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Event Quantification and Distributivity

1 Introduction

It is well known that sentences with plural subjects involve a semantic ambiguity that is not available with singular subjects. For example, while John made a chair simply states that John made a chair, John and Bill made a chair could mean that John and Bill together made a chair (collective reading) or that each of them made a chair (distributive reading). Similarly, the Japanese and German sentences in (1)a and (1)b have the collective reading that three boys together made one chair and the distributive reading that each of the three boys made a chair. The empirical data examined here come from what I call split quantifier constructions in (2), where a quantificational expression appears away from its host noun. It has been observed in the previous literature that the Japanese split quantifier construction (i.e. so-called floating quantifier construction) allows for a distributive reading, but not for a collective reading (Terada 1990, Kitagawa and Kuroda 1992, Ishii 1999, Kobuchi-Philip 2003, among others): unlike the non-split quantifier construction in (1)a, the split quantifier construction in (2)a has the distributive reading only. The same contrast can be observed in German, as in (1)b and (2)b.

(1) (a) [Otokonoko san-nin]-ga kinoo isu-o tukut-ta.
[boy three-CL]-NOM yesterday chair-ACC make-PAST

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1 A bare noun in Japanese can be interpreted as singular or plural. Thus, the bare noun isu in (1) is ambiguous between ‘a chair’ and ‘chairs’. See section 3.2 below for further discussion.

2 In some previous studies, a distinction between distributive and non-distributive readings is made depending on whether or not multiple events occur simultaneously (Kitagawa and Kuroda 1992, Ishii 1999, for example). The distributive-collective distinction here is nothing to do with a temporal relationship, but it is due to agenthood: a distributive reading obtains when each individual in the extension of the plural subject is the agent of the relevant event, and a collective reading obtains when a group represented by the plural subject is the agent.
In this paper, I argue that split quantifier constructions involve the measurement of events. The mechanism of event measurement requires a homomorphism $h$ (a structure-preserving function) from events to individuals and that a measure function applies to the range of $h$, i.e. to individuals mapped from events. In this way, the measure function in split quantifier constructions indirectly measures events by measuring individuals. I show that this mechanism satisfactorily accounts for why split quantifier constructions lack collective readings in (2). Furthermore, I present some examples where a collective reading is available in split quantifier constructions and show that the proposed analysis is able to account for these cases.

The organization of the paper is as follows. In section 2, I briefly summarize previous studies on distributive and collective readings. In section 3, I examine various empirical data on collective and distributive readings of split quantifier constructions. I argue that split quantifier constructions involve measurement in the verbal domain. Section 4 shows that the proposed analysis is capable of handling the whole range of data. Section 5 concludes the paper.

2 Previous Studies on Distributivity

Before examining the data on split quantifier constructions, I briefly summarize the previous literature on distributivity. First, I introduce the lexical distinction between distributive and collective predicates, and then I move onto Landman’s theory of distributivity as semantic plurality (Landman 1989a, 1989b, 1996, 2000).³

2.1 Distributive and Collective Predicates

As mentioned in section 1, sentences with plural subjects sometimes evoke semantic ambiguity between distributive and collective readings (see (1)).

³ See Winter (2001) for a possibly relevant distinction between atom and set predicates, which is proposed as an alternative for the distinction between distributive and collective predicates.
Sentences with plural subjects may also be unambiguous, allowing either only a collective reading, as in (3)a, or only a distributive reading, as in (3)b.

(3)  (a)  The students are numerous. / John and Mary are a couple.
     (b)  The babies are asleep. / Ann and Beth are pregnant.

These observations lead some researchers to the assumption that there are inherently collective, inherently distributive, and ambiguous predicates (Link 1984, Dowty 1987, Roberts 1990, Lasersohn 1995, in particular). Under this view, a distributive reading arises when a distributive operator is present on the VP, while a collective reading arises when there is no such operator. The distributive operator $D$ is defined in (4), where $\leq$ is a part-of relation and $\text{ATOM}$ stands for the property of being an atomic element à la Link (1983).

This operator makes the relevant verbal predicate $P$ apply to all atomic members of the plural subject $x$. Following Link, I assume that the extension of plural subjects is the sum of individuals ($\cup$). For instance, the extension of John and Bill is $j \cup b$, and the extension of the students would be $a \cup b \cup c$ when there are three students $a$, $b$, and $c$. With the $D$-operator, we obtain (5) as the truth conditions of {John and Bill / the students} lifted the piano. (5)a means that all atomic members of $j \cup b$, namely, John and Bill, lifted the piano, yielding the distributive reading ‘John lifted the piano and Bill lifted the piano’. A collective reading obtains when there is no distributive operator and $\text{lift the piano}$ simply applies to the plural subject $j \cup b$, meaning John and Bill together lifted the piano, i.e. $[ [\text{John and Bill lifted the piano}]=\text{lift the piano}(j \cup b)]$.

\[ D P(x) = \forall y \left[ y \leq x \land \text{ATOM}(y) \rightarrow P(y) \right] \]

\[ D \text{lift the piano}(j \cup b) = \forall y \left[ y \leq j \cup b \land \text{ATOM}(y) \rightarrow \text{lift the piano}(y) \right] \]

\[ D \text{lift the piano}(a \cup b \cup c) = \forall y \left[ y \leq a \cup b \cup c \land \text{ATOM}(y) \rightarrow \text{lift the piano}(y) \right] \]

2.2 Plurality of Events and Landman’s Distributivity

Landman (1989a, 1989b, 1996, 2000) proposes a novel analysis that distributivity is reduced to a semantic pluralization of verbal predicates. First, Link’s (1983) operation of semantic pluralization $*$ needs to be introduced. The $*$-operator (the ‘star’-operator) applies to a one-place predicate $P$ and generates all the individual sums of members of the extensions of $P$. For instance, if the denotation of $\text{dog}$ is $\{x, y, z\}$, the denotation of $*\text{dog}$ or $\text{dogs}$ would be $\{x, y, z, x \cup y, y \cup z, x \cup y \cup z\}$. $*P$ is closed under sum

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4 Link’s original definition is given in (i).

(i)  $\text{Distr}(P) \leftrightarrow \forall x \left( P(x) \rightarrow \text{ATOM}(x) \right)$  \hspace{1cm} (Link 1983:309)
formation: any sum of parts that are \(*P\) is also \(*P\). Link treats nominal predicates such as *are boys as inherently distributive, based on the assumption that their interpretation is the same as the plural NP that they are based on, i.e. the denotation of *are boys is *boy. Then the denotation of *John and Bill are boys is *boy(j∪ib). Landman shows that (6) is guaranteed by the definition of * and by the fact that the domain \(D\) is an atomic part-of structure. Moreover, (6) in turn guarantees that *John and Bill are boys is distributive, i.e. John is a boy and Bill is a boy. The same paraphrase obtains for distributive readings in general; the denotation of *John and Bill made a chair is *make.a.chair(j∪ib), yielding a distributive reading that John made a chair and Bill made a chair.

\[
\text{(6) FACT: if P is a set of atoms, then } a \in *P \text{ iff } \forall a \in AT(a): a \in P \quad (\text{Landman 2000:148})
\]

Landman’s analysis is further supported by the fact that so-called collective predicates such as *meet can have distributive readings; *the boys and the girls met has a distributive reading where the boys met and the girls met (in a different room). Landman proposes the group-forming operation \(\uparrow\) that maps a sum of individuals (e.g. the sum of the boys; \(x∪iy\)) to an atomic group individual (e.g. the boys as a group; \(\uparrow(x∪iy)\)). Under a distributive reading, a pluralized predicate *meet takes the sum of the two groups in its extension, as in *meet(\(\uparrow(x∪iy)\cup\uparrow(a∪ib∪ic)\)), where \(\uparrow(x∪iy)\) is the boys as a group and \(\uparrow(a∪ib∪ic)\) is the girls as a group. Since groups are atomic elements, the predicates distribute to the two groups, and not all the way down to the individuals in the groups. In this analysis, a collective reading obtains when a group applies to a singular predicate, as in make.a.chair(\(\uparrow(j∪ib)\)) for *John and Bill made a chair. Crucially, Landman claims that “basic predicates never take sums in their extension” (Landman 1989a:593), hence make.a.chair(j∪ib) is not a legitimate denotation. With this claim, Landman reaches to a simple generalization: when a verbal predicate is singular, it applies to an atomic (singular or group) individual. When a verbal predicate is pluralized, it applies distributively to a plural sum of atomic individuals.

3 Split Quantifier Constructions and Distributivity

Having seen some previous studies on distributivity, I now turn to various data on collective and distributive interpretations of split quantifier constructions.

3.1 The Data

In the introduction, we have seen that split quantifier constructions allow only for distributive readings, while their non-split counterparts allow for both
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distributive and collective readings (see (1) and (2)). I provide here further examples to illustrate this point. (7)b and (8)b only mean that each student found a ten-dollar bill, although (7)a and (8)a have the reading where three students together found one bill. Similarly, (9)a and (10)a can mean that each of the two friends got married to someone (there were two couples) or that two friends married each other (there was one couple), while (9)b and (10)b have the former distributive reading only.

(7) (a)  
\[ \text{Gakusei san-nin]-ga mitibata-de juu-doru-satu-o hirot-ta. } \]  
\[ \text{[student three-CL-NOM roadside-by ten-dollar-bill-ACC find-PAST} \]  
\‘Three students found a ten-dollar bill by the roadside.’  
\checkmark \text{distributive, } \checkmark \text{collective}  
(b)  
\[ \text{Gakusei-ga mitibata-de san-nin juu-doru-satu-o hirot-ta. } \]  
\[ \text{student-NOM roadside-by three-CL ten-dollar-bill-ACC find-PAST} \]  
\checkmark \text{distributive, } \checkmark \text{collective}  

(8) (a)  
\[ \text{[Drei Kinder] haben einen Zehn-Euro-Schein im Straβengraben gefunden.} \]  
\[ \text{[three children] have a ten-Euro-bill in street-ditch found} \]  
\‘Three children found a ten-Euro bill in a gutter.’  
\checkmark \text{distributive, } \checkmark \text{collective}  
(b)  
\[ \text{Kinder haben drei einen Zehn-Euro-Schein im Straβengraben gefunden.} \]  
\[ \text{children have three a ten-Euro-bill in street-ditch found} \]  
\checkmark \text{distributive, } \checkmark \text{collective}  

(9) (a)  
\[ \text{Tomodati huta-ri]-ga kyonen kekkonsi-ta. } \]  
\[ \text{[friend two-CL-NOM last year marry-PAST} \]  
\‘Two friends got married last year.’  
\checkmark \text{distributive, } \checkmark \text{collective}  
(b)  
\[ \text{Tomodati-ga kyonen huta-ri kekkonsi-ta.} \]  
\[ \text{friend-NOM last year two-CL marry-PAST} \]  
\checkmark \text{distributive, } \checkmark \text{collective}  

(10) (a)  
\[ \text{[Zwei Bekannte] haben gestern geheiratet.} \]  
\[ \text{[two acquaintances] have yesterday married} \]  
‘Two acquaintances married yesterday.’  
\checkmark \text{distributive, } \checkmark \text{collective}  
(b)  
\[ \text{Bekannte haben gestern zwei geheiratet.} \]  
\[ \text{acquaintances have yesterday two married} \]  
\checkmark \text{distributive, } \checkmark \text{collective}  

3.2 The Analysis

The data in the previous section revealed that split quantifier constructions are semantically more restricted than their non-split counterparts in terms of collective readings. In Nakanishi (2003, 2004, in press), I presented further data showing that semantic restrictions of split quantifier constructions are
manifested in terms of different semantic properties. First, unlike non-split quantifier constructions, split quantifier constructions are incompatible with single-occurrence events such as *kill Peter, as in (11) and (12), and with individual-level predicates, as in (13) and (14).

(11) (a) \[Gakusei san-nin]-ga kinoo Peter-o korosi-ta.  
\[student three-CL]-NOM yesterday Peter-ACC kill-PAST  
‘Three students killed Peter yesterday.’

(b) ??Gakusei-ga kinoo san-nin Peter-o korosi-ta.  
student-NOM yesterday three-CL Peter-ACC kill-PAST

(12) (a) \[Drei Studenten\] haben Peter umgebracht.  
\[three students\] have Peter killed  
‘Three students killed Peter.’

(b) ??Studenten haben Peter drei umgebracht.  
students have Peter three killed

(13) (a) Kono kurasu-de [gakusei san-nin]-ga kasikoi.  
this class-in [student three-CL]-NOM smart  
‘Three students are smart in this class.’

(b) ??Gakusei-ga kono kurasu-de san-nin kasikoi.  
student-NOM this class-in three-CL smart

(14) (a) \[Drei Feuerwehrleute\] sind intelligent.  
\[three firemen\] are intelligent  
‘Three firemen are intelligent.’

(b) *Feuerwehrleute sind drei intelligent.  
firemen are three intelligent

I argued that this is because the measure function in split quantifier constructions measures events, while the measure function in non-split quantifier constructions measures individuals (see Nakanishi 2003, 2004, in press for details). The extension of single-occurrence events is a singleton, hence it cannot be measured by the measure function associated with a split quantifier. This analysis can further account for the fact that split quantifier constructions are incompatible with I-level predicates. Kratzer (1995) argues that, unlike S-level predicates, I-level predicates lack event arguments in their denotation. It follows that a split quantifier is not compatible with I-level predicates that lack event arguments.

However, the situation is not so simple. On the one hand, a split quantifier contains a classifier or a measure word that correlates with the host NP. For instance, in (7)b above, the split quantifier contains a classifier -*nin, which semantically agrees with the host NP gakusei ’student’, indicating that san-nin ‘three-classifier’ must express the cardinality of the students. On the other
hand, the incompatibility with single-occurrence events and with I-level predicates clearly indicates some restriction in the verbal domain, which can be explained straightforwardly if we assume that the measure function in split quantifier constructions applies to events. To solve this dilemma, I propose a mechanism that maps events to individuals and, with the help of this mapping, the measure function in split quantifier constructions applies to individuals mapped from events. In this way, split quantifier constructions indirectly measure events by measuring individuals. This mechanism is motivated by Krifka’s (1989) analysis of temporal adverbials like *for two hours* in *John slept for two hours* (see also Lasersohn 1995). Krifka claims that temporal adverbials cannot apply to events directly, but they can apply to entities which bear a relation to events, most notably times. That is, *for two hours* indirectly measures the sleeping event by measuring the run time of the event. Formally, he assumes that there is a homomorphism from events E to event run times T. A homomorphism h is a function that preserves some structural relation defined on its domain in a similar relation defined on the range, as in $h(e_1 \cup E e_2) = h(e_1) \cup_T h(e_2)$, where $\cup_E$ and $\cup_T$ are sum operators for events and times, respectively. Krifka claims that, given a measure function $\mu$ for times and $h$ from E to T, we can construe a derived measure function $\mu'$ for events, as in (15). A derived measure function describes the transfer of a measure function from one domain to another. In (15), $\mu'$ is defined by $\mu$ and $h$: for all events, the amount of the event e measured by $\mu'$ in E is equal to the amount of $h(e)$ measured by $\mu$ in T.

\[
\forall e \ [ \mu'(e) = \mu(h(e)) ] \tag{Krifka 1989:97}
\]

Extending Krifka’s analysis to the Japanese data, I argue that there is a homomorphism $h$ from events in E denoted by the VP to individuals in I denoted by the host NP, satisfying $h(e_1 \cup E e_2) = h(e_1) \cup_I h(e_2)$. From the data on non-split quantifiers, it is clear that measure functions can apply to individuals (e.g. in *three liters of water*, the measure function applies to water). Following Krifka, given a measure function $\mu$ for individuals and $h$ from E to I, we can derive a measure function $\mu'$ for events. In (16), a measure function $\mu$ associated with a non-split quantifier directly applies to a set of individuals (the grey-shaded area in (16)) and returns measured amounts. In contrast, the measure function $\mu'$ associated with a split quantifier in (17) applies to a set of events (the grey-shaded area in (17)) and returns measured amounts. As in (15), since $\mu'$ for events in (17) amounts to $\mu(h(e))$, the same measurement as (17) can be represented as in (18); $\mu'(e)$ in (17) (the measured amount obtained by

\[
\forall e \ [ \mu'(e) = \mu(h(e)) ] \tag{Krifka 1989:97}
\]

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5 A homomorphism of the semilattice $S_1 = \langle S_1, \cdot \rangle$ into the semilattice $S_2 = \langle S_2, \cdot \rangle$ is a mapping $F: S_1 \rightarrow S_2$ such that $F(a \cdot b) = F(a) \cdot F(b)$, where ‘$\cdot$’ denotes a composition of two functions (Partee, ter Meulen and Wall 1990:286).
μ’ applying to events) is equal to μ(h(e)) in (18) (the measured amount obtained by μ applying to individuals mapped from events), that is, μ’ for events is a combination of h and μ for individuals. The measure function μ in (18) associated with a split quantifier applies to individuals mapped from events by h, i.e. the range of h (the grey-shaded area in (18)), indicating that μ indirectly measures events by measuring individuals mapped from events by h.

(16) A measure function associated with a non-split quantifier

(17) A measure function associated with a split quantifier

(18) A measure function associated with a split quantifier

An issue arises as to what kind of function can serve as a homomorphism h from events to individuals. Suppose there are two elements of the sort S. Then h from S to S’ maps the sum of x and y in S, i.e. x∪Sy, to the sum of h(x) and h(y) in S’, i.e. h(x)∪Sh(y), as defined in (19). That is, h must be a function and it must be structure preserving. The structure preserving nature of h is reminiscent of the property of cumulativity. Cumulativity as a property of individuals or events is defined in (20)a: if we add two elements in the extension of some predicate, the sum of the two is also in the extension of the same predicate (cf. (22) below). Cumulativity as a property of relations between two sorts is defined in (20)b. We can further define cumulativity as a property of functions from elements in the sort S to elements in the sort S’, as in (20)c. Functional cumulativity in (20)c essentially expresses the defining property for h in (19): F(a∪b)=F(a)∪F(b). Thus, any relation that is functional and cumulative can serve as h. The agent function is functional and cumulative, as in (21)a, which is equivalent to (21)b (see Kratzer to appear). It follows that, when the host NP of a split quantifier is an external argument, the agent function serves as h from events to individuals.

(19) ∀h ∀x,y∈D ∧ (h(x∪y)) = h(x)∪h(y)

(20) (a) ∀P ∀x,y∈D ∧ [P(x) ∧ P(y) → P(x∪y)]
Before applying the current analysis to split quantifier constructions, I introduce a model-theoretic method of representing extensions of NPs and of VPs. Link (1983) claims that NPs can be divided into two classes, mass and plural count NPs on the one hand and singular count NPs on the other. The NPs in the first class, but not the ones in the second, have cumulative reference (Quine 1960), as in (22) (≤ is a part-of relation). Link proposes to capture this fact model-theoretically using a lattice, which is a partially ordered set ordered by a reflexive, anti-symmetric, and transitive relation. Assuming that the denotation of NPs is a set of individuals, the cumulative reference of mass and plural count NPs can be expressed by ordering the individuals in the extension. For instance, consider (23)a, where x, y, and z are singular individuals, \( \cup_I \) is an individual sum operator, and the lines indicate the part-of relation \( \leq \).6 If the extension of a given NP is a lattice, some members of the denotation of an NP are a subpart of some other members. For example, suppose that x, y, and z are water, then their sums \( (x \cup_I y, x \cup_I z, y \cup_I z, x \cup_I y \cup_I z) \) are also water due to the cumulative reference property, i.e. \( \{ \text{water} \} \) is \{x, y, z, x \cup_I y, x \cup_I z, y \cup_I z, x \cup_I y \cup_I z \}. Thus, the extension of a mass NP can be modeled as a lattice, as in (23)a. The same argument holds for plural count NPs. In contrast, the denotation of a singular count NP is a set of singular individuals, hence no member is a subpart of others. That is, unlike the extensions of plural count and mass NPs, the extension of singular count NPs is not a lattice.

(22) P has cumulative reference iff: \( \forall x \forall y [ P(x) \land P(y) \land \neg x \leq y \rightarrow P(x \cup_I S y) ] \)

(23) (a) \( x \cup_I y \cup_I z \) (b) \( e_1 \cup_E e_2 \cup_E e_3 \)

The denotation of VPs can be expressed by using a lattice if we introduce event arguments and assume that events can form a lattice, as in (23)b, where \( e_1, e_2, \text{ and } e_3 \) are singular events, \( \cup_E \) is an event sum operator, and the lines

6 In Link (1983), besides singular individuals like John, there are plural individuals or individual sums of type e like John ∪ Bill that are different from sets like {John, Bill} (see Schwarzschild 1996 for alternative approaches).
indicate the ordering part-of relation ≤ (Krilka 1989, 1992, 1998, Landman 1996, 2000, in particular). Different theories have been proposed depending on how event arguments are associated with verbs, as in (24) (v for the type of events). Among these, I adopt Kratzer’s (1996, to appear) claim in (24)c that external arguments are introduced by a neo-Davidsonian method both in the syntax and at conceptual structure.

(24)

(a) Davidsonian: \( \lambda x.\lambda y,\lambda e. \text{see}(x,y,e) \)

(b) Neo-Davidsonian: \( \lambda x.\lambda y,\lambda e. \text{see}(e) \land \text{Theme}(x,e) \land \text{Agent}(y,e) \)

(c) Kratzerian: \( \lambda x,\lambda e. \text{see}(x,e) \)

Under Kratzer’s analysis, at the level of the VP, all the internal arguments are saturated and the VP denotes a set of events of type \( \langle v, t \rangle \) (see (24)c). Take the atelic VP *drive a car*, for instance (*John drove a car [for/in] one hour*), where \( \llbracket \text{drive a car} \rrbracket \) is \( \lambda e. \text{drive}(a,\text{car},e) \). If the members in this set stand in the part-of relation, the extension of *drive a car* is a lattice of events, as in (23)b. Suppose that \( e_1, e_2, e_3 \) are drive-a-car events. If the members in this set stand in the part-of relation, the extension of *drive a car* is a lattice of events, as in (23)b.

7 Atelic VPs are like mass NPs in terms of cumulative reference; if we have two driving-a-car events, the sum of the two is also a driving-a-car event. Thus, the sums of \( e_1, e_2, e_3 \), i.e., \( e_1 \cup_e e_2, e_1 \cup_e e_3, e_1 \cup_e e_2 \cup_e e_3 \), are also drive-a-car events. That is, \( \llbracket \text{drive a car} \rrbracket \) is \( \{ e_1, e_2, e_3, e_1 \cup_e e_2, e_1 \cup_e e_3, e_1 \cup_e e_2 \cup_e e_3 \} \). Since the members can be ordered by the part-of relation, the extension of this atelic VP is a lattice of events, as in (23)b. Telic VPs are analogous to count NPs; in the same way as a singular count NP like *dog* denotes a set of atomic individuals, a singular telic VP like *break a car* denotes a set of atomic events. Telic VPs can be pluralized by applying the semantic pluralization operation * used for pluralization in the nominal domain (see section 2.1, see also Landman 1989a, 1989b, 2000). With the help of the *-operator, telic VPs can be semantically pluralized. A plural telic VP denotes a set containing atomic events and their sums, just like a plural count NP denotes a set containing atomic individuals and their sums. For instance, when \( \llbracket \text{break a car} \rrbracket \) is \( \{ e_1, e_2, e_3 \} \), \( \llbracket *\text{break a car} \rrbracket \) is \( \{ e_1, e_2, e_3, e_1 \cup_e e_2, e_1 \cup_e e_3, e_1 \cup_e e_2 \cup_e e_3 \} \), which can be modeled as a lattice of events, as in (23)b. Note that a telic VP that denotes a single-occurrence event like *kill Peter* can never denote a lattice: assuming that Peter dies only once, the killing-Peter event can occur only once. That is, even if we pluralize it, the extension of *kill Peter* is always a singleton. In sum, the extensions of a plural telic VP and of an atelic VP are a lattice of events, while the extension of a singular telic VP is not.

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7 Just like mass NPs, minimal parts of atelic VPs are somewhat vague (see Rothstein 2004, for instance). In this paper, I simply assume that bottom elements in a lattice of an atelic VP are events which have the same property as the relevant atelic VP.
Let us now apply the proposed analysis to some empirical data. In (25), for example, a homomorphism $h$ maps coughing events to their agents. The measure function then applies to the range of $h$ and picks out a sum of students whose cardinality is two. (26) and (27) illustrate legitimate $h$ from a lattice of coughing events to a lattice of students.\footnote{A lattice of coughing events can be much larger than the ones in (26) and (27) in that these events can take individuals who are not in the denotation of *student as an agent. Since what is relevant for the denotation of (25) is individuals who are students and coughed, I only consider the relevant portion of the lattice of coughing events.} Importantly, the atomic coughing events $e_1$, $e_2$, and $e_3$ are never be mapped to the sums of individuals $x \cup y$, $x \cup z$, $y \cup z$, and $x \cup y \cup z$. This is due to Landman’s (1989a) claim that basic predicates never take sums in their extension. Hence, $h$ must map atomic events to atomic (singular or group) individuals. The measure function applies to a set of individuals mapped from events, that is, $\{x, y, z, x \cup y, x \cup z, y \cup z, x \cup y \cup z\}$ in (26) and $\{x, y, x \cup y\}$ in (27). Among these sets, the split quantifier picks up a sum whose cardinality is two, i.e. $x \cup y$, $x \cup z$, or $y \cup z$ in (26) and $x \cup y$ in (27).

\begin{align*}
(25) & \text{Gakusei-ga kono jup-pun-de buta-ri seki-o si-ta.} \\
& \text{student-NOM this ten-minute-in two-CL cough-ACC do-PAST} \\
& \text{‘Two students coughed within the last ten minutes.’}
\end{align*}

\begin{align*}
(26) & e_1 \cup e_2 \\
& e_1 \cup e_3 \\
& e_2 \cup e_3 \\
& e_1 \cup Ee_2 \\
& e_1 \cup Ee_3 \\
& e_2 \cup Ee_3 \\
& e_1 \cup Ee_2 \cup Ee_3 \\
& e_1 \cup Ee_2 \\
& e_1 \cup Ee_3 \\
& e_2 \cup Ee_3 \\
& e_1 \cup Ee_2 \cup Ee_3 \\
& h \\
& x \cup y \cup z \\

& \text{[cough] = \{ e_1, e_2, e_1 \cup Ee_2, e_1 \cup Ee_3, e_2 \cup Ee_3, e_1 \cup Ee_2 \cup Ee_3 \} } \\
& \text{[student] = \{ x, y, z, x \cup y, x \cup z, y \cup z, x \cup y \cup z \} } \\
\end{align*}

\begin{align*}
(27) & e_1 \cup e_2 \\
& e_1 \\
& e_2 \\
& e_1 \cup Ee_2 \\
& e_1 \cup Ee_2 \\
& e_1 \cup Ee_2 \\
& e_1 \cup Ee_2 \\
& h \\
& x \cup y \cup z \\

& \text{[cough] = \{ e_1, e_2, e_1 \cup Ee_2 \} } \\
& \text{[student] = \{ x, y, z, x \cup y, x \cup z, y \cup z, x \cup y \cup z \} } \\
\end{align*}

The definition of $h$ permits a one-to-many mapping; as in (28), multiple atomic events can be mapped to one atomic individual, where $y$ corresponds to
two events. Indeed, (25) is compatible with a scenario where, among two
students who coughed within the last ten minutes, one of them coughed twice.
In this scenario, the number of students who coughed is two, but the number of
atomic coughing events is three. The situation in (28) is compatible with (25),
just like (27) is: the measure function applies to \{x, y, x \cup y\}, and it picks up a
sum whose cardinality is two, that is, x \cup y.

(28)

![Diagram]

Note that a one-to-many mapping is not legitimate when the relevant VP
has a singular count NP as an internal argument. Consider first the German
example in (29)b, where the extension of *ate a cake* forms a lattice of events.
This example is not compatible with (28), since, in (28), one of the two boys,
i.e. y, is an agent of two eating-a-cake events, that is, y ate two cakes. Unlike
(29)b, (29)a in Japanese is compatible with (28). This is because bare nouns in
Japanese can be interpreted as singular or plural (see footnote 1); (29)a doesn’t
say anything about how many cakes the two boys ate. Although the plural
interpretation of Japanese bare nouns hasn’t been discussed so far, it is
certainly available in any example with a bare internal argument. For instance,
in (2)a, *isu ‘chair’* can be interpreted as singular or plural, hence (2)a means
that each boy made one chair or chairs, yielding three or more chairs as a result.
Crucially, (2)a still lacks the collective reading that three boys together made
one chair or chairs.

(29) (a) **Otokonoko-ga** sono kafe-de **huta-ri** keeki-o  tabe-ta.
boy-NOM that cafe-at two-CL cake-ACC eat-PAST
‘Two boys ate a cake / cakes at that cafe.’

(b) **Jungen haben** **zwei** einen Kuchen **gegessen.**
boys have two a cake eaten

The proposed analysis captures the semantic differences between (25) and
(30), where *ni-kai ‘twice’* is simply counting the number of events without
being associated with the number of students (cf. Doetjes 1997). Crucially,
while (25), with the split *two-CL*, must involve two students, (30) does not
have to: (30) means that a student or students whose cardinality is unspecified
coughed twice. This semantic difference indicates that the measure function in
(25) is not applying to events directly.
Let us now consider the observation that split quantifier constructions allow only distributive readings (see section 3.1). Suppose that, in (2) above, a lattice of making-a-chair events is mapped to a lattice of boys by a one-to-one mapping \( h \), as in (31). The measure function applies to the range of \( h \), i.e. a set of agents \{x, y, z, x ∪ y, x ∪ z, y ∪ z, x ∪ y ∪ z\}. The split quantifier picks out the member whose cardinality is three, i.e. \( x ∪ y ∪ z \). \( x ∪ y ∪ z \) consists of \( x, y, z \), each of whom is an agent of an atomic making-a-chair event \( e_1, e_2, e_3 \), which yields a distributive reading. As discussed above, Japanese further allows a one-to-many mapping like the one in (28). Suppose that there are four making-a-chair events \( e_1, e_2, e_3, e_4 \), and \( e_1 \) is mapped to \( x \), \( e_2 \) is to \( y \), and \( e_3 \) and \( e_4 \) are to \( z \). The proposed mechanism yields the reading that three boys \( x ∪ y ∪ z \) are agents of four building-a-chair events, where \( x \) and \( y \) built one chair each and \( z \) built two chairs. Indeed, (2)a is compatible with such a situation.

Under Landman’s analysis discussed in the previous section, a collective reading obtains when a predicate is not pluralized and it takes a group individual as an agent. In my analysis, this would be the case with \( h \) from a singleton containing an atomic making-a-chair event \( e \) to the group of three students \( \uparrow(x ∪ y ∪ z) \). In this case, although the split quantifier needs to pick out the member whose cardinality is three, there is no such element in the range of \( h \); the range of \( h \) only has \( \uparrow(x ∪ y ∪ z) \) whose cardinality is one. In this way, the proposed analysis correctly rules out the collective reading.

4 Split Quantifier Constructions and Collectivity

In the previous section, I proposed a mechanism where, with the help of a homomorphism \( h \) from events to individuals, the measure function associated with a split quantifier applies to individuals mapped from events, i.e. the range of \( h \). This mechanism accounts for why split quantifier constructions lack
collective interpretations. In this section, I show that the proposed analysis extends to a wider range of data on distributive and collective readings. In section 4.1, I present novel data indicating that, depending on the aspectuality of the VPs, collective readings are available with split quantifier constructions. Section 4.2 deals with another instance of collective readings, i.e. collective readings obtained with a collectivizing adverb such as together. In section 4.3, I introduce another type of reading, namely, the so-called cover reading, which can also be explained by the current analysis. Section 4.4 discusses collective interpretations allowed by split quantifier constructions where the host NP is an internal argument. I propose that these collective readings are not genuinely collective, hence they are not problematic to the present analysis.

4.1 Collectivity with Progressives

In section 3.1, I showed that, while non-split quantifier constructions have both collective and distributive readings, split quantifier constructions have only distributive readings. However, it is not the case that collective readings are always unavailable in split quantifier constructions: when a VP is in a progressive form, a collective reading obtains. Japanese has a morpheme -teiru, which attaches to a verb and expresses that the relevant event is progressing, like -ing in English (see Ogihara 1998). The example in (32)a illustrates that, with -teiru, a telic VP such as make a chair permits a collective reading even in the split quantifier construction (cf. (2)a). In German, progressive aspect can be expressed by a construction with the preposition an.9 For example, in (32)b, the an construction roughly translates as the -ing progressive in English. In this progressive context, the split quantifier construction allows ambiguity between a distributive and a collective reading (cf. (2)b).

(32) (a) Otokonoko-ga kinoo san-nin isu-o tukut-tei-ta.
    boy-NOM yesterday three-CL chair-ACC make-PROG-PAST
    ‘Three boys were making a chair yesterday.’ √collective, √distributive

(b) Jungen haben drei an ein Stuhl gebaut.
    boys have three PREP a chair built √collective, √distributive

9 The an construction is rather restricted in its distribution. For instance, predicates such as read a chapter, eat a cake, drink a glass of wine are not permitted in the an construction, as in (i).

(i) a. *Die Studenten haben an einem Kapitel gelesen.
    the students have PREP a chapter read

b. *Die Studenten haben an einem Kuchen gegessen.
    the students have PREP a cake eaten

c. ??Die Studenten haben an einer Flasche Wein getrunken.
    the students have PREP a bottle wine drunk
In the same vein, although the split quantifier constructions in (33)b and (34)b with the collective VP *build Tokyo Tower* are unacceptable, their progressive counterparts in (33)c and (34)c are acceptable.

(33) (a) 
[Sagyooin *hyaku-nin*-ga Tokyo-de *tate-ta.*]
worker-CL NOM Tokyo-in build-PAST
‘100 workers built Tokyo Tower in Tokyo.’

(b) *
[Sagyooin-ga Tokyo-de *hyaku-nin* Tokyo Tower-o *tate-ta.*]
worker-NOM Tokyo-in 100-CL Tokyo Tower-ACC build-PAST

(c) 
[Sagyooin-ga Tokyo-ni *hyaku-nin* Tokyo Tower-o *tate-tei-ta.*]
worker-NOM Tokyo-in 100-CL Tokyo Tower-ACC build-PROG-PAST
‘100 workers were building Tokyo Tower in Tokyo.’

(34) (a) 
[100 *Arbeiter* haben den Tokio-Tower in Tokio gebaut.
100 workers have the Tokyo-Tower in Tokyo built
‘100 workers built Tokyo Tower in Tokyo.’

(b) *
[Arbeiter haben 100 den Tokio-Tower in Tokio gebaut.
workers have 100 the Tokyo-Tower in Tokyo built

(c) Arbeiter haben 100 an den Tokio-Tower in Tokio gebaut.
workers have 100 PREP the Tokyo-Tower in Tokyo built
‘100 workers were building Tokyo Tower in Tokyo.’

The question to be addressed is then why split quantifier constructions permit collective readings with progressive VPs. It has been noted that verbal predicates in progressives are tied to a notion of partiality, as informally defined in (35) (Bennett and Partee 1972, Krifka 1992). With this definition, the extension of progressive VPs is considered to be a lattice of subevents. For instance, the VP *make a chair* in a progressive form may have subparts \( e', e'', e''' \). Crucially, \( e', e'', e''' \) are subevents of a singular making-a-chair event \( e \). These subevents and their sums form a lattice of subevents, where \( e' \cup e'' \cup e''' \) corresponds to \( e \). Then the extension of the making-a-chair event is a lattice, as in (36).

(35) \[
\text{PROG} = \lambda P, x, \lambda e. \exists e [ P(e) \land e \leq e' \land e' \text{ is not the final subevent of } e ]
\]

(36) \[
\begin{align*}
\text{[be making a chair]} &= \{ e', e'', e''', e', e'', e''', e''', e', e''', e''''' \} \\
\end{align*}
\]

In section 3.2 above, I discussed why split quantifier constructions lack collective interpretations. The measurement of events is done by measuring individuals through events with the help of a homomorphism from events to
individuals. One possible case is to make use of a one-to-one homomorphism, as illustrated in (31) above, which necessarily yields a distributive reading: each making-a-chair event e₁, e₂, e₃ is mapped to its agent x, y, z, respectively. Extending this approach to split quantifier constructions with progressive VPs, we could postulate h in (37), where each subpart e', e'', e''' of a making-a-chair event is mapped to its agent x, y, z, respectively. Crucially, a singular making-a-chair event e, that is, e' ∪ e'' ∪ e''' is mapped to x ∪ y ∪ z, which yields a collective reading, although (37) is still distributive in that each individual is an agent of a different subevent.

(37) $\begin{align*}
e' &\cup e'' &\cup e''' \\
x \cup y &\cup z \\
\{x, y, z\} \end{align*}$

The analysis that progressives create subevents receives supporting evidence from the following Japanese data. Recall the claim in section 3.2 that split quantifier constructions are incompatible with VPs denoting a single-occurrence event. These examples become acceptable when VPs are in a progressive form, as in (38) and (39). This pattern follows naturally from the current analysis: in (38)a and (39)a, the extension of the VPs is a singleton, while the extension of the progressive VPs in (38)b and (39)b is a lattice of subevents. We further predict that these sentences allow a collective reading.

In fact, since the events of breaking-that-table and killing-Mary can occur only once, the collective reading is the only reasonable interpretation.

(38) (a) ?? Gakusei-ga kinoo san-nin sono isu-o kowasi-ta.
student-NOM yesterday three-CL that chair-ACC break-PAST

"Three students were breaking that chair yesterday."

(b) Gakusei-ga kinoo san-nin sono isu-o kowasi-tei-ta.
student-NOM yesterday three-CL that chair-ACC break-PROG-PAST

10 The German equivalent of these examples is unacceptable, as in (i). However, this may be because the distribution of the an construction is much more restricted in the first place, as mentioned in footnote 9.

(i) a. *Die Studenten haben an Peter umgebracht.
the students have PREP Peter killed

b. *Die Studenten haben an einem Haus vernichtet.
the students have PREP a house destroyed
Event Quantification, Distributivity, and Aspect

‘Three students were breaking that chair yesterday.’

(39) (a) ?? John-wa [gootoo-ga sokode san-nin Mary-o korosi-ta]-to itta.
John-TOP [robber-NOM there three-CL Mary-ACC kill-PAST]-COMP said
‘John said that three robbers were killing Mary over there.’

(b) John-wa [gootoo-ga sokode san-nin Mary-o korosi-tei-ta]-to itta.
John-TOP [robber-NOM there three-CL Mary-ACC kill-PROG-PAST]-COMP said
‘John said that three robbers were killing Mary over there.’

In this way, the mechanism of a homomorphism proposed in section 3 can account for the fact that split quantifier constructions permit collective readings in progressive forms.

4.2 Collectivity with Together

Directly relevant to the data presented in this section are so-called “collectivizing” adverbials in English such as together (also as a group, collectively, jointly, etc.) (Lasersohn 1995, in particular). When these adverbs appear in sentences which are otherwise ambiguous between distributive and collective readings, only a collective reading is available, as in (40). Likewise, in Japanese and German, when collectivizing adverbs co-occur with split quantifiers, as in (41), only collective readings are available.

(40) (a) John and Mary built a table.
(b) John and Mary built a table together.

(41) (a) Otokonoko-ga kinyoo san-nin issyon-i isu-o tukut-ta.
boy-NOM yesterday three-CL together chair-ACC make-PAST
‘Three boys made a chair together yesterday.’
(b) Otokonoko-ga san-nin(-hito-kumi)-de isu-o tukut-ta.
boy-NOM three-CL(-one-CL)-COP chair-ACC make-PAST
‘Boys made a model boat by three (as a group).’
(c) Jungen haben drei zusammen ein Stuhl gebaut.
boys have three together a chair built

I propose that these collectivizing adverbs rely on the group formation operator \( \uparrow \) proposed by Landman (1989a, 1989b, 2000), which was introduced in section 2.2. \( \uparrow \) is a type-shifting operator that maps a sum of individuals (e.g. \( x \cup y \cup z \)) to an atomic group individual (e.g. \( \uparrow (x \cup y \cup z) \)). For instance, in (41), \( \uparrow \) forms a group of three boys. That is, with \( \uparrow \), the split quantifier indicates the cardinality of individuals in the group. Then (41) means that one group consisting of three boys made a chair, where there was only one agent, namely,
a group of three boys. It follows that the sentences with these collectivizers have the same status as sentences with the split one, as in (42).\footnote{The German ST with one is generally ungrammatical, as in (i), except for the examples in some special contexts (e.g. es gibt construction in (ii), etc.).}

I propose that the extension of the VP is a lattice of events even with the split one. For instance, in (42), a lattice of hitting-Peter events is mapped to a lattice of students, and the split quantifier picks out a member whose cardinality is one. The role of split one is simply to say that, out of a lattice of individuals mapped from events, there is a relevant individual $h(e)$ whose cardinality is one.

\begin{equation}
\text{(42) } \text{Gakusei-} \text{ga kinoo hito-ri Peter-o tatai-ta.}
\end{equation}

\text{student-NOM yesterday one-CL Peter-ACC hit-PAST}

\text{‘One student hit Peter yesterday.’}

Similarly, I assume that the extension of the VP must be a lattice of events even with a collectivizing adverb. In (41), each atomic event is mapped to an atomic group consisting of three boys, as illustrated in (43), which illustrates a legitimate homomorphism from events to groups.

\begin{equation}
\text{(43) } \begin{align*}
e_1 & \cup e_2 & \cup e_3 \\
e_1 & \cup e_2 & \cup e_3 \\
\uparrow (a_1 \cup b_1 \cup c_1) & \uparrow (d_1 \cup e_1 f_1) & \uparrow (g_1 h_1 j_1)
\end{align*}
\end{equation}

\text{Note that the analysis proposed here is analogous to Landman’s analysis of collective predicates like meet. He points out that these predicates allow distributive readings: the boys and girls met has a reading where a group of boys met and a group of girls met independently (see section 2.2). This is because the extension of the boys and girls can be a lattice consisting of two group atoms, i.e. a group of boys and a group of girls. In the same vein, in split quantifier constructions with collectivizers, the extension of agents can be a lattice consisting of group atoms, as illustrated in (43).}

In section 3.1, I showed that split quantifier constructions lack collective readings. What is relevant here is that the degree of unacceptability seems to
vary among the informants. In fact, some informants said that collective readings do not seem to be completely unacceptable. I suggest that this is because the informants manipulate the existence of collectivizing adverbs. This is especially plausible for Japanese. As in (41)b, by simply having -de ‘-COPULA’ following the split quantifier, collective interpretations obtain. Hence, even when the split quantifier is not followed by -de, speakers may obtain ‘illusive’ collective interpretations by positing a covert -de.

4.3 Cover Readings

There is another reading relevant to the discussions here, namely, cover readings (Gillon 1987, Schwarzschild 1991, 1996, Verkuyl and van der Does 1991, van der Does 1992, Brisson 1998, 2003). For instance, (44)a is true when, among three composers Ann, Beth, and Colin, Ann wrote musicals, and Beth and Colin together wrote musicals. Another example is given in (44)b, where Landman (2000) claims that the most plausible reading is a cover reading: different groups of firefighters (maybe overlapping) put out fires, and those groups together make up 400 firefighters. The distributive and collective readings are less plausible: each of 400 firefighters put out the fires or a single group of 400 firefighters put out the fires. Indeed, the Japanese non-split quantifier construction in (45)a shows the same preference. However, the corresponding split quantifier construction in (45)b does not allow the cover reading nor the collective reading. Rather, it only allows the distributive reading where each of 400 firefighters put out fires. Thus, (45)b is most naturally used in a scenario such as follows: there was a contest participated in by 400 firefighters where each of them put out fires.

(44) (a) Three composers wrote musicals. (Gillon 1987)
(b) 400 firefighters put out the fires in Colorado. (Landman 2000:125)

(45) (a) [Syooboosi yonhyaku-nin]-ga kororado-de kaji-o kesi-ta.
[firefighter 400-CL]-NOM Colorado-in fire-ACC put out-PAST
‘400 firefighters put out the fires in Colorado.’
(b) Syooboosi-ga kororado-de yonhyaku-nin kaji-o kesi-ta.
firefighter-NOM Colorado-in 400-CL fire-ACC put out-PAST

In Japanese, the classifier -nin is used for individual persons; in (45)b, -nin must count individual firefighters, that is, -nin must be associated with individual atoms. Thus, in the extension of the host NP, an atomic element in a lattice must be an individual firefighter. The collective reading would obtain when the extension of the NP contains a group consisting of 400 firefighters. Although the split quantifier picks out an element whose cardinality is 400,
cardinality of the group is one. Hence, the collective reading is unavailable (see section 3.2 for details). The cover reading obtains when each atomic element is a group of unknown number of firefighters and ‘400-CL’ indicates the total number of firefighters. For example, take the situation illustrated in (46), which is analogous to the one proposed in (43) for together. To achieve the cover reading, we need to ensure that the total number of individual firefighters is 400. However, in (46), there are no individual atoms that can be associated with -nin, hence the cover reading is unavailable. The closest reading available would be the one presented in (47). Besides a classifier for individual atoms, Japanese has the classifier -kumi that is used for group atoms. For example, in (47), -kumi must count groups of firefighters, that is, -kumi must be associated with group atoms. In this way, with -kumi, it is possible to count the number of group atoms in (46).

\[(46)\]
\[
e_1 \cup e_2 \cup e_3 \cup \ldots \cup e_n
e_1 \cup \ldots \cup e_n
\]

\[(47)\]  
Syooboosi-ga kororado-de yonhyaku-kumi kaji-o kesi-ta.
firefighter-NOM Colorado-in 400-CL fire-ACC put out-PAST

‘400 groups of firefighters put out the fires in Colorado.’

4.4 Collectivity with Internal Arguments

So far, I have examined split quantifier constructions where the host NP is a subject, or more specifically, an external argument. As shown in (48), the host NP in these constructions can be an internal argument.

\[(48)\]
\[(a)\] John-ga hon-o kinoo san-satu yon-da.
John-NOM book-ACC yesterday three-CL read-PAST

‘John read three books yesterday.’
\[(b)\] Bücher hat Hans gestern drei gelesen.
books has Hans yesterday three read

In the following, depending on whether a split quantifier is associated with an external argument or an internal argument, split quantifier constructions are referred to as external split quantifier constructions or internal split quantifier constructions. In this section, I first show that internal split quantifier constructions seem to allow a collective reading. However, this reading is
different in nature from the collective reading prohibited in external split quantifier constructions. I propose that the asymmetry between external and internal arguments discussed in Chapter I: 4.3 is responsible for the difference in collective readings.

The categorization of predicates based on distributivity is generally defined with respect to plural subjects, or more precisely, external arguments. Little has been said on distributivity with respect to plural objects (or internal arguments). The only previous references I have found are Dowty (1987), where *enumerate* and *count* are categorized as collective predicates and *summarize* as an ambiguous predicate, and Landman (2000), where *combine* is argued to be collective in its object position. As an ambiguous predicate, I use *mix*, as in (49). The distributive reading is that John made three different cocktails separately, say, martini, margarita, and piña colada. The collective reading is that John put together three cocktails and made a mysterious drink. The split internal quantifier constructions in (49) have these two readings. The examples in (50) show that they are compatible with a collective predicate such as *pile up*.12

(49) (a) John-ga kakaten-o syeikaa-de san-bai maze-ta.
     John-NOM cocktail-ACC shaker-by three-CL mix-PAST
     ‘John mixed three cocktails by shaker.’
(b) Getränke hat Hans drei gemixt.
     drinks has Hans three mixed
     ‘Hans mixed three drinks.’

(50) (a) John-ga hako-o heya-ni juk-ko tumikasane-ta.
     John-NOM box-ACC room-in ten-CL pile up-PAST
     ‘John piled up ten boxes in the room.’
(b) Kasten häufte Hans gestern zehn an.
     boxes heaped Hans yesterday ten on
     ‘Hans piled up ten boxes yesterday.’

It seems then that internal split quantifier constructions allow collective readings, unlike external split quantifier constructions. I argue that the collective readings with respect to a plural internal argument are different in nature from collective readings with respect to a plural external argument. For instance, in (50), if John piled up ten boxes, then he must have piled up nine boxes, eight boxes, and so on. Compare this with *ten boys built the statue*, where there is no entailment that the smaller number of boys could have built the statue. In this sense, although *pile up* is ‘collective’ in that it is

12 Other collective predicates with respect to a plural internal argument I came up with are *collect*, *assemble*, *gather*, *sum*, *accumulate*, *separate*, and *divide*. 
incompatible with one (*John piled up one box), it is different from genuinely collective predicates with respect to an external argument where there is no entailment. Consider further the distributive predicate sleep. If ten boys slept, then nine boys must have slept, eight boys must have slept, and so on. This suggests that a collective reading in internal split quantifier constructions is not really ‘collective’, but rather distributive. There seem to be no genuine collective readings that do not have this entailment with respect to a plural internal argument. A piece of supporting evidence for this generalization comes from the observation that the distributive quantifier every is inappropriate in subject position of collective predicates (Roberts 1990), but not in object position (Landman 2000), as in (51).

(51) (a) ? Every boy meets.
    (b) In this class I will try to combine every semantic theory that has been proposed in the literature. (Landman 2000:83)

Assuming that the generalization that internal split quantifier constructions lack genuine collective readings is on the right track, the question is why. I propose that this is because there is an inherent incremental relationship between an event and its internal argument, but not between an event and its external argument.\footnote{Previous studies have argued for various types of incremental relationships: “ADD-TO” property (Verkuyl 1972, 1993), “measuring out” (Tenny 1987, 1994), “graduality” (Krifka 1989, 1992), “incremental theme” (Dowty 1991), and “structure-preserving binding relations” (Jackendoff 1996) (see Krifka 1998:198-199 for summary).} For instance, in eat an apple, there is an incremental relationship between the eating event and its internal argument an apple in that, as the eating event proceeds, the amount of apple consumed increases. In contrast, it has been claimed that there is no such incremental relationship found between an event and its external argument (Tenny 1987, 1994, in particular).\footnote{Dowty (1991) and Krifka (2001) argue that there can be an incremental relationship between an event and its external argument, as in (i) and (ii). However, these examples are not strong counter-examples to the generalization that the incremental relationship holds only between an event and its internal argument. For (i), we could say that the external argument of a movement verb is special in that it has a double role of being an agent and a moved object, as claimed in Krifka (2001:7). As for (ii), the incrementality found with quantified NPs such as fifty customers is different in nature from the incrementality with singular NPs, in that, in the former case, the incrementality can be forced by pluralizing both individuals and events, yielding a homomorphic relation between the two (cf. Dowty 1991:570). Thus, a singular external argument is different from a singular internal argument in that it does not have an incremental relationship with an event.}

Let us now go back to the data on distributivity. In John piled up

\begin{itemize}
\item (i) a. John entered the icy water (very slowly).
\end{itemize}
ten boxes, there is an incremental relation between the piling up event and boxes, that is, as the piling up event proceeds, the number of boxes increases. This amounts to the entailment described above. In contrast, in ten boys built the statue, there is no incremental relationship between ten boys and the building-the-statue event, hence there is no entailment of the kind found with pile up ten boxes. Summing up, since an internal argument always has an incremental relationship with an event, it never allows a genuine collective reading without entailment. I take this to mean that the seemingly collective readings in (49) and (50) are not genuinely collective, hence they are different in nature from genuine collective readings with external arguments.

5 Conclusion

In this paper, I presented various empirical data on collective and distributive interpretations of split quantifier constructions, which is summarized in (52). I proposed a mechanism of event measurement that makes use of a homomorphism from events to individuals. This mechanism is capable of handling the whole range of data.

(52) (a) Split quantifier constructions generally disallow collective readings.
(b) Split quantifier constructions allow collective readings with a progressive VP.
(c) Split quantifier constructions allow collective readings with a collectivizer.
(d) Split quantifier constructions disallow cover readings.
(e) Internal split quantifier constructions lack genuine collective reading.

References


b. John crossed the desert in a week. (Dowty 1991:570-571)
(ii) Fifty customers complained about the product in two days. (Krifka 2001:7)
Short portraits
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