

The set of interveners and the nature of intervention itself have been the subject of much debate. Existing theories have tied intervention to the semantics of focus (Kim 2002, Beck 2006, Beck and Kim 2006), quantification (Beck 1996), topichood (Grohmann 2006), prosody (Tomioka 2007), (anti-)additivity (Mayr 2014), and semantic type-mismatch (Li and Law 2016).

In this paper, we offer a new generalization for intervention-hood in Japanese (3), building on an observation regarding disjunction in Shibata (2015a), and present a principled explanation for this pattern of intervention effects in Japanese.

- (3) **Generalization: Intervention correlates with scope-taking**
 Scope-rigid quantifiers above an in-situ *wh* cause intervention. Quantifiers that allow scope ambiguities — i.e., those that allow reconstruction below *wh* — do not.

Following Kotek (2017), we derive this generalization as a corollary of a logical incompatibility between Predicate Abstraction and Rooth-Hamblin alternative computation (see e.g. Shan 2004, Novel and Romero 2009, Ciardelli, Roelofsen, and Theiler 2017, Charlow 2017).

2 Scope-rigidity and intervention

2.1 Shibata (2015a) on disjunction

Shibata (2015a) notes that the scope of different disjunctors correlates with their status as interveners; see (4–5). *Ka*-disjunction is scope-rigid with respect to negation, and acts as an intervener. At the same time, *naishi*-disjunction leads to scope ambiguities and is not an intervener. (We discuss the use of sentential negation for evaluating scope-rigidity in section 3.2 below.) In all intervention examples here, scrambling the *wh*-word above the intervener rescues the structure, as in (1–2) above, but we omit this data for reasons of space.

- (4) ***ka*-disjunction is scope-rigid; *naishi* is not:**
- a. [Taro-**ka** Jiro]-ga ko-**nak**-atta. (Shibata 2015a:23)
 Taro-or Jiro-NOM come-NEG-PAST
 ‘Taro or Jiro didn’t come.’ ✓or > not, *not > or
- b. [Taro-**naishi** Jiro]-ga ko-**nak**-atta. (Shibata 2015a:96)
 Taro-or Jiro-NOM come-NEG-PAST
 ‘Taro or Jiro didn’t come.’ ✓or > not, ✓not > or
- (5) ***ka* is an intervener; *naishi* is not:**
- a. ??? [Taro-**ka** Jiro]-ga *nani*-o yon-da-no? (Hoji 1985:264)
 Taro-or Jiro-NOM *what*-ACC read-PAST-Q
- b. ✓ [Taro-**naishi** Jiro]-ga *nani*-o yon-da-no?
 Taro-or Jiro-NOM *what*-ACC read-PAST-Q
 ‘*What* did [Taro or Jiro] read?’ (Shibata 2015a:98)

The conclusion we draw from this data is that intervention cannot be predicted by the semantics of the quantificational elements alone, since the two disjunctors have equivalent denotations, differing only in their possible scopes at LF.

2.2 Establishing the correlation

We present additional data to show that Shibata’s observed correlation goes beyond disjunction and generalizes to other quantificational elements in Japanese: scope-rigidity with respect to sentential negation correlates with interventionhood. Most of the individual examples and judgments here have been reported in the existing literature on Japanese, but have not been previously collected to highlight this correlation.⁴

First, we show another pair of quantifiers with identical meanings — *wh-mo* universal quantifiers⁵ and *subete* ‘all’ — which vary in their scope-rigidity with respect to negation and concomitantly in their status as interveners. Like with disjunction, only the scope-rigid quantifier is an intervener. This is shown through (6–7).

(6) *wh-mo* universal quantifier is scope-rigid; *subete* is not:

- a. **Da’re-o-mo** tsukamae-**nak**-atta.
 who-ACC-MO catch-NEG-PAST
 ‘*pro* did not catch anyone.’ ✓every > not, *not > every
- b. [**Subete-no mondai**]-o toka-**nak**-atta.
 all-GEN problem-ACC solve-NEG-PAST (Mogi 2000:59)
 ‘*pro* did not solve every problem.’ ✓every > not, ✓not > every

⁴ Translations and glosses for examples from Japanese texts are contributed by the first author. Uncredited examples such as (6a) and (7b) etc. were constructed by the first author with judgments confirmed with one other native speaker, and these patterns accord with generalizations discussed in the literature, as noted. Some spelling has also been changed for uniformity.

⁵ As has been widely noted, there are two, superficially similar *wh-mo* forms in Japanese: the universal quantifier series and the NPI/n-word series. However, these forms are easily distinguishable as (a) universal *wh-mo* but not the NPI series preserve original pitch accents on the *wh*-word and (b) universal *wh-mo* but not the NPI series allow case markers; see e.g. Aoyagi and Ishii (1994). On both counts, the form here is clearly a universal *wh-mo*. (The ’ indicates that the first syllable of *da’re-mo* bears the pitch accent in (6a), echoing the pitch accent on the bare *wh*-word *da’re*.)

The judgment here is predicted by the generalization that the universal *wh-mo* takes scope in the pronounced position of the particle *mo* and cannot reconstruct into a VP-internal base position (Yatsushiro 2009), and therefore cannot scope under negation; see also section 3.2.

- (7) ***wh-mo* is an intervener; *subete* is not:**⁶
- a. ?? **Da're-mo-ga** *nani-o* *kai-mashi-ta-ka?*
 who-MO-NOM what-ACC buy-POLITE-PAST-Q
 Intended: ‘What did everyone buy?’ (Hoji 1985:270)
- b. ✓ [**Subete-no** *gakusei*]-ga *dono-mondai-o* *toi-ta-no?*
 all-GEN student-NOM which-problem-ACC solve-PAST-Q
 ‘Which problem(s) did every student solve?’

The focus particles *-mo* ‘also’ and *-sae* ‘even’ pattern together in taking obligatory wide scope with respect to sentential negation and in being interveners.⁷ We will discuss the ‘only’ particle *-dake* in detail in the following section.

- (8) **Focus particles are scope-rigid:** (Shibata 2015b:235)
 Taro-**mo/sae** *ko-nak-atta.*
 Taro-ALSO/EVEN come-NEG-PAST
 ‘{Even} Taro {also} didn’t come.’ ✓_{EVEN/ALSO} > not, *not > _{EVEN/ALSO}
- (9) ***-mo* ‘also’ is an intervener:** (Hasegawa 1995:119)
 * Hanako-**mo** *nani-o* *ka-tta-no?*
 Hanako-ALSO what-ACC buy-PAST-Q
 Intended: ‘What did Hanako_F also buy?’ (in addition to other people)
- (10) ***-sae* ‘even’ is an intervener:** (Yanagida 1996:30)
 ?* John-wa Mary-ni-**sae** *nani-o* *oku-tta-no?*
 John-TOP Mary-to-EVEN what-ACC send-PAST-Q
 Intended: ‘What did John send even to Mary?’

Next we consider the so-called NPIs ‘only’ *-shika* and *wh-mo* (see footnote 5). We follow Kataoka (2006) and Shimoyama (2011) in taking *-shika* and *wh-mo* to be quantifiers which obligatorily take wide scope over a local negation. See these works for their evidence for these claims from variable binding (for Kataoka) and the scope of these operators with respect to other quantifiers. As predicted by our generalization, these items are also interveners for *wh*-in-situ. See (11) for *-shika* and example (1) above for the *wh-mo* NPI.

- (11) ***-shika* NPI ‘only’ is an intervener:** (Takahashi 1990:134)
 ?* John-**shika** *nani-o* *tabe-nak-atta-no?*
 John-ONLY_{NPI} what-ACC eat-NEG-PAST-Q
 Intended: ‘What did only John eat?’

⁶ Tomioka (2007:1574) states “...*subete-no/zenbu-no*-NP are not interveners and can c-command *wh*-phrases at S-structure without making the sentence deviant.”

⁷ See Shibata (2015a) for one account for the obligatory scope-rigidity of focus particles.

Finally, we turn to indefinites and numerals. Examples (12–13) below show that *wh-ka* indefinites are scope-rigid and act as interveners:⁸

- (12) **Indefinite *wh-ka* is scope-rigid:** (Mogi 2000:59)
 [Ikutsu-ka-no mondai]-o toka-nak-atta
 how.many-KA-GEN problem-ACC solve-NEG-PAST
 ‘*pro* did not solve some problems.’ ✓some > not, *not > some
- (13) **Indefinite *wh-ka* is an intervener:** (Hoji 1985:269)
 *Dare-ka-ga nani-o nomi-masi-ta-ka
 who-KA-NOM what-ACC drink-POLITE-PAST-Q
 ‘What did someone drink?’

This contrasts with the behavior of modified numerals, which are not scope-rigid and are also not interveners:

- (14) **Modified numerals are not scope rigid:** (Shibata 2015b:66)
 [Go-nin-ijyoo-no gakusei]-ga ko-nak-atta
 5-CL-or.more-GEN student-NOM come-NEG-PAST
 ‘Five or more students didn’t come.’ ✓(≥ 5) > not, ✓not > (≥ 5)
- (15) **Modified numerals are not interveners:**
 ✓[Go-nin-ijyoo-no gakusei]-ga dono-hon-o yon-da-no?
 five-CL-or.more-GEN student-NOM which-book-ACC read-PAST-Q
 ‘Which book(s) did five or more students read?’

2.3 Supporting data from *-dake* ‘only’

Novel supporting data comes from the interaction of ‘only’ *-dake* and postpositions. *Dake* can occur outside or inside a postposition: DP-P-*dake* or DP-*dake*-P. Considering their scope with respect to modals, Futagi (2004) show that ‘only’ in *-P-dake* is scope-rigid, whereas ‘only’ in *-dake-P* leads to scope ambiguities (16). This difference correlates with their status as interveners (17).

- (16) **-P-*dake* is scope-rigid; -*dake*-P is not:**
- a. Taro-wa Hanako-to-dake hanasa-nak-atta.
 Taro-TOP Hanako-with-only talk-NEG-PAST
 lit. ‘Taro didn’t talk only with Hanako.’ ✓only > not, *not > only
- b. Taro-wa Hanako-dake-to hanasa-nak-atta.
 Taro-TOP Hanako-only-with talk-NEG-PAST
 lit. ‘Taro didn’t talk with only Hanako.’ ✓only > not, ✓not > only

⁸ Again, the scope-rigidity that we confirm and report here is simply with respect to sentential negation: *wh-ka* must take wide scope in (12). This conforms to the generalization that the scope of indefinite *wh-ka* may be variable, but cannot be lower than its surface position; see Yatsushiro (2009).

(17) **-P-dake is an intervener; -dake-P is not:**

- a. ??? Taro-wa Hanako-to-**dake** *nani-o* tabe-ta-no?
 Taro-TOP Hanako-with-only what-ACC eat-PAST-Q
- b. ✓ Taro-wa Hanako-**dake**-to *nani-o* tabe-ta-no?
 Taro-TOP Hanako-only-with what-ACC eat-PAST-Q
 ‘What did Taro eat (only) with (only) Hanako?’

2.4 Summary

The findings discussed in this section are summarized in the table below. Here, “scope-rigid” (○) indicates that the given quantifier takes obligatory wide scope with respect to negation. Non-“scope-rigid” (×) quantifiers exhibit scope ambiguities with respect to negation, reflecting the ability of the quantifier to reconstruct at LF. Quantifiers may interrupt the interpretation of lower *wh*-in-situ, being “interveners” (○), or not (×).

(18) **Summary of Japanese data:**

	disjunction		universal		also	even	NPI
	<i>ka</i>	<i>naishi</i>	<i>wh-mo</i>	<i>subete</i>	<i>-mo</i>	<i>-sae</i>	<i>wh-mo</i>
<i>scope-rigid?</i>	○ (4a)	× (4b)	○ (6a)	× (6b)	○ (8)	○ (8)	○ (Shimoyama 2011)
<i>intervener?</i>	○ (5a)	× (5b)	○ (7a)	× (7b)	○ (9)	○ (10)	○ (1b)
	NPI only		indefinite	modified	only		
	<i>-shika</i>		<i>wh-ka</i>	numerals	<i>-P-dake</i>	<i>-dake-P</i>	
<i>scope-rigid?</i>	○ (Kataoka 2006)		○ (12)	× (14)	○ (16a)	× (16b)	
<i>intervener?</i>	○ (11)		○ (13)	× (15)	○ (17a)	× (17b)	

The data generally motivates the generalization in (3), repeated here:

(3) **Generalization: Intervention correlates with scope-taking**


Scope-rigid quantifiers above an in-situ *wh* cause intervention. Quantifiers that allow scope ambiguities — i.e., those that allow reconstruction below *wh* — do not.

In particular, pairs of synonymous operators such as *ka*-disjunction vs *naishi*-disjunction, *wh-mo* vs *subete* universals, and *-P-dake* vs *-dake-P* show that different quantifiers with the same semantics may trigger intervention or not, and this correlates with their scope-rigidity with respect to sentential negation. Such pairs are problematic for prominent accounts of intervention, including the prosodic and information-structural theory of Tomioka (2007) and the influential Beck (2006) proposal where interveners are focus-sensitive items. More generally, any theory that proposes a rigid set of interveners and bases the nature of intervention on the semantics of the interveners, will face similar difficulties explaining the data we have shown here.

3 Analysis

The findings here support the recent proposal in Kotek (2017) where intervention is caused by any quantifier taking scope at LF in a region where Rooth-Hamblin alternatives generated by *wh*-in-situ are being computed for interpretation by C, indicated by the squiggly arrow.

(19) **Kotek’s intervention schema:**

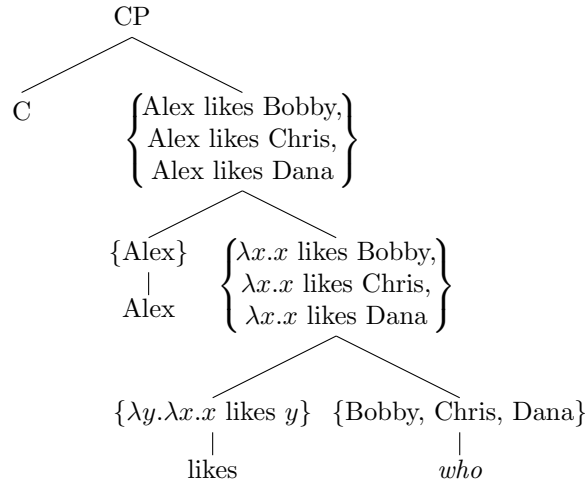
* LF: C ... λ ... *wh*


Quantifiers are interveners or not depending on whether or not they can reconstruct at LF to avoid the configuration in (19). We begin in section 3.1 with some background on the compositional semantics of questions. In section 3.2, we explain the observed correlation between scope-rigidity and intervention-hood in Japanese. Finally, in section 3.3, we present the logical problem encountered by the configuration in (19), following Kotek (2017). Together, our proposal derives the pattern of intervention observed above.

3.1 *Wh*-in-situ as Rooth-Hamblin alternatives

Rooth-Hamblin alternatives are a parallel mode of semantic composition, where a *focus-semantic value* is computed compositionally for each syntactic node in parallel to its ordinary semantic value (Hamblin 1973, Rooth 1985, 1992). This computation has been argued to supply operators such as focus operators and question complementizers with a relevant set of alternative denotations or propositions. Consider the LF representation for the *wh*-in-situ pseudo-English question “Alex likes *who*?” in (20) below. Focus-semantic values — also referred to simply as *alternatives* — are given for each node.

(20) **Toy LF: *wh*-in-situ interpreted via Rooth-Hamblin alternatives:**



In (20), the *wh*-phrase *who* has a focus-semantic value corresponding to relevant individuals in its domain — here, the individuals Bobby, Chris, and Dana. We adopt the two-dimensional semantics for *wh*-words from Beck (2006):

- (21) *Semantics of who*:
 ordinary semantics: $\llbracket who \rrbracket$ undefined
 alternatives: $\llbracket who \rrbracket^f = \{x : x \text{ is human}\} = \{\text{Bobby, Chris, Dana}\}$

The alternatives from (21) compose pointwise at each nonterminal node, resulting in the complement of the interrogative C having a set of propositions as its focus-semantic value. We refer the reader to Hamblin (1973), Rooth (1985, 1992) and subsequent work on the technical details of Rooth-Hamblin alternative computation.⁹ The interrogative C then computes the question denotation using these alternatives in its complement (Shimoyama 2001, Beck and Kim 2006, Kotek 2014), so that these alternative propositions correspond to possible (weak) answers to the question (Hamblin 1973, Karttunen 1977). This yields the appropriate question semantics without establishing a syntactically local relationship between the *wh*-phrase and C, as may be hypothesized in a covert movement theory of *wh*-in-situ.

3.2 Explaining the correlation

Based on the consideration of scope interactions between different quantificational objects and negation in Japanese, Shibata (2015a,b) argues that all objects in Japanese (DP arguments in *vP*) move overtly out of *vP*. Objects also necessarily move out of NegP, if present, which Shibata argues has a fixed position just above *vP*. We further assume the *vP*-internal subject hypothesis (see e.g. Fukui 1986, Kitagawa 1986, Kuroda 1988), concluding that all (DP) arguments evacuate *vP* in Japanese. These assumptions are illustrated schematically in (22a). Quantifiers then vary with respect to their ability to reconstruct: those which cannot reconstruct have obligatory wide-scope with respect to negation (22b), whereas those which can reconstruct lead to scope ambiguities with respect to negation, allowing the LFs in (22b) or (22c).

- (22) **Scope-rigidity in Japanese (Shibata 2015a,b):**
- a. All arguments move out of *vP*:

$$\left[\text{CP} \dots \text{DP} \dots \left[\text{vP} \dots t \dots \text{V} \right] \right]$$

$$\uparrow$$
- b. LF interpretation in surface position leads to wide scope over negation:
 LF: $\left[\text{CP} \dots \text{DP } \lambda x \dots \left[\text{NegP} \left[\text{vP} \dots x \dots \text{V} \right] \text{Neg} \right] \right]$ DP > Neg
- c. Some (not all) quantifiers reconstruct into *vP*, allowing narrow scope:
 LF: $\left[\text{CP} \dots \dots \left[\text{NegP} \left[\text{vP} \dots \text{DP} \dots \text{V} \right] \text{Neg} \right] \right]$ Neg > DP

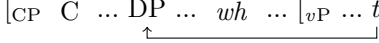


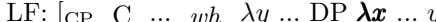
⁹ The semantic denotations here must be interpreted intensionally. World variables are not illustrated here to simplify the presentation.

Now consider a surface structure where the DP could lead to an intervention configuration (23a). (Movement of the *wh*-phrase to its surface position is not illustrated. The interpreting complementizer is at the left edge of CP for illustration purposes only.) We assume that *wh*-phrases are interpreted in-situ at LF by introducing Rooth-Hamblin alternatives which compose pointwise (squiggly arrow, see previous section) and will be interpreted by the interrogative complementizer; see e.g. Beck (2006) and Kotek (2017) for details.

If the quantifier is scope-rigid, it has no choice but to lead to the LF configuration as in (23b). This is a Kotek intervention configuration (19): the calculation of Rooth-Hamblin alternatives must cross an instance of Predicate Abstraction (λx , in bold), which cannot be defined (see next section). But if a quantifier is not scope-rigid — i.e. it can reconstruct at LF — the LF in (23c) will also be available. Alternatively, scrambling the *wh*-word above the potential intervener also avoids intervention (23d) without requiring the DP to reconstruct.

(23) **Deriving the generalization (3):**

- a. Potential intervener (DP) above *wh*:

$$[_{CP} C \dots DP \dots wh \dots [_{vP} \dots t \dots V]]$$

- b. LF interpretation in surface position lead to intervention!
 * LF: $[_{CP} C \dots DP \lambda x \dots wh \dots [_{vP} \dots x \dots V]]$

- c. Reconstruction avoids the intervention configuration:
 \checkmark LF: $[_{CP} C \dots wh \dots [_{vP} \dots DP \dots V]]$

- d. Scrambling *wh* above also avoids intervention:
 \checkmark LF: $[_{CP} C \dots wh \lambda y \dots DP \lambda x \dots y \dots [_{vP} \dots x \dots V]]$


3.3 The logical problem of abstraction over alternatives

A problem with defining Predicate Abstraction (PA) over non-trivial sets of alternatives has been acknowledged in the literature on focus and *wh* semantics for as long as that literature has existed, but its implications have not been fully investigated. See e.g. Rooth (1985), Hagstrom (1998), Kratzer and Shimoyama (2002), Shan (2004), Novel and Romero (2009), Ciardelli et al. (2017).

In brief, as demonstrated by e.g. Rooth (1985) and Shan (2004), standard syncategorematic treatments of a PA rule (as in Heim and Kratzer 1998) are not well-defined over sets of alternatives. As noted by Shan (2004), previous work (implicitly) adopts a procedure as in (24) which transposes a *function into a set of alternatives* that a PA rule yields into a *set of alternative functions*. Shan shows that this leads to a problem of over-generation. The result of this procedure (24) includes both (desired) constant functions as in (25) but also (undesired) non-constant ones as in (26).

(24) **A procedure for converting a function into a set of τ -alternatives, to a set of functions into τ -alternatives:**

$$Q_{\langle e, \langle \tau, t \rangle \rangle} \longmapsto \{f_{\langle e, \tau \rangle} : \forall x_e . f(x) \in Q(x)\}$$

(25) **Constant $\langle e, t \rangle$ -functions, as desired:**

$$\left\{ \begin{array}{l} \left[\begin{array}{l} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Alice saw } x_2 \\ x_3 \mapsto \text{Alice saw } x_3 \end{array} \right], \left[\begin{array}{l} x_1 \mapsto \text{Barbara saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Barbara saw } x_3 \end{array} \right], \left[\begin{array}{l} x_1 \mapsto \text{Carol saw } x_1 \\ x_2 \mapsto \text{Carol saw } x_2 \\ x_3 \mapsto \text{Carol saw } x_3 \end{array} \right] \end{array} \right\}$$

(26) **Non-constant $\langle e, t \rangle$ -functions, also produced by (24):**

$$\left\{ \begin{array}{l} \left[\begin{array}{l} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Carol saw } x_2 \\ x_3 \mapsto \text{Barbara saw } x_3 \end{array} \right], \left[\begin{array}{l} x_1 \mapsto \text{Alice saw } x_1 \\ x_2 \mapsto \text{Barbara saw } x_2 \\ x_3 \mapsto \text{Carol saw } x_3 \end{array} \right], \left[\begin{array}{l} x_1 \mapsto \text{Carol saw } x_1 \\ x_2 \mapsto \text{Barb. saw } x_2 \\ x_3 \mapsto \text{Alice saw } x_3 \end{array} \right] \end{array} \right\}$$

This problem can be solved in different ways, including a move to a variable-free and movement-free semantics (Shan 2004), type-lifting the basic elements in the theory (Novel and Romero 2009, cf Poesio 1996), or re-defining the denotation of propositions (Ciardelli, Roelofsen, and Theiler 2017, Charlow 2017), all in order to allow assignment functions to be part of the basic type theory.

However, Kotek (2017) argues that this fundamental problem of abstraction over alternatives should not be solved at all — instead, it is precisely what gives rise to intervention effects. More precisely, intervention configurations can be undone through movement of *wh* or of interveners, but not through a repair to the basic types allowed in the system.

4 Conclusion

In this paper we motivated the generalization that intervention in Japanese correlates with scope-rigidity: scope-rigid quantifiers lead to intervention, whereas those that can reconstruct do not. This conclusion is explained by and supports Kotek’s (2017) view that scope-taking into regions of alternative computation is not possible. As discussed above, Kotek predicts the uninterpretability of LF configurations of the form in (19), repeated below.

(19) **Kotek’s intervention schema:**

$$* \text{LF: } C \underbrace{\dots \lambda \dots}_{\text{wavy}} wh$$

Whenever a quantifier is interpreted at LF, λ -abstraction is involved. Since Predicate Abstraction is not well-defined over non-trivial sets of alternatives, the result is ungrammaticality, diagnosed as an intervention effect.

Together with Shibata’s proposal for the positions of quantificational DPs in Japanese, we explain the observed correlation between scope-rigidity and intervention-hood. Quantifiers which permit scope ambiguities with respect to negation are those which can reconstruct into a *vP*-internal base position, and therefore are exactly those which can avoid the LF configuration in (19).

Our work here, following Shibata (2015a), shows that intervention-hood is not simply a property of a quantifier’s logical denotation, but depends more on its possible positions at LF. Kotek’s theory can be described as a *dynamic* theory of intervention-hood: It predicts that manipulations which exceptionally enable or disable scope reconstruction can change the status of a quantifier as an intervener or not. In further work, we intend to extend our investigation into additional quantifiers and configurations in Japanese, to test such predictions.

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