A Hybrid Approach to Floating Quantifiers: Experimental Evidence

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The non-local dependency between a noun and its associate quantifier has been widely discussed. The details may differ, but the formal analyses on floating quantifiers can be divided into three schools of research. One is an adnominal approach, which argues that the noun and the quantifier are externally-merged together (at some point of the derivation), and that the noun has undergone leftward movement in a later derivation (e.g. Kuroda 1983, Sportiche 1988, Ueda 1990, Bošković 2004). Another is an adverbial approach, which claims that the quantifier modifies the event structure of the verb phrase, and that the noun and the quantifier are not related to each other by movement (e.g. Kayne 1975, Fukushima 1991, Bobaljik 1995, 2003, Brisson 1998, Nakanish 2003, Kim and Yang 2006). The other is a hybrid approach (e.g. Ishii 1998, Kang 2002, Ko 2005, 2007, Fitzpatrick 2006) which argues that some floating quantifiers are adnominals while some are adverbials. This paper evaluates the predictions and validity of the three approaches with new experimental data, and provides evidence for the hybrid approach from on-line processing and off-line judgment data.

Japanese/Korean Linguistics 19.
Edited by Sang Yee Cheon.

1. The Issues

The three major approaches to capture the non-local dependency between a noun and its associate quantifier have different predictions and implications.

On the adnominal approach, floating Q(uantifier) constructions are transformationally related to a corresponding non-floating Q construction. For instance, *the students* in (1a) is externally-merged with *all* in base position, and has undergone leftward movement, as in (1b).[1]

(1) a. $[_{TP}$ ___ $[_{T'}$ have $[_{VP}$ $[_{DP}$ all $[_{DP}$ the students]] had lunch]]]

b. $[_{TP}$ $[_{DP}$ the students$]_1$ $[_{T'}$ have $[_{VP}$ $[_{DP}$ all t_1] had lunch]]]

This approach has some advantages in explaining the close relationship between floating and non-floating Q constructions. The semantic similarities between (1a) and (1b) straightforwardly follow from the claim that they share the base structure. The fact that the floating Q shows the same agreement pattern with its host noun as the non-floating Q is also naturally explained by the adnominal approach (e.g. Shlonsky 1991, Merchang 1996). It also explains the fact that floating Qs appear in original or intermediate positions of its host noun (e.g. Bošković 2004). Floating Qs were also taken as evidence for the predicate-internal subject hypothesis (e.g. Sportiche 1988; see Fitzpatrick 2006 for a summary).

Under the adverbial approach, on the other hand, the quantifier modifies the event structure of the verb phrase, and crucially, the noun and its associate Q are not directly related to each other by syntactic movement. For instance, (1a) and (1b) are not related to each other by syntax. Instead, the "apparent" ability of the adjunct Q to modify the noun is derived *indirectly* by the semantics. Due to the lexical meaning, *all* "maximizes" the external argument of the verbal phrase, as stated in (2) (Dowty and Brody 1984, adopted by Bobaljik 1995).

(2) $[[\text{all}]] = \lambda\ P_{<e,t>}.\ \lambda\ x\ P(\max(x))$

The adverbial approach has some advantages, too. When a floating Q appears in non-argument position, the adverbial approach claims to best explain distribution of the floating Q. Some semantic differences between floating and non-floating Q constructions are also naturally explicable by the adverbial approach (see a detailed discussion by Bobaljik 1995, 2003).

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[1] In the strict sense, *all* is "stranded" in its base position rather than "floated" in an arbitrary place. For the sake of simplicity, however, we use the term *floating* theory-neutrally to denote a non-local dependency between a noun and its associate Q.

Lastly, the hybrid approach argues that both adnominal and adverbial approaches are basically on the right track. It argues that in languages, some floating Qs are adnominal while some are adverbial, and that the two types of floating Qs show different semantic and syntactic properties. For instance, Ishii (1988) argues that floating Qs are ambiguous between a stranded Q and adverbial Q, and that systematic counterexamples to the adnominal Q approaches are limited to the cases where the floating Qs bear a distributive reading, which should be analyzed as an adverbial Q. Fitzpatrick (2006) argues that the split between the two types of floating Qs exists not only between languages (e.g. Japanese vs. English), but also within a single language (e.g. Korean, West-Ulster English). Fitzpatrick (2006) further shows that adverbial floating Qs are characterized by the A-movement-like properties of the host noun, whereas adnominal floating Qs are diagnosed by A'-movement-like properties of the host noun. Fitzpatrick (2006) also shows that exhaustivity is systematically related with the Q types. Ko (2005, 2007) focuses more on syntactic properties of floating Qs, and argues that while the distribution of adnominal Qs is affected by various syntactic factors (e.g. grammatical function of the host noun, argument structure of the verb, and the position of the intervening element), the distribution of adverbial Qs is not restricted by those syntactic factors.

The predictions of the three approaches to floating Qs are divergent. Under the adnominal approach, we predict that the distribution of floating Qs will be restricted by the locality conditions on NP-movement. Under the hybrid approach, on the other hand, only a subset of floating Qs would show such locality effects. On the adverbial approach, floating Qs may appear rather freely as long as event quantification is possible.

Though the predictions can be clearly stated, there has been lack of consensus on which prediction is supported by quantifiable empirical data. Each approach often discusses different sets of data in different languages, and researchers occasionally report different judgments on the same data set, too (e.g. Hoji and Ishii 2005, Miyagawa and Arikawa 2007 for debates on Japanese floating Q data). Moreover, it has been unclear what we mean by "unacceptability". It remains unclear whether "unacceptability" of floating Q constructions comes from mere processing difficulty or quintessential ungrammaticality (cf. Miyagawa and Arikawa 2007 for a suggestion that prosody plays a crucial role in processing floating Q constructions). If the former is correct, we expect that the unacceptability can be overcome in off-line judgment tasks. If the latter is correct, however, we predict that the unacceptability will be maintained both in on-line and off-line tests.

To tackle the issue of judgment variations more properly, we need a controlled experiment on floating Q constructions so that we may apply a statistical analysis on the data. Furthermore, to test whether unacceptability

originates from processing difficulty or ungrammaticality, we need both real time and off-line data. It may be worth noting, however, that linguistically-informed processing studies on floating Qs are in fact quite rare. Miyagawa and Arikawa (2007) properly addressed the issues of prosody in processing floating Qs but conducted a pilot study only. Kang (2002) pointed out the effects of discourse focus, but experimental evidence is yet to be given (see also Kim and Yang 2006 for discussion).

The goal of the study is to evaluate predictions and validity of the three approaches on floating Q constructions with new experimental data from Korean. Korean is a language that is claimed to have both adnominal and adverbial Qs (see Kang 2002, Ko 2005, 2007, Fitzpatrick 2006). Thus, some systematic correlations between various syntactic factors and Q-types are expected. Furthermore, the two types of floating Qs are claimed to be only minimally different from each other in morphology: the adnominal Qs are Caseless and the adverbial Qs are Case-marked. Otherwise, they look the same. Thus, Korean floating Qs may provide an ideal background to test the hypotheses concerning the syntactic differences associated with Q-types.

2. Experimental Design

2.1 Theoretical Background

Ko (2005, 2007) argues that (at least) three factors in (3) are involved in licensing floating adnominal Qs, and claims that the distribution of floating adnominal Qs conforms to the *Edge Generalization*, stated in (4).

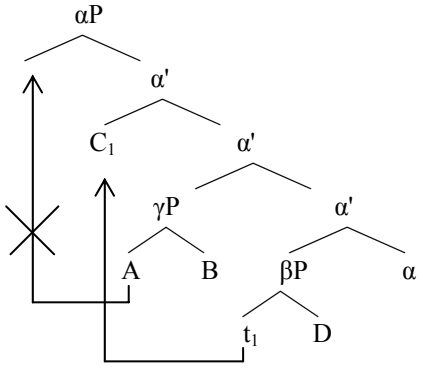
(3) a. Grammatical function of the host noun (e.g. subject vs. object)
b. Type of the quantifier (e.g. adverbial vs. adnominal Q)
c. Argument structure (e.g. unergative vs. unaccusative verb)

(4) *Edge Generalization*
Elements that are externally merged as a constituent in syntactic edges cannot be separated by their domain-mates.

Ko (2005) argues that the Edge Generalization is a consequence of *Cyclic Linearization* (Fox and Pesetsky 2005) and a *probe-goal Search* (Chomsky 2001). As described in (5), when the two elements A and B are base-generated as a constituent at syntactic edge of αP, their domain-mate C may precede or follow them. Crucially, however, A or B would not be able to move over C within αP since they are not in the search domain (i.e. c-command domain) of the head α (Chomsky 2001). Consequently, A and B are not separable by C within αP. If αP is a Spell-out domain, the linear orderings in αP must be preserved in the higher domains, due to Cyclic

Linearization (Fox and Pesetsky 2005). Hence, A and B are not separable by their domain-mate C in the higher domains, either. As in Ko (2005), we call this ordering restriction the *Edge Effect*.

(5) *[A ... C ... B]: *Edge Effect*



If (4) is correct, we make a particular prediction on the distribution of floating Qs. If the floating Q is adnominal (e.g. B in (5)), we predict that the floating Q will show Edge Effects. More specifically, if *v*P is a Spell-out domain (Chomsky 2001), we predict that the external argument (e.g. transitive subject, unergative subject) cannot be separated from its associate Q by their domain-mate (e.g. object). We also predict that the internal argument (e.g. unaccusative subject, transitive object) can be separated by *v*P-internal elements from its associate Q since it may undergo *v*P-internal movement (just like C in (5)). Ko shows that Caseless N(umeral) Qs in Korean show the Edge Effects, as expected for adnominal Qs. Some examples are given in (6).

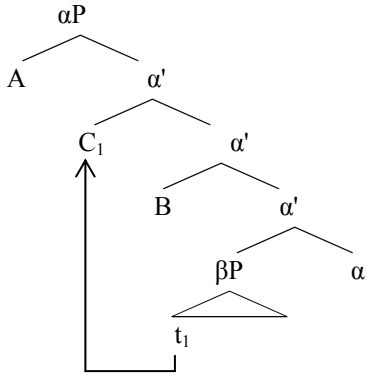
(6) a. ***Haksayngtul-i** maykcwu-lul **sey-myeng** masiessta
Students-NOM beer-ACC 3-CL_{person} drank
'Three students drank beer.' [see B in (5)]

b. **Maykcwu-lul** John-i **sey-pyeng** masiessta
Beer-ACC J-NOM 3-CL_{bottle} drank
'John drank three bottles of beer' [see D in (5)]

Ko (2005) further argues that when two elements are merged at the edge as non-constituents, they are separable by their domain-mate, in contrast to (5). This is illustrated in (7). As shown in (7), the domain-mate C may be merged above B before A is merged (or tuck-in between A and

B) within αP. Hence, A<C<B ordering is possible in split edges. As named in Ko (2005), we call this the *Split Edge Effect.*

(7) √[A ... C ... B]: *Split Edge Effect*



Ko (2005) argues that Case-marked Qs show Split Edge Effects described in (7) (inspired by the proposals of O'Grady 1991 and Kang 2002). Unlike Caseless NQs, the subject-oriented Case-marked Qs may be separated by *v*P-internal elements (e.g. object) from its host noun, as illustrated in (8).[2]

(8) **Haksayngtul-i** maykcwu-lul **sey-myeng-i** masiessta
Students-NOM beer-ACC 3-CL_{person}-NOM drank
'Three students drank beer.' (cf. Caseless NQ in (6a))

Though Ko provides evidence that the predictions depicted in (5) and (7) are borne out, a large-scale experimentation has not been conducted before. Furthermore, on-line processing data have not been provided in the previous studies, either. In this paper, we evaluate Ko's proposal with experimental data more thoroughly, and tie the experimental results with the general discussions of floating Qs presented in Section 1.

[2] In this paper, we categorize the Case-marked Q into an adverbial-type. To be precise, however, the Case-marked Qs may be a different type from adverbial Qs. As long as it is merged as a non-constituent from it host noun (e.g. secondary predicate; Miyagawa 1989), it would show the *Split Edge Effect* (7). Ko (2005) has also argued that focus-marked Qs, universal Qs, and noun-associated NPIs also show the same distribution as Case-marked Qs. For the sake of space, we limit our discussion to Case-marked Qs here. See Ko and Oh (in prep.) for further discussion.

2.2 Stimuli and Predictions

In the experiment, we examined how the three factors in (3) affect on-line and off-line judgments of floating Q constructions. The stimuli consist of 16 types of floating Qs, with 4 tokens each (64 main items). There were 16 fillers. The items were matched in word length. In this paper, we report the results, focusing on the contrast between Caseless NQs and Case-marked NQs.[3] The schema of the main itemis given in (9). As depicted in (9), we tested the effects of verb types (argument structure), Q-types, and the grammatical function of the host noun in processing and judging floating Q constructions. (In (9e-h), *v*P-internal adverbs were used to test the ordering in intransitive verb constructions. See also Ko (2005, 2007) for the behavior of *v*P-external adverbs). See (10) for representative examples for each item.

(9) Stimuli Items

V / Q	*Transitive Verb*		*Intransitive Verb*	
	Subject-oriented NQ	Object-oriented NQ	Unergative subject-NQ	Unaccusative subject-NQ
Caseless NQ	a. S-O-NQ_{subj}	c. O-S-NQ_{obj}	e. S-adv-NQ_{subj}	g. S-adv-NQ_{subj}
Case-marked NQ	b. S-O-NQ_{subj}	d. O-S-NQ_{obj}	f. S-adv-NQ_{subj}	h S-adv-NQ_{subj}

(10) Sample Stimuli Items

a. S<O<NQ_{subj} [transitive subject-oriented Caseless NQ] (cf. (9a))
Haksayngtul-i kongchayk-ul **ney-myeng** sassta
Students-Nom notebook-Acc 4-Cl bought
'Four students bought a notebook'

b. S<O<NQ_{subj} [transitive subject-oriented Case-marked NQ] (cf. (9b)
Haksayngtul-i kongchayk-ul **ney-myeng-i** sassta
Students-Nom notebook-Acc 4-Cl-Nom bought
'Four students bought a notebook'

c. O<S<NQ_{obj} [transitive object-oriented Caseless NQ] (cf. (9c))
Kongchayk-ul haysayngtul-i **han-kwon** sassta
Notebook-Acc students-Nom 1-Cl bought
'Students bought one notebook'

[3] In the experiment, we also examined the distribution of universal Qs (e.g. *motwu* 'all') and focus-marked NQs (e.g. *two-myeng-man* 'two-Cl-only'), which are claimed to show *Split Edge Effects* by Ko (2005). The results from these items are as expected by Ko (2005) (but with some complications on universal Qs). For the sake of space, we omit the discussions on these items. See Ko and Oh (in prep.) for detailed discussion.

d. O<S<NQ_{obj} [transitive object-oriented Case-marked NQ] (cf. (9d))

Kongchayk-ul	haysayngtul-i	**han-kwon-ul**	sassta
Notebook-Acc	students-Nom	1-Cl-Acc	bought

'Students bought one notebook'

e. S<Adv<NQ_{subj}[unergative subject-oriented Caseless NQ] (cf. (9e))

Haksayngtul-i	chulkepkey	**ney-myeng**	wusessta
Students-Nom	happily	4-Cl	laughed

'Four students laughed happily'

f. S<Adv<NQ_{subj}[unergative subject-oriented Case-marked NQ] (cf. (9f))

Haksayngtul-i	chulkepkey	**ney-myeng-i**	wusessta
Students-Nom	happily	4-Cl-Nom	laughed

'Four students laughed happily'

g. S<Adv<NQ_{subj}[unaccusative subject-oriented Caseless NQ] (cf. (9g))

Haksayngtul-i	coyonghi	**ney-myeng**	tulewassta
Students-Nom	quietly	4-Cl	came

'Four students came in quietly'

h. S<Adv<NQ_{subj}[unaccusative subject-oriented Case-marked NQ](cf. (9h))

Haksayngtul-i	coyonghi	**ney-myeng-i**	tulewassta
Students-Nom	quietly	4-Cl-Nom	came

'Four students came in quietly'

Under the hybrid approach proposed by Ko (2005), we predict that only the shaded cells in (9) (*i.e.* items (9a) and (9e)) would show Edge Effects. Under the adnominal approach, differences related to argument structure and the host noun may be relevant. However, no differences between the Q-types are expected. Hence, we expect that (9a),(9b), (9e), and (9f) would show the same Edge Effect. Under the adverbial approach, we expect that the floating Q constructions listed in (9) would behave in the same way (as long as their event structure is not different from each other). The predictions of each approach are summarized in (11).

(11) ***Predictions***

A. Hybrid Approach: Stimuli (9a) and (9e) will show Edge Effects. Hence, processing delay and/or ungrammaticality is expected only for these items.

B. Adnominal Approach: Stimuli (9a),(9b),(9e), and (9f) [namely, all the transitive/unergative subject-related NQs] will show Edge Effects. Hence, processing delay and/or ungrammaticality is expected only for these items.

C. Adverbial Approach: No differences among the stimuli types in (9) are expected (unless a theory of event structure leads us to the contrary).

To test the predictions in (11), we conducted on-line processing (self-paced reading task) and off-line judgment tests (scaled judgment task) with native speakers of Korean. In section 3, we report the results.

3. Experiment

3.1 On-line Study

A time course study was conducted with 74 native speakers of Korean (male 37; female 37) to test when and where, if any, anomaly occurs with floating Q constructions. On-line test stimuli were randomized and presented by the DMDX program (a Windows display program with millisecond accuracy: Forster and Forster 2003). After reading a stimulus, subjects were asked to answer a follow-up question about the stimulus. In our data analysis, we filtered out trials with wrong answers to check-up questions and responses that took more than 2500ms as errors. Consequently, results from 70 subjects were analyzed after filtering. We found statistically significant processing effects in verb position, but not in quantifier position. The mean Response Time (RT) on the verb position is summarized in (12). For statistical analysis, a paired-sample t-test was conducted.

(12) Results: Processing data

	Transitive Verb		*Intransitive Verb*	
	Subject- NQ	Object-NQ	Unergative	Unaccusative
Caseless NQ	a. **556.17ms** S-O-NQ_{subj}	c. 413.97ms O-S-NQ_{obj}	e. **501.30 ms** S-adv-NQ	g. 461.30ms S-adv-NQ
Case-marked NQ	b. 444.54ms S-O-NQ_{subj}	d. 481.15ms O-S-NQ_{obj}	f. 437.72 ms S-adv-NQ	h 550.79ms S-adv-NQ

Consider first the mean RT for the subject-oriented NQs in (12a) and (12b). As shown above, the mean RT for Caseless NQ constructions (12a) was much slower than the corresponding Case-marked NQs (12b). The contrast between (12a) and (12b) is significant ($p<.0001$). Consider also the contrast between the unergative NQs in (12e) and (12f). Similar to the transitive subject patterns, the mean RT for Caseless NQ constructions (12e) was much slower than the corresponding Case-marked NQs (12f) ($p=.003$). We also found a contrast due to the host noun. As shown in the contrast between (12a) and (12c), the subject-oriented NQs slowed down the processing, in comparison to the object-oriented NQs ($p<.0001$). The same type of pattern was also observed in (12e) and (12g). The unergative subject-oriented NQ slowed down the processing, in comparison to the unaccusative subject-oriented NQ ($p=.083$, approaching significance).

Turning to the object-oriented NQs in (12c) and (12d), we found a very interesting inhibition effect due to Case-marking. As demonstrated in (12c) and (12d), Caseless NQs triggered faster RT than Case-marked NQs ($p=.003$). This is surprising given the exactly opposite effects of Case for the subject-oriented NQs in (12a) and (12b). The same type of inhibition effects was also observed with unaccusative subject-oriented NQs in (12g) and (12h). Caseless NQs triggered faster RT than Case-marked NQs when the NQ is associated with the unaccusative subject ($p=.002$) (cf. the contrast between (12e) and (12f) with the unergative subject-oriented NQ).

Overall, the experimental results support the hypotheses of the hybrid approach (3-4). First, the experiment shows that the type of host noun matters in processing floating adnominal Qs. The transitive subject-oriented NQ triggered slower RT than the object-oriented NQ. Second, the result also confirms the prediction that Caseless subject-oriented NQs (adnominal Qs) showed slower RT than Case-marked Qs (adverbial Qs). Third, the result also shows that the type of argument structure matters. The unergative subject-oriented NQ triggered slower RT than the unaccusative subject-oriented NQ. All of these effects were predicted by the hybrid approach proposed by Ko (2005, 2007). Note that the results reported here are not expected either by the adnominal approach or adverbial approach. On the adnominal approach, we would not expect differences due to Q-types, contrary to facts. On the adverbial approach, we have no principled reasons to expect differences reported here.

Very interestingly, we also found inhibition effects due to Case-marking, which has not been observed in any of the previous studies (to the best of our knowledge). When an NQ is associated with a (deep) object, the Caseless NQ is processed faster than the Case-marked NQ. Note, crucially, that in exactly those environments, we expect that there will be no Edge Effects with Caseless NQs (see (5) and (6b)) and that the sentences will be grammatical. Put differently, the result shows that when both adnominal (Caseless) Qs and adverbial (Case-marked) Qs are grammatical, adnominal Qs are processed faster than adverbial Qs. We speculate that this is due to the additional information conveyed by the Case-marker on the NQ. If Case marking carries the semantics of focus and exhaustivity, it is expected that Case-marked NQs are processed slower than Caseless NQs (when both structures are grammatical).[4]

[4] As William O'Grady (p.c.) pointed it out, it would be interesting to test whether Case-marking in general (without an NQ) would trigger the same processing delay. Since Korean allows Case drop, it would be interesting to test whether Case-dropped sentences are processed faster than Case-marked ones. For clarification, when an NQ is associated with a transitive subject, Edge Effects are obtained (e.g. (12a), (12e)). The NQ is simply ungrammatical when

3.2 Off-line Study

To test how the grammaticality judgment holds at the off-line level, we also tested 64 native speakers of Korean (35 males; 29 females) with the same types of stimuli as the on-line study. The participants were asked to judge a sentence with a floating Q with respect to 3 other types of floating Q constructions (scale of 1-4). There were 24 quadruple set of sentences, and the test order was randomized. The off-line test results are summarized in (13).

(13) Results: Judgment data ["4" means absolutely grammatical]

	Transitive Verb		*Intransitive Verb*	
	Subject-NQ	Object-NQ	Unergative	Unaccusative
Caseless NQ	a. **1.78** S-O-NQ_{subj}	c. 2.91 O-S-NQ_{obj}	e. **2.14** S-adv-NQ	g. 2.65 S-adv-NQ
Case-marked NQ	b. 1.96 S-O-NQ_{subj}	d. 2.75 O-S-NQ_{obj}	f. 2.37 S-adv-NQ	h. 2.55 S-adv-NQ

Consider first the contrast between the subject-oriented NQs in (13a) and object-oriented NQs in (13c). The subject-oriented NQs were much less acceptable than the object-oriented NQs ($p<.0001$). Note also that the subject-oriented Caseless NQs in (13a) were also less acceptable than the subject-oriented Case-marked NQs in (13b) ($p=.028$). The same types of patterns were obtained with intransitive verbs. Unergative Caseless NQs in (13e) were significantly less acceptable than unaccusative Caseless NQs in (13g) ($p<.0001$), or unergative Case-marked NQs in (13f) ($p<.0001$).

Note also that the processing delay due to Q-types associated with object-oriented NQs disappeared in off-line judgment tests. As shown in (13c) and (13d), object-oriented Caseless and Case-marked NQs were both judged grammatical, and the difference between the two was not statistically significant ($p=.269$). The same results were obtained with unaccusative NQ pairs in (13g) and (13h). Unlike the on-line test, Caseless (13g) and Case-marked NQs (13h) were judged grammatical, and the difference between the two was not statistically significant ($p=.146$).

The results support for the hybrid approach from quantifiable off-line data. First, we obtained a significant effect of the host noun. The subject-oriented NQs were significantly less acceptable than the object-oriented NQs when separated from its host noun by a *v*P-domain-mate. Second, a significant effect of Q-types was also obtained. Caseless subject-oriented floating NQs (adnominal Qs) were judged significantly less

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separated from its host subject by a *v*P-domain-mate. Hence, the processing delay due to Case-marking cannot be observed with the transitive/unergative subject-oriented NQs.

acceptable than adverbial Qs (Case-marked Qs). Third, the predictions on verb types were also borne out. The unergative NQs showed Edge Effects and were judged significantly less acceptable than unaccusative NQs when separated from its host by a *v*P-domain-mate. The off-line data confirm all the predictions of the hybrid approach adopted in Ko (2005, 2007). Under the hybrid approach, it is also expected that there will be no difference between adnominal and adverbial Qs when they are associated with the object. Since they are not merged on the edge of a Spell-out domain, we expect that both types of floating Q constructions would be grammatical. This is in fact what we have observed in the off-line test.

4. Conclusion

In this paper, we evaluated three major approaches to floating quantifiers, with special attention to Korean numeral quantifier constructions. We have seen significant effects of grammatical function, argument structure and Q-types in processing and judging floating quantifiers, exactly in the direction expected by the hybrid approach. We also found a previously unnoticed fact that when a sentence is grammatical, adnominal floating Qs trigger faster RT than adverbial floating Qs in processing. The overall results provide empirical support for the *Edge Generalization* advanced in Ko (2005).

We also found an interesting asymmetry between processing and judgment data due to the host noun. The processing delay obtained with transitive/unergative subject-oriented Qs was also observed with off-line data (ungrammatical sentences with *Edge Effects*). In contrast, the inhibition effects with object-oriented Case-marked NQs in processing disappeared in the off-line test (grammatical sentences with temporary processing delay). Hence, the current results provide some challenges to the claim that the Edge Effects obtained with the subject-oriented NQs reflect processing difficulty, but not grammaticality (cf. Miyagawa and Arikawa 2007).

At the same time, the results reported in this paper challenge the "across-the-board" adnominal or adverbial approaches, which do not predict such intricate interactions among syntactic factors in processing and judging floating Q constructions. Korean speakers find both processing difficulty and ungrammaticality where we expect Edge Effects under the hybrid approach. Under the adnominal approach, we expect that there would be no differences associated with Q-types. Hence, the differences attributed to Q-types cannot be explained. This result also poses serious challenges to the adverbial approach since there is no obvious reason why the NQ_{subj} and unergative NQ_{subj} are not qualified as an event modifier.

Turning to a more general issue, our study supports the claim that the experimental syntax not only provides a large-scale empirical data but also provide a useful probe into theoretical concern. A controlled experiment helps us to sort out various factors that underlie one phenomenon. Statistical analysis helps us to investigate subtle distinctions. In our case, by conducting a structured experimentation, we were able to evaluate various predictions by competing theories on floating Q constructions. Through experimentation, we may also uncover new patterns which lead to new theoretical questions. Our results suggest that the role of particles attached to a numeral quantifier is a new area of research in processing. In the offline-tests, more studies are needed on discourse effects such as distributivity and exhaustivity in licensing floating Qs. We hope that the current study provides a useful background to deepen our understanding of the processing and grammar of floating quantifier constructions.

Acknowledgement

We thank the participants of our experiments (138 undergraduate and graduate students at Korea University). Thanks also to Mun Hyong Kim, Sunju Kim, and Daeyoung Sohn for their help with data collection and analysis. We are also grateful to the audiences of SICOGG-10 and JKL-19, especially Kamil Ud Deen, Marcel den Dikken, and William O'Grady for their helpful questions and comments. All errors are of our own, of course.

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