ACC catch-PST
 'Two girls caught some boy.' (Expecting true)
 b. Dareka on'nanoko-ga futa-ri-no otokonoko-o tsukamae-ta.
 some girl-NOM two-CL-GEN boy-ACC catch-PST
 'Some girl caught two boys.' (Expecting false)

Looking at (4a), where the universal appears in the subject position, and the existential in the object position, under the scenario described, scope rigidity would lead us to expect that the sentence should be true for all participants; for each girl there exists a specific boy she caught. However, for (4b), where the quantifiers are reversed and the universal is in the object position under the existential subject, scope rigidity predicts that all participants should evaluate this sentence as false. The surface scope reading describes a situation in which one girl caught all the boys, not one in which each boy is caught by a different girl. Similar predictions are made for the stimuli in (5) through (7). Even where (7) uses the modified scenario, the wide scope reading of *futa-* is expected to be true, reflected by the surface scope of (7a).

The structure of the quantified DP's varies between the quantifiers, with *daremo* and *minna* appearing between the head noun and the case marker, while *subete* and *futari* are positioned at the periphery of the DP preceding the noun and the case marker. Both orderings of elements are attested in a corpus study of the language (Kim, 1995), but the specific choices above were judged by a native speaker of Japanese to be the most natural applications of these various quantifiers. While it does introduce a measure of variation, this choice was made to eliminate the possibility that a peripheral issue such as an unnatural word order might influence the participants' responses. We return to this issue in the discussion section of the paper.

3.2. *Participants*

In all, 256 participants took part in this experiment. All were native speakers of Japanese, living in the city of Vancouver, Canada. To qualify for the experiment, participants could have spent no more than one year living in an English-speaking country. Most were living in Vancouver to pursue ESL studies, and ranged in age from 18 to 39 years old, though the vast majority fell within the 20-30 range. All experiments took place in a classroom at the Vancouver campus of Simon Fraser University.

The sentences described above in (4) through (7) were embedded within a larger TVJT study involving quantifiers and negation. In all, participants saw sentences of numerous different configurations, generally with one quantifier, in either subject or object position, with or without negation. For the eight

conditions in the scope rigidity study, stimuli of each condition were seen by 32 different participants out of the 256 total.

4. Results

The results of our experiment are shown in Figure 3. From these results, we derive four major findings.

Firstly, we see that in subject position, all four of our test quantifiers can take scope over an object existential, reflected in the near universal acceptance of sentences in which the target scope was reflected by the surface structure of the sentence. *Daremo* and *subete* were accepted as having a wide scope reading from subject position for all participants, while the acceptance was slightly lower (but still over 90%) for wide scope readings of both *minna* and *futa-* in the same position.

The second major finding was that in all cases, the acceptance rates for the wide scope readings of our quantifiers were significantly lower when those quantifiers appeared in the object position ($F(1, 254) = 181.04; p < .0001$).

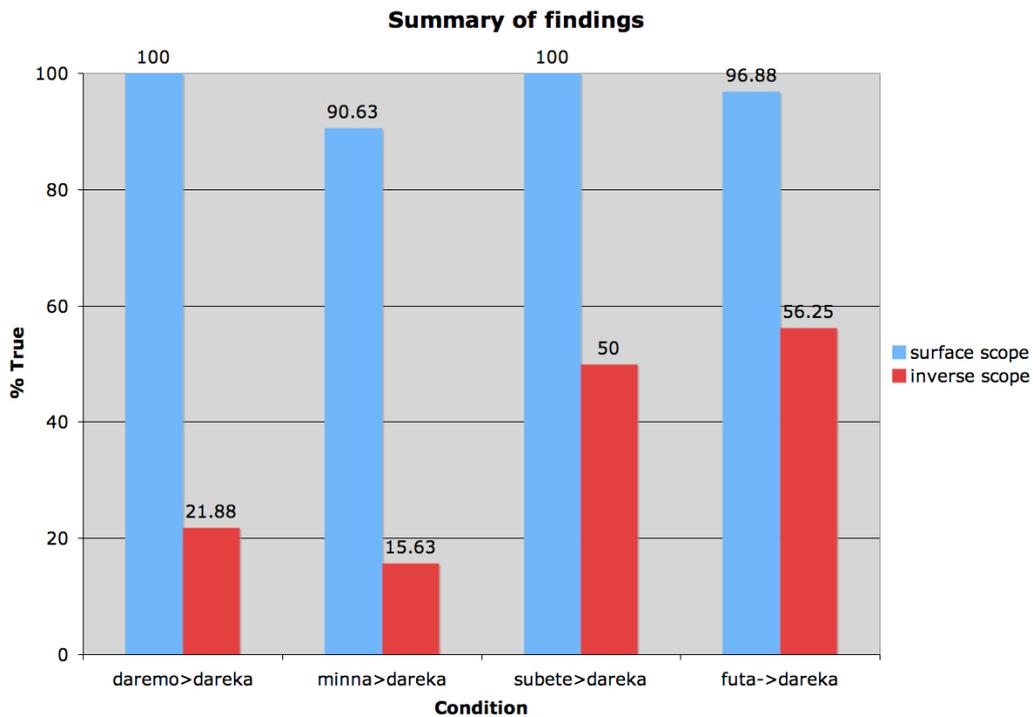


Figure 3: % True responses for each condition

Next, we observe from the distinctions between Conditions 2 & 4 and Conditions 6 & 8 that the wide scope readings of *subete* and *futa-* from object position were significantly more accessible to our participants than the wide scope readings of *daremo* and *minna* from the same position ($F(1, 126) = 18.547$; $p < .0001$).

Finally, an examination of the results for Conditions 6 & 8 indicates that there is no significant difference in the acceptance rates for wide scope readings of *subete* and *futa-* from object position ($F(1, 62) = 2.44$; $p > .05$).

5. Discussion

5.1. Does Japanese have scope rigidity?

The first two findings of section 4 speak to the first question posed at the outset of the paper, is scope rigidity a reality in the grammar of Japanese? The first finding, that there is a near-universal acceptance of the wide-scope readings of the quantifiers in a subject position, demonstrates that surface scope readings are readily available for native speakers of the language. Speakers do not appear to interpret sentences with their inverse readings as opposed to the surface one.

The second finding re-enforces the conclusion that scope rigidity is indeed a reality in Japanese. The significantly lower acceptance of inverse scope readings points toward scope rigidity being a real factor in the interpretation of Japanese sentences. Especially in the case of *minna* and *daremo*, inverse scope readings are simply not available to a majority of Japanese speakers. Even including the cases of *subete* and *futa-* does not change the fact that as a whole: the inverse scope readings were significantly less available for the participants in our experiment. Based on these findings, we conclude that yes, scope rigidity does indeed exist within the grammar of Japanese; scopal interactions are calculated before LF, based upon the surface structure of the sentence before any covert movements after spellout.

5.2. Variability in the results

However, the results from Conditions 6 & 8 cannot be simply dismissed. To

account for the variance with these two cases, we begin by examining the case of *futa-*. Unlike the other three quantifiers in this study, *futa-* is a numeral rather than a universal quantifier. As noted in Reinhart (1997), numerals have the ability to take their scope using a mechanism outside of quantifier raising. Using a choice function strategy, numerals can take scope over a c-commanding quantifier in cases where QR is not structurally possible. We postulate that the increased acceptance for wide scope readings of the numeral from object position is due to this choice function strategy being adopted by some of the participants.

Next, we consider the fourth finding, which is that there was no significant difference between the results for *futa-* and for *subete*. From this finding, we conclude that these two quantifiers receive the same treatment by speakers of Japanese. We therefore further postulate that the choice function strategy is available for *subete* as well as for *futa-*. This is not surprising, as it is not the fact that *futa-* is a numeral which allows the choice function strategy to be employed. Rather, it is the fact that numerals can be considered to be indefinites, and it is indefinites which can make use of the choice function. By extension, we then conclude that *subete* is also acting as an indefinite in a case like (6b).

One factor which remains to be accounted for is the different internal structure of the quantified phrases. As shown through word order and case marking, the object quantifiers in (6b) and (7b) are still within the c-command domain of the subject. As such, there should be no impact on the relative scope between the subject and object quantifiers. However, in his corpus study of Japanese quantified DP's, Kim (1995) notes that the order of noun-quantifier-case marker, as in (4) and (5), is most often used for definite, discourse-old information. This suggests that the *subete* and *futa-* phrases of (6) and (7), having the order quantifier-case marker-noun, may be a signal of indefiniteness, which could encourage the use of the choice function strategy.

6. Conclusion

In short, the answer to both questions posed at the end of section 1 is yes. Japanese does indeed exhibit scope rigidity, and the apparent reach of scope rigidity does depend on the choice of scopal elements. The caveat suggested here is that the findings which appear to contradict the claim that Japanese is a scope rigid language are not a result of a failure of scope rigidity *per se*, but

rather a circumvention of it. It is not that scope rigidity applies only in some cases, but rather that other properties of the lexical items at play may provide different mechanisms for the calculation of scope.

This idea that scope rigidity is not strictly an absolute, but interacts with other factors, is not new to this paper. Work on negation and quantifier scope in Japanese and Korean (a syntactically similar head-final language which has been argued to be scope rigid) has shown that there is disagreement in the literature on whether sentential negation scopes over an object quantifier or vice versa.¹ In those cases, it was concluded that a choice over verb raising was responsible for the various results, rather than a failure of scope rigidity (Han et. al. 2007, Han et. al. 2008).

A wider discussion of the different syntactic and semantic properties of scopal elements, such as modals and negation, and their interactions with scope rigidity is clearly called for, but outside the scope of the present paper. A part of this work would be to determine more systematically whether there are factors (such as word order) which seemed to make it possible to employ the choice function as a means of generating a wide-scope reading not supported by scope rigidity, and why this only happens about half of the time. Also left unanswered at this time is the question of scrambling. The present study only deals with quantified DP's in their canonical positions; variations in the word order and their effect on scope interpretation are held over for future work.

References

- Crain, Stephen, and Rosaline Thornton. 1998. *Investigations in universal grammar: A guide to research in acquisition of syntax and semantics*. Cambridge, Massachusetts: The MIT Press.
- Futagi, Yoko. 2004. Japanese focus particles at the syntax-semantics interface. Doctoral Dissertation, Rutgers, the State University of New Jersey, New Brunswick, New Jersey.
- Han, Chung-hye, Jeffrey Lidz and Julien Musolino. 2007. Verb-raising and grammar competition in Korean: Evidence from negation and quantifier scope.

¹ See Storoshenko (2004) for a discussion of the literature on Japanese, and Han et al (2007) for a similar discussion of Korean.

Linguistic Inquiry 38(1). 1-47.

- Han, Chung-hye, Dennis Ryan Storoshenko and Yasuko Sakurai. 2008. An experimental investigation into the syntax of negation in Japanese. *Language Research* (44)1. 1-31.
- Harada, Yasunari, and Naohiko Noguchi. 1992. On the semantics and pragmatics of *dake* (and *only*). In *Proceedings of Semantics and Linguistic Theory*, volume II. Columbus, Ohio: Ohio State University.
- Hoji, Hajime. 1985. Logical form constraints and configurational structure in Japanese. Doctoral Dissertation, University of Washington.
- Kim, Alan Hyun-Oak. 1995. Word order at the noun phrase level in Japanese. In P. Downing and M. Noonan, (eds.), *Word Order in Discourse*, 199-246. Philadelphia, PA: John Benjamins Publishing Company.
- Kuno, Susumu. 1973. *The structure of the Japanese language*. Cambridge, MA: MIT Press.
- Kuroda, Shige-Yuki. 1970. *Japanese syntax and semantics*. Dordrecht: Kluwer.
- Reinhart, Tanya. 1997. Quantifier scope: how labor is divided between QR and choice function. *Linguistics and Philosophy* 20. 335-397.
- Shoji, Atsuko. 1986. *Dake* and *sika* in Japanese: Syntax, semantics and pragmatics. Doctoral Dissertation, Cornell University.
- Storoshenko, Dennis Ryan. 2004. *Negation and Quantifier Scope in Japanese*. MA Dissertation, Simon Fraser University.