

Acquisition of Floating Quantifiers by L1 English Speakers of L2 Japanese

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1. Introduction

As pointed out by Nakanishi (2007) and others, Japanese numeral quantifiers are subject to a semantic restriction: when they are separated from their host nouns (i.e., the numeral quantifiers are floating), they are not interpreted as collective. By contrast, when they are adjacent to their host nouns, they have either collective or distributive interpretation. This paper reports the results of an empirical study that investigated the following: (i) whether the semantic restriction on floating numeral quantifiers holds true in the grammar of native Japanese non-linguists; and (ii) whether L1 English speakers of L2 Japanese can acquire the semantic restriction on floating numeral quantifiers.

This paper is structured as follows: Section 2 explains the interpretations of floating and non-floating numeral quantifiers in Japanese; Section 3 introduces a previous L2 study on distinct word-order and sentence interpretation; Section 4 presents research questions; Section 5 explains the experiment methodology; and Sections 6 and 7 present the results and discussion, followed by a conclusion.

2. Semantic restriction on Japanese floating quantifiers

Numeral quantifiers (NQs) can appear in different syntactic positions in Japanese. In (1) and (2), the NQ *san-nin* ('three-CL') and the host noun *gakusei* ('student'), which the NQ modifies, are adjacent. By contrast, in (3), the NQ is separated behind the host noun, and is traditionally called a floating numeral quantifier (FNQ). Note that the term 'floating' is conventionally used to refer to the separated quantifiers and is not based on a specific syntactic derivation of the quantifiers. (See Nakanishi (2008) for a review of syntactic proposals regarding derivation of FNQs.)

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(1) Non-floating 1 (prenominal)

[San-nin]-no gakusei]-ga kyoo shukudai-o dasi-ta.
 [three-CL-GEN student]-NOM today homework-ACC submit-PAST
 ‘Three students submitted homework today.’

(2) Non-floating 2 (postnominal)

[Gakusei san-nin]-ga kyoo shukudai-o dasi-ta.
 [student three-CL]-NOM today homework-ACC submit-PAST
 ‘Three students submitted homework today.’

(3) Floating

Gakusei-ga kyoo san-nin shukudai-o dasi-ta.
 student-NOM today three-CL homework-ACC submit-PAST
 ‘Three students submitted homework today.’

FNQs and non-FNQs are different, in terms of not only word order but also interpretation. As shown in Table 1, non-FNQs allow both distributive and collective interpretations while FNQs only allow distributive interpretation (Ishii 1999, Nakanishi 2007). For example, (1) and (2) could be interpreted to mean that three students worked individually and submitted three pieces of homework (i.e., distributive interpretation/multiple-event interpretation), or that three students worked together and submitted one homework (i.e., collective interpretation). In contrast, (3) can only be interpreted as the former (i.e., distributive interpretation). Thus, FNQs are subject to a semantic restriction that does not allow their collective interpretation.

Table 1. Sentence types and their interpretations

	Distributive interpretation	Collective interpretation
Non-FNQs (pre/post- nominal)	✓	✓
FNQs	✓	✗

Nakanishi (2007) suggests that the semantic restriction on FNQs is attributable to the Monotonicity Constraint proposed by Schwarzschild (2002). The Monotonicity Constraint suggests that a measure function (e.g., volume, weight, length, depth) expressed by a measure phrase (e.g., *three liters*, *five ounces*, *three feet*) must track part-whole relations of the element to which the measure phrase applies. For example, in the English pseudo-partitive, *three liters of water*, the measure function (volume) tracks part-whole relations of the noun *water*: when water has a certain volume, its proper subparts have lower volumes and its superparts have higher volumes. Nakanishi extends the Monotonicity Constraint to Japanese NQs in nominal and verbal domains.

When NQs are in a verbal domain, including FNQs, measure function (cardinality) denoted by FNQs must be monotonic, relative to the part-whole structure given by the meaning of the VP. Therefore, predicates which cannot offer subevents, such as collective interpretations of FNQs, fail to form the part-whole structure of the event, and consequently they are incorrect. Nakanishi points out two other characteristics of FNQs: They do not occur with single-occurrence events and individual-level predicates as in (4), and they are attributable to the Monotonicity Constraint. Single-occurrence events and individual-level predicates also fail to offer subevents.

(4) a. ??Gakusei-ga kinoo san-nin sono-isu-o kowasi-ta.
 student-NOM yesterday three-CL that chair-ACC break-PAST
 ‘Three students broke that chair yesterday.’

b. *Uti-no doobutuen-de-wa kaba-ga zannennakotoni san-too osu-dearu.
 Our zoo-at-TOP hippo-NOM unfortunately three-CL male
 ‘In our zoo, unfortunately, three hippos are male.’

As outlined so far, in Japanese, NQs can float. In contrast, in English, only some quantifiers such as *all*, *each* and *both* can float (Kobuchi-Philip, 2007), as shown in (5). Moreover, it seems that floating quantifiers in English do not have the same semantic restriction. In other words, both (5a) and (5b) have collective and distributive reading, unlike in Japanese. Furthermore, the semantic restriction on FNQs is not taught in Japanese language classrooms. Therefore, in order to acquire the correct interpretation of Japanese NQs, native English speakers of L2 Japanese need to understand the semantic restriction on FNQs. This could pose a difficult challenge for them. The next section reviews relevant previous studies regarding syntax and semantic interface.

(5) a. All the students will submit a report tomorrow.
 b. The students will all submit a report tomorrow.

3. Previous studies on floating quantifiers

To the best of the author’s knowledge, few attempts have been made to investigate interpretations of FNQs in Japanese. In many L2 studies, FNQs have been used as a diagnostic to test L2ers’ knowledge of unaccusativity because only unaccusative structures, not unergative structures, allow FNQs (Sorace & Shomura 2001, Fukuda 2017). Acquisition of the semantic distinction between FNQs and non-FNQs has been overlooked.

Among L2 studies on the syntax-semantics interface, Dekydtspotter, Sprouse, & Swanson (2001) may be relevant, as their study suggests that advanced L2ers can successfully acquire the subtle interpretive differences caused by the distinct word orders of L2. Dekydtspotter et al. investigated the interpretation of French interrogatives by L1 English speakers. French has two

types of interrogatives, continuous and discontinuous, as shown in (6). In the continuous interrogative (6a), the interrogative cardinality determiner *combien* ('how many') and its nominal restriction *de livres* ('of books') are adjacent. In the discontinuous interrogative (6b), they are separated.

(6) Two types of French interrogatives:

a. Continuous interrogative

Combien de livres est-ce que les étudiants achètent tous?
 how many of books is it that the students buy all
 'How many books are the students all buying?'

b. Discontinuous interrogative

Combien est-ce que les étudiants achètent tous de livres?
 how many is it that the students buy all of books
 'How many books are the students all buying?'

As (6) shows, the two types of interrogatives have different word orders and they also have different interpretations. Both (6a) and (6b) suppose that there is a context in which two students, John and Mary, are buying books: John is buying Books A, B, and C, while Mary is buying Books A, B, and D. Two answers are possible for the continuous interrogative (6a) in this context: 'three,' i.e., the number of books any given student is individually buying (individual interpretation), or 'two,' i.e., the number of books in common the students are buying (common interpretation). However, for the discontinuous interrogative (6b), only the individual interpretation is possible. Table 2 presents the interpretive differences between the two types of interrogatives.

Table 2. Two types of interrogatives and their interpretations in French

Interrogative types	Individual interpretation	Common interpretation
Continuous interrogative	✓	✓
Discontinuous interrogative	✓	✗

Table 2 shows that discontinuous interrogatives are subject to the semantic restriction, which is relevant to mapping (morpho) syntactic and semantic representations. The semantic restriction on discontinuous interrogatives poses a learnability problem for L1 English speakers of L2 French. In English, discontinuous interrogatives are not grammatical. Moreover, the semantic restriction is not explicitly taught in French language classrooms. Nevertheless, the advanced L2ers in Dekydtspotter et al. made the distinction between the two interpretations just like native French speakers. Consequently, Dekydtspotter et al. concluded that L2ers successfully acquired the semantic restriction, which

cannot be triggered simply by L2 input, and so suggests that UG is operative in L2 acquisition.

4. Research questions

- (7) a. Does the semantic restriction on FNQs hold true in the grammar of native Japanese non-linguists?
b. If the semantic restriction holds in (a), is it acquirable by L1 English speakers of L2 Japanese?

The present study raises two research questions in (7). The first question in (7a) concerns the prominence of the semantic restriction on FNQs among native Japanese speakers. As seen in Section 2, the linguistic literature suggests that FNQs must have distributive rather than collective interpretation. However, to the best of the author's knowledge, few empirical attempts have been made to examine whether native Japanese non-linguists truly interpret FNQs with a distributive interpretation. This study aims to clarify whether native Japanese non-linguists make a clear distinction between the collective and distributive interpretations of FNQs. If they do, it follows that the semantic restriction holds true in Japanese. The second question (7b) seeks to clarify whether native English speakers studying Japanese can correctly use the semantic restriction. Few L2 studies have investigated the interpretations of FNQs in Japanese by native English speakers. If we extend the findings of Dekydtspotter et al. and assume that any L2 property of the syntax-semantics interface is acquirable, it can be predicted that native English speakers of L2 Japanese with advanced proficiency levels can acquire the semantic restriction.

5. Experiment

5.1. Participants

Twenty-two native Japanese speakers and eighteen native English speakers of L2 Japanese participated in the experiment. All native Japanese speakers, serving as a control group, were university freshmen (non-linguistics majors), who had never been abroad for more than three months. The L2ers were residents of Japan at the time of testing. Their understanding of Japanese, including knowledge of grammar and vocabulary, was confirmed in a written cloze test adapted from Okuma (2015) consisting of 33 items. Their accuracy rates were between 33% and 97%, and their proficiency level was judged as intermediate to advanced. Because of limited numbers, the L2ers served as one group in the statistical analyses later. Table 3 summarizes the participants' profiles. In the table, figures represent group means, with ranges in brackets.

Table 3. Participants

(J represents Japanese)						
Group	n	Age (years old)	Score on the J pro- ficiency test (%)	Age of first exposure to J	Formal education (years)	Naturalistic exposure to J (years)
L2ers	18	33 (24-54)	67 (33-97)	22 (13-38)	4.0 (0.5-15)	5.6 (0.1-227)
Native J speakers	22	22 (18-23)	n.a.	n.a.	n.a.	n.a.

5.2. Tasks

5.2.1. Pre-test

Prior to the main experiment, a pre-test was conducted to check whether the L2ers knew that Japanese allows FNQs. In this small grammaticality judgement test, L2ers judged how far they felt that the written Japanese test sentences were odd or natural on a 4-point scale from -2 (very odd) to +2 (perfectly natural). The test sentences were of three types: Non-floating 1 (prenominal), Non-floating 2 (postnominal), and Floating, as shown in (8), which was previously presented as (1)-(3). Each type included two test sentences.

(8) a. Non-floating 1 (prenominal)

[San-nin]-no gakusei]-ga kyoo shukudai-o dasi-ta.
[three-CL-Gen student]-NOM today homework-Acc submit-PAST
'Three students submitted homework today.'

b. Non-floating 2 (postnominal)

[Gakusei [san-nin]]-ga kyoo shukudai-o dasi-ta.
[student three-CL]-NOM today homework-ACC submit-PAST
'Three students submitted homework today.'

c. Floating

Gakusei-ga kyoo [san-nin] shukudai-o dasi-ta.
student-NOM today three-CL homework-ACC submit-PAST
'Three students submitted homework today.'

The purpose of the pre-test was to identify and exclude L2ers who were not aware that Japanese allows FNQs. I had predicted that L2ers without this knowledge would consistently choose +2 for prenominal NQs and -2 for FNQs. However, no L2er exhibited this behavior, suggesting that they were all aware, at least to some extent, that Japanese allows FNQs. Consequently, all L2ers tested went on to participate in the main experiment.

5.2.2. Main experiment

A truth-value judgement task was administered to the participants. They were presented with combinations of written contexts and Japanese sentences, and asked to judge whether the sentence matched the context by choosing one of the three responses, *tadashii* ('true'), *machigai* ('false'), or *wakaranai* ('I don't know'). This task was presented in a 3x2 design, which manipulated the sentences (three types: non-floating, floating, or floating with *de* marker) and the context (two types: distributive or collective), creating a total of six conditions, as shown in Table 4. Examples of the test sentences and the contexts are presented in (9) and (10) respectively. Note that the third sentence type (floating with *de* marker) in (9c) can only have collective interpretation. The *de* marker is used to identify the agent performing an action, like *by* in English, and when the *de* marker follows the numeral and the classifier (e.g., *san-nin-de* 'by three people' in (9c)), the sentence can only have collective interpretation. Each condition consisted of 6 combinations of a context and a test sentence, and a total of 36 test items were created, among which 24 were expected to be judged as *true* and 12 as *false* by native Japanese speakers, given that the semantic restriction holds in Japanese. The 36 test items were distributed among 3 lists in a Latin Square design, and were intermixed with 6 distractors in a pseudo-random order. Among the 6 distractors, 3 were expected to be judged as *true* and the remaining 3 as *false* by native Japanese speakers. Consequently, each participant judged 18 items. The contexts provided for the task were written in Japanese for native Japanese speakers, and in English for L2ers, to ensure that each participant understood their meaning.

Table 4. Stimuli conditions and expected responses by the control group

Conditions	Sentence types	Contexts	Expected responses
1	Non-floating	Distributive	✓
2		Collective	✓
3	Floating	Distributive	✓
4		Collective	✗
5	Floating with <i>de</i> marker	Distributive	✗
6		Collective	✓

(9) Test sentences

a. Non-floating (postnominal) : collective or distributive interpretation

[Gakusei san-nin]-ga kyoo posutaa-o tukut-ta.

[student three-CL]-NOM today poster-ACC make-PAST

'Three students made poster(s) today.'

b. Floating : distributive interpretation only

Gakusei-ga kyoo san-nin posutaa-o tukut-ta.
 student-NOM today three-CL poster-ACC make-PAST
 ‘Three students made posters today.’

c. Floating with *de* marker: collective interpretation only

Gakusei-ga kyoo san-nin-de posutaa-o tukut-ta.
 student-NOM today three-CL-by poster-ACC make-PAST
 ‘Three students made poster(s) together today.’

(10) Contexts

a. Collective

Yutaka, Shou, Takuya are male students of the art club of B Junior High School. They worked together at the art club room yesterday and finally made one big poster of the school festival which will be held next month.

b. Distributive

Yutaka, Shou, Takuya are male students of the art club of B Junior High School. Yesterday they individually worked and they each made one poster to announce the upcoming school festival next month. Yutaka put the poster in front of the school gate, Show put the poster in the school ground, Takuya put the poster at school dining hall.

6. Results**6.1. Group results**

Figure 1 shows the group means of the acceptance rates of each interpretation by the native Japanese speakers. The native Japanese group accepted both interpretations of non-FNQs to the same extent (84% of the time). By contrast, regarding the FNQs and the FNQs with *de* marker, they made a clear distinction between the two interpretations. They accepted the collective interpretation of FNQs less frequently than the distributive interpretation (36% vs. 64%, $t(20)=2.23$, $p=0.038$). The acceptance rate of the collective interpretation of FNQs was also significantly smaller than that of non-FNQs (36% vs. 84%, $t(20)=5.55$, $p<0.01$). Regarding the FNQs with *de* marker, the control group accepted the collective interpretation more frequently than the distributive interpretation (97% vs. 9%, $t(21)=19.38$, $p<0.001$).

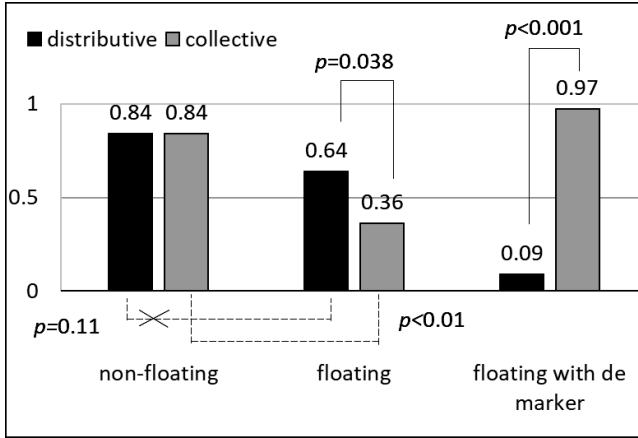


Figure 1. Acceptance rates of each interpretation (the control group)

Figure 2 shows the acceptance rates of the L2 group. Regarding the non-FNQs and the FNQs with *de* marker, the L2 group results were similar to the native Japanese group results. The L2 group accepted both interpretations of non-FNQs to the same extent (75% vs. 67%, $t(17)=0.72$, $p=0.48$). In contrast, they made a distinction between the two interpretations of the FNQs with *de* marker. They accepted the collective interpretation more frequently than the distributive interpretation of the FNQs with *de* marker (76% vs. 28%, $t(16)=3.11$, $p<0.01$). Regarding the FNQs, the L2 group responded differently from the native Japanese group, in that they failed to make a distinction between the two interpretations. The L2 group accepted the distributive interpretation 44% of the time and the collective interpretation 56% of the time, and the difference was not statistically significant ($t(17)=0.75$, $p=0.47$). Thus, the group results show that the L2 group interpreted non-FNQs and FNQs with *de* marker in a similar way to the native Japanese group, but they interpreted the FNQs differently.

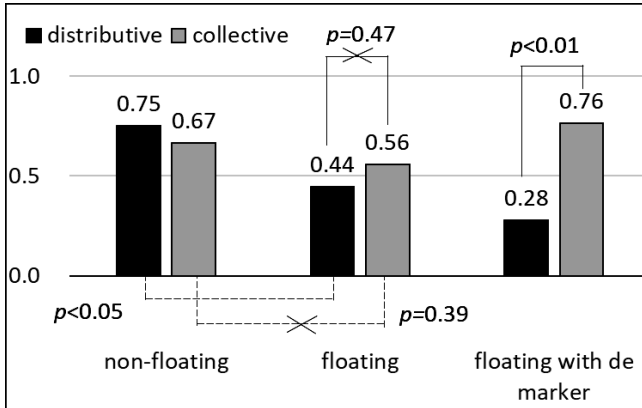


Figure 2. Acceptance rates of each interpretation (the L2 group)

6.2. Individual results

In Section 6.1, we found that the control group accepted the distributive interpretation of FNQs more often than the collective interpretation, while the L2 group failed to make a distinction between the two. This section focuses on the performance of individual participants to clarify whether each L2er could make a distinction between the two interpretations. Figure 3 presents the individual responses to FNQs of the native Japanese speakers for comparison. The bars in Figure 3 represent the difference between the acceptance rate of the distributive and the collective interpretations of FNQs (i.e., distributive minus collective). The horizontal axis represents the twenty-two native Japanese speakers. In the figure, the bars above zero show that the participant interpreted FNQs as distributive rather than collective. The bars that reach 1 on the vertical axis represent that the participant interpreted all FNQs as distributive. By contrast, the bars that reach -1 on the vertical axis represent that the participant interpreted all FNQs as collective. Figure 3 shows that eleven out of the twenty-two total native Japanese speakers accepted the distributive interpretation more frequently than the collective interpretation.

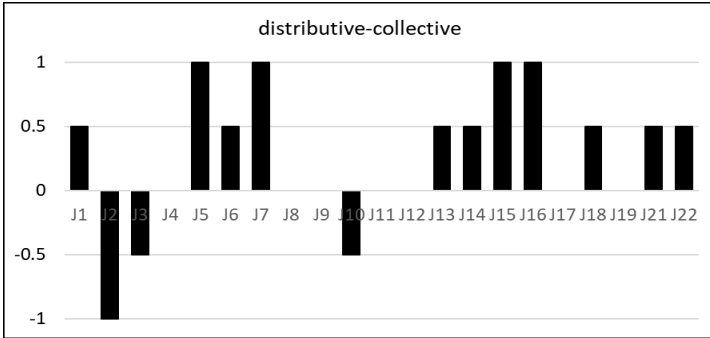


Figure 3. The difference between the two interpretations of FNQs (the control group)

Figure 4 shows the difference in acceptance rates between the individual L2ers. The bars in Figure 4 represent the difference between the acceptance rates of the distributive and collective interpretation of FNQs (i.e., distributive minus collective), just as those in Figure 3. The horizontal axis presents the eighteen L2ers in order of their scores in the Japanese language proficiency test, E1 being the most proficient, and E18 the least. Figure 4 shows that four out of the eighteen L2ers (i.e., E2, E9, E11, and E17) accepted the distributive interpretation more frequently than the collective. In other words, four L2ers successfully made a distinction between the distributive and collective interpretation of FNQs, just as the native Japanese speakers did.

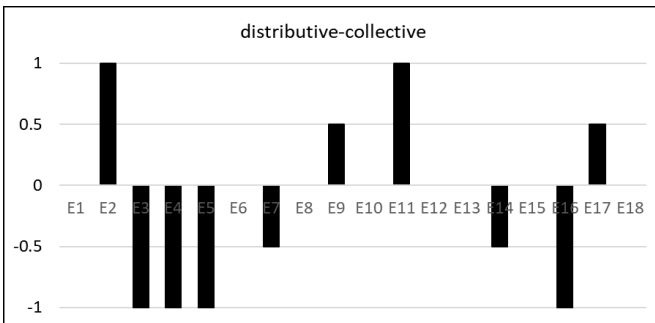


Figure 4. The difference between the two interpretations of FNQs (the L2 group)

7. Discussion

7.1. Discussion

In Section 4, I put forward the following research questions:

- (11) a. Does the semantic restriction on FNQs hold true in the grammar of native Japanese non-linguists?
b. If the semantic restriction holds in (a), is it acquirable by L1 English speakers of L2 Japanese?

Regarding the first question (11a), the native Japanese control group made a distinction between the distributive and collective interpretations of FNQs. The result, following Nakanishi (2007), suggests that the semantic restriction on FNQs holds true in the grammar of non-linguists. As for the second question (11b), the L2 group results suggest that the L2ers did not make a distinction between the two interpretations of FNQs. Nevertheless, the individual results show that four out of the eighteen L2ers made a distinction between the two interpretations, as the control group did. It follows that these individual L2ers have acquired a distinction that is not present in their L1 English. This result is also consistent with previous L2 studies on the syntax–semantics interface, including Dekydsporter et al. (2001) and Dekydsporter and Sprouse (2001) that have suggested that advanced L2ers can successfully acquire subtle interpretative differences between syntactic forms in L2.

7.2. Limitations of the study

This study demonstrates two points: (i) the semantic restriction on FNQs holds true in the grammar of native Japanese non-linguists; (ii) a native English speaker can successfully acquire this restriction, which is not present in L1. To strengthen the reliability of the findings, one aspect must be improved in future studies. The native Japanese control group accepted the correct distributive interpretation only 64% of the time. Similarly, they did not completely reject the incorrect collective interpretation but accepted it 36% of the time. The reason why their judgements regarding FNQs were not categorical should be clarified in future research.

8. Conclusion

This study investigated (i) whether the semantic restriction on FNQs holds true in the grammar of native Japanese non-linguists, and (ii) whether the semantic restriction on FNQs can be successfully acquired by L1 English speakers of L2 Japanese. The truth-value judgement task was administered to twenty-two native Japanese speakers and eighteen L1 English speakers of L2 Japanese to compare their interpretations of FNQs in Japanese. The results suggest: (i) the semantic restriction holds firm in the grammar of native Japanese non-linguists; and (ii) four out of the eighteen L2ers had successfully acquired the semantic restriction, despite it being absent in L1. These results are consistent with previous L2 studies that have investigated acquisition of syntax-semantics interface, including Dekydtspotter et al (2001).

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Floating numeral quantifiers as an unaccusative diagnostic in native, heritage, and L2 Japanese speakers. *Language Acquisition*, Vol. 24, Issue. 3, p. 169. This paper reports on an experimental study that investigates the acquisition of Japanese unaccusative verbs by English-speaking learners. Following Levin and Rappaport Hovav (1995), it is assumed that unaccusativity is syntactically represented but semantically determined. The experiment is devised specifically to examine whether L2 learners are sensitive to syntactic and semantic properties associated with unaccusative verbs in Japanese, which contrast with the properties of unergative verbs.