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Incremental *more*

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1 Introduction

The morpheme *more* has been mostly studied as a comparative operator. However, it appears that *more* can be used non comparatively, as in (1):

(1) It rained for three hours this morning, and it rained a little more in the afternoon.

There is an interpretation of (1) in which the second conjunct, *it rained a little more in the afternoon*, is an assertion that it rained in the afternoon, possibly less than three hours. In this reading, the second conjunct is interpreted neither as an assertion that the duration of the rain in the afternoon was greater than some standard (the duration of the rain in the morning), nor as an assertion that it was a little longer than this standard. Rather, this interpretation of (1) conveys that it rained for some short period of time in the afternoon, and that this event of raining is in some sense added to the event of raining that took place in the morning, the two events forming a larger eventuality of raining. We call this the incremental use of *more*.

In this paper, we argue that incremental *more* ($more_{inc}$) is a pluractional additive operator. As shown in sections 2 and 3, $more_{inc}$ combines with a relation D between degrees and eventualities, triggers a presupposition that a similar relation is satisfied by a pair of degree and eventuality (d_p, e_p), asserts that D itself is satisfied by another pair of degrees and eventuality (d, e), and asserts also that a similar relation is satisfied by the sum of the two pairs, $(d_p + d, e_p \oplus e)$. It is this last component of the meaning of $more_{inc}$ that makes it a pluractional operator. Evidence for such a pluractional semantics comes from the analysis of some restrictions on the use of $more_{inc}$ with stative predicates on the one hand, and with achievements and accomplishments on the other hand.

$More_{inc}$ is attested in some stative predications, c.f. (2), but not in others, c.f. (3):

(2) Michael owns two apartments in Boston and he owns one more apartment in New York.

(3) This area was quite dangerous a few years ago. Now it is a little more dangerous.

(2) has an incremental reading according to which John owns (at least) three houses, two in Boston and one in New York. By contrast, the only available reading of *more* in (3) is comparative (this area is a little more dangerous now than it was before). We

argue in section 5 that gradable stative predicates (like *dangerous*) denote relations between individuals, states and degrees. It is shown in section 6 that incremental *more* is ungrammatical in exactly those stative predications where *more* binds the degree argument of the stative predicate. This generalization correctly predicts that $more_{inc}$ is unattested in sentences such as (3), where *more* binds the degree argument of *dangerous*, while it can occur in stative sentences such as (2), where the degree that it binds originates inside the DP *apartment*.

$More_{inc}$ is attested inside *take α time to* constructions with achievements and accomplishments, c.f. (4). However, $more_{inc}$ is not attested inside *in α time* measure phrases, c.f. (5):

(4) Michael solved the first puzzle in 5 minutes, and it took him 10 more minutes to solve the second one.

(5) ?Michael solved the first puzzle in 5 minutes, and he solved the second one in 10 more minutes.

(4) has an incremental reading according to which Michael solved the second problem in 10 minutes. On the other hand, in so far as (5) is acceptable at all, it only has a comparative reading according to which Michael solved the second problem in 15 minutes.

In sections 6 and 7, we argue that $more_{inc}$ cannot combine with stative predicates and with *in α time* measure phrases, because these expressions are inherently distributive in a way that is inconsistent with the pluractional meaning of $more_{inc}$.

2 Incremental *more*

Consider the following sentence:

(6) There were five beers on the kitchen table. There are two more in the fridge.

In its incremental reading, the second sentence asserts that there are two beers in the fridge. It also seems to presuppose that there are/were some other beers, possibly somewhere else – in this case, the presupposition is satisfied by the fact that the context entails the proposition that there were five beers on the kitchen table. This division of labor between assertion and presupposition is supported by classical tests. The proposition that there are two beers in the fridge can be denied by the addressee:

(7) A: There are two more beers in the fridge.
B: No, the only beers we had were on the kitchen table.

The proposition that there are/were some other beers somewhere (else) can be targeted by the 'Hey, wait a minute!' test, and projects from the antecedent of conditionals, among other environments:

(8) A: There are two more beers in the fridge.
B: Hey, wait a minute, I didn't know that we had any other beers!

(9) A: If there are two more beers in the fridge, Chuck will drink them.

B: Hey, wait a minute, I didn't know that we had any other beers!

More$_{inc}$ appears to contribute yet another element of meaning to the utterance in (6) beyond the assertion and the presupposition we just mentioned. (6) means that the number of beers that there are in the fridge has to be added to the number of beers that there are/were somewhere else, the sum of the two numbers being the total number of beers available. This is shown by the fact that (6) is not felicitous in the following context. There were exactly five beers on the kitchen table, I drank three of them, and then I put the two that were left in the fridge. There are no other bottles of beer in the fridge. In sum, the second sentence in (6) asserts that there are two beers in the fridge, presupposes that there are/were other beers somewhere (else), in this case that there were five beers on the kitchen table, and asserts that there is a total of at least seven beers on the kitchen table and in the fridge. Consider now this other example of *more*$_{inc}$:

(10) I ran for two hours this morning and I ran for three more hours this afternoon.

Once again, the second sentence with *more*$_{inc}$ conveys three different propositions: it asserts that the speaker ran for three hours in the afternoon, it presupposes that the speaker ran for some time on some other occasion, and it asserts that these two events of running can be summed to form a plural event whose duration is the sum of the duration of the two simple events.

3 A formal analysis of *more*$_{inc}$

3.1 *More*$_{inc}$ as a pluractional additive operator

More$_{inc}$ is found inside nominal projections as in (6), repeated here as (11), and also in adverbial projection as in (10), repeated here as (12):

(11) There were five beers on the kitchen table. There are two more in the fridge.

(12) I ran for two hours this morning and I ran for three more hours this afternoon.

In order to analyze the meaning of *more*$_{inc}$ in (6) and in (10) in a unified way, we hypothesize that *more*$_{inc}$ is a function that applies to a relation between degrees and eventualities. In (6), the relation is between states *s* of being some beers and the cardinalities of the groups of beers in these states (degrees *d*) as in (13). In (10), the relation is between events *e* of the speaker running and the durations $\tau(e) = d$ of these events as in (14):

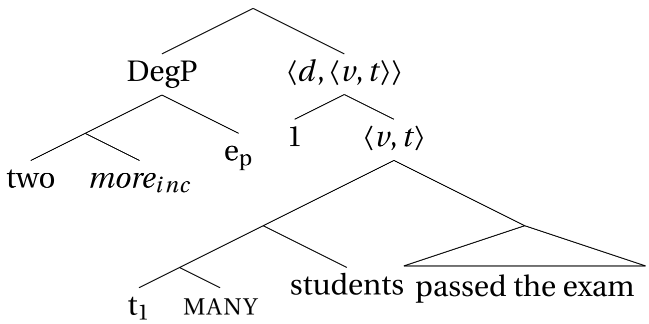
(13) $\lambda d.\lambda s.\exists X[\text{beers}(s)(X) \wedge \mid X \mid = d \wedge \text{in the fridge}(X)]$

(14) $\lambda d.\lambda e.[\text{run}(e) \wedge \text{agent}(e) = (\text{sp}_c) \wedge \tau(e) = d]$

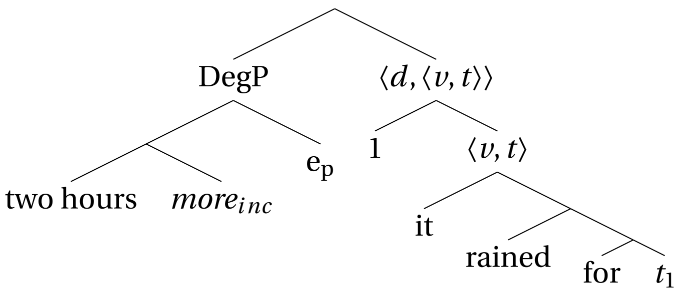
In both cases, *more*$_{inc}$ contributes an assertion that this relation holds between some event e and some degree d, a presupposition that a similar relation holds between some salient event e' and some degree d', and an assertion that these two events can be summed to form an eventuality $e \oplus e'$ that is realized to a degree $d + d'$.

Therefore, we argue that the semantic type of $more_{inc}$ is the same in nominal and in adverbial environments, and that in both cases, $more_{inc}$ applies to a relation between degrees and eventualities. We claim that such a relation is built in the syntax, along the following lines:

(15) Two more students passed the exam.



(16) It rained for two hours more.



We hypothesize that $more_{inc}$ heads a *Degree Phrase* (DegP) that originates inside a measure phrase. In the case of nominal $more_{inc}$, this measure phrase is created by a covert MANY operator, that applies to an NP and returns a parametrized generalized quantifier (Hackl, 2001):

(17) $[\![\text{MANY}]\!] = \lambda d.\lambda P_{\langle e,t\rangle}.\lambda Q_{\langle v\langle e,t\rangle\rangle}.\lambda e.\exists X[|X| = d \wedge P(X) = 1 \wedge Q(e)(X) = 1]$

In the case of adverbial $more_{inc}$, we assume that a measure phrase relating to the verbal head as an adjunct is provided overtly (cf. the *for* phrase in (16)) or covertly. In both cases, the Deg head by $more_{inc}$ originates in a position where an element of type d (for degrees) is expected. Since the type of the DegP does not fit the local requirements, it raises to a position above the VP, leaving behind it a trace of type d that is abstracted over. This QR of $more_{inc}$ creates an argument of type $\langle d,\langle v,t\rangle\rangle$ (a relation between degrees d and eventualities v) for $more_{inc}$ to apply to at the level of the VP.

Let us now consider the meaning we hypothesize for $more_{inc}$. We assume a system of types including at least eventualities (type v), degrees (type d) and individuals (type e). We assume that the domain of eventualities and the domain of individuals come with part-whole structures (Krifka, 1998), with relations of sum $\oplus$, and part-of $\leq$. The following denotation for $more_{inc}$ is temporary and will be revised later on (the presupposition of $more_{inc}$ is underlined):

(18) $[\![\text{more}_{inc}]\!]^g = \lambda d.\lambda e'.\lambda D_{\langle d,\langle v,t\rangle\rangle}.\lambda e.\underline{\exists d'[D(d')(e')]} \wedge D(d)(e) \wedge D(d+\delta)(e \oplus e')$
where $\delta = \iota d'[D(d')(e')]$

Remember that in our analysis, *more*$_{inc}$ contributes the assertion that some relation of type $\langle d, \langle v, t\rangle\rangle$ holds of a pair of degree and eventuality (d, e) (call them the asserted degree and eventuality) and triggers the presupposition that a similar relation holds of a degree d' and a contextually salient eventuality e'. As can be seen in the LF above, we assume that *more*$_{inc}$ first applies to the asserted degree. The resulting function then applies to the contextually salient eventuality mentioned in the presupposition. We represent it as e_p in our metalanguage. It is treated as a pronoun and is never bound in the semantic representation. The presupposed degree is existentially quantified in the presupposition of *more*$_{inc}$ and referred back to in the assertion using a definite description δ. *More*$_{inc}$ together with its two innermost arguments forms a constituent that denotes a degree quantifier of type $\langle\langle d, \langle v, t\rangle\rangle, \langle v, t\rangle\rangle$, labeled DegP in the LF. This DegP is then merged with an expression denoting a function that expects a degree argument (MANY in the LF above), and undergoes QR. The complete semantic derivation of the sentence is as follows (presuppositions are underlined):

(19)
1. $[\![\text{DegP}]\!]^g = \lambda D_{\langle d,\langle v,t\rangle\rangle}.\lambda e.\underline{\exists d' \wedge [D(d')(\text{e}_\text{p})]} \wedge D(2)(e) \wedge D(2+\delta)(e \oplus \text{e}_\text{p})$
   where $\delta = \iota d'[D(d')(e_p)]$
2. $[\![\text{MANY}]\!]^g([\![t_1]\!]^g) =$
   $\lambda P_{\langle e,t\rangle}.\lambda Q_{\langle v,\langle e,t\rangle\rangle}.\lambda e.\exists X[|X| = g(t_1) \wedge P(X) \wedge Q(e)(X)]$
3. $[\![\text{MANY } t_1]\!]^g([\![\text{students}]\!]^g) =$
   $\lambda Q_{\langle v,\langle e,t\rangle\rangle}.\lambda e.\exists X[|X| = g(t_1) \wedge \text{students}(X) \wedge Q(e)(X)]$
4. $[\![\text{MANY } t_1 \text{ students}]\!]^g([\![\text{passed the exam}]\!]^g) =$
   $\lambda e.\exists X[|X| = g(t_1) \wedge \text{students}(X) \wedge \text{pass(the exam)}(e) \wedge \text{agent}(e) = (X)]$
5. $[\![1 \text{ MANY } t_1 \text{ students passed the exam}]\!]^g =$
   $\lambda d.\lambda e.\exists X[|X| = d \wedge \text{students}(X) \wedge \text{pass(the exam)}(e) \wedge \text{agent}(e) = (X)]$
6. $[\![\text{DegP}]\!]^g([\![1 \text{ MANY } t_1 \text{ students passed the exam}]\!]^g) =$
   $\lambda e.\underline{\exists d' \exists X[|X| = d' \wedge \text{students}(X) \wedge \text{pass(the exam)}(\text{e}_\text{p}) \wedge \text{agent}(\text{e}_\text{p}) = (X)]} \wedge$
   $\exists X[|X| = 2 \wedge \text{students}(X) \wedge \text{pass(the exam)}(e) \wedge \text{agent}(e) = (X)] \wedge$
   $\exists X[|X| = 2+\delta \wedge \text{students}(X) \wedge \text{pass(the exam)}(e \oplus \text{e}_\text{p}) \wedge \text{agent}(e \oplus \text{e}_\text{p}) = (X)]$
   where $\delta = \iota d'[D(d')(e_p)]$

The interpretation of a sentence with adverbial *more*$_{inc}$ is similar, and we leave it to the reader.

The semantics we have given to *more*$_{inc}$ requires the asserted relation and the presupposed relation to be identical. This is clearly too restrictive. The relations between degrees and eventualities that are mentioned in the presupposition and the assertion of *more*$_{inc}$ are obviously allowed to differ, as illustrated in the following examples, with nominal and adverbial *more*$_{inc}$:

(20) A: How much did you exercise last week?
B: I ran for two hours and I biked for three more hours.

(21) A: How many students are asking for a grant this year?

B: Five students submitted a proposal to the NSF and three more to the ELF.

In (20), the presupposed and asserted relation are as in (22) and (23) respectively:

(22) $\lambda d.\lambda e.\, run(e) \wedge \text{agent}(e) = (\text{sp}_\text{c}) \wedge \tau(e) = d$

(23) $\lambda d.\lambda e.\, bike(e) \wedge \text{agent}(e) = (\text{sp}_\text{c}) \wedge \tau(e) = d$

In order to make the semantics of $more_{inc}$flexible enough to be consistent with such variation, we assume that a function *alt* is available, that generates the set of alternatives of an expression α. We assume that this set is a contextually restricted subset of the set of expressions of the same type as α. The revised semantics of $more_{inc}$ is:

(24) $[\![\text{more}_{inc}]\!]^{g,c} = \lambda d.\lambda e'.\lambda D_{\langle d,\langle v,t\rangle\rangle}.\lambda e.$
$\underline{\exists d' \exists D' \in alt(D)[D'(d')(e')]} \wedge D(d)(e) \wedge \exists D'' \in alt(D)[D''(d+\delta)(e \oplus e'])$
where $\delta = \iota d'[\exists D' \in alt(D)[D'(d')(e')]]$

This allows us to predict the following truth conditions for the second conjunct of (20):

(25) $\underline{\exists d' \exists D' \in alt(D)[D'(d')(e_p)]} \wedge \exists D(d)(e) \wedge \exists D'' \in alt(D)[D''(d+\delta)(e \oplus e_p)$
where $\delta = \iota d'[\exists D' \in alt(D)[D'(d')(e_p)]]$
and $D = \lambda d.\lambda e.run(e) \wedge \text{agent}(e) = (\text{sp}_\text{c}) \wedge \tau(e) = d$

The set of alternatives to a given relation between eventualities and degrees must of course be constrained in several respects. One that seems to be of theoretical interest is that in some sense, the degree arguments of the asserted relation and of the presupposed relation must stand for measures of the same kind of entity. Consider for instance (26):

(26) ?I met two boys yesterday and I met two more girls today.

(26) sounds odd, unless we are able to accommodate the information that I had met other girls before today, i.e. we are aware that there is a particular event of me meeting some girls that is relevant to the conversation at the point when I utter (26). This suggests that the presupposed eventuality to which $more_{inc}$ relates in (26) must be an event of interacting in some way with some girls. Why is that? The relational argument of $more_{inc}$ in (26) is:

(27) $\lambda d.\lambda e.\exists X[\text{girl}(X) \wedge \text{meet}(e)(X) \wedge \text{agent}(e) = (sp_c) \wedge |X| = d]$

We have seen that the alternatives to (27) might be as (28), but cannot be as (29); else, the oddity of (26) would be unexpected:

(28) $\lambda d.\lambda e.\exists X[\text{girl}(X) \wedge P(e)(X) \wedge |X| = d$
where $P \in alt(\lambda e.\lambda x.\text{meet}(e)(x) \wedge \text{agent}(e) = (sp_c))$

(29) $\lambda d.\lambda e.\exists X[P(X) \wedge \text{met}(e)(X) \wedge \text{agent}(e) = (sp_c) \wedge |X| = d$
where $P \in alt(\lambda x.\text{girl}(x))$

We suggest that (29) is not a good alternative to (27) because the degrees in both relations are measures of potentially different kinds of entities. In (27), the degrees are cardinalities of groups of girls. In (19) on the other hand, the degrees are cardinalities of groups of individuals having the property P, where P is an alternative to $\lambda x.\text{girl}(x)$.

In short, we suggest that the degree argument of the relational argument of $more_{inc}$ and the degree argument of its alternatives must stand for measures of the same kind of entity. How this constraint is to be implemented compositionally is left for further research.

3.2 Comparison with Greenberg (2009, 2010)

Greenberg (2009, 2010)'s analysis of incremental *more* and mine are very similar in their basic aspects. As we will see later, they differ in non trivial ways when it comes to explaining the various restrictions on the use of $more_{inc}$. Additionally, the two analyses differ in their syntactic assumptions.

Greenberg (2009) argues that incremental or as she calls them additive readings of *more* come in two varieties, nominal $more_{add}$ and verbal $more_{add}$, each corresponding to a different denotation of $more_{add}$. Consider sentences (30) and (31):

(30) Three $more_{add}$ boys danced.

(31) John ran three kilometers $more_{add}$.

Let us focus on nominal $more_{add}$ in (30) first. According to Greenberg, the truth conditions of (30) are:

(32) Assertion: There is a dancing eventuality e_1, whose agent is three individuals who are boys.
Presupposition: There is a P_2 event, e_2, which is temporally not later than the reference time of the assertion, and whose agent is a group of boy with cardinality d_2. The eventualities e_1 and e_2 are in the denotation of a predicate P_3, and there is an eventuality e_3 in the plural predicate $*P_3$, which is the sum of the dancing eventuality e_1 and e_2, whose agents are the boys which are agents to e_1 and of e_2, with cardinality of 3 individuals+d_2. Finally, this summed eventuality e_3 is more developed than e_2.

The two analyses of nominal $more_{add}$ in (30)[1] are similar in that both assume that (30) contributes an assertion that there exists an event of three boys dancing, and a presupposition that there is an other event e_2 of d_2 other boys dancing. Both analyses also argue that these two events are summed to form a larger event $e_1 \oplus e_2$ of $3 + d_2$ boys dancing. In more general terms, nominal $more_{add}$ in both analyses relate eventualities of some sort to the cardinality of some (plural) individual participating in these eventualities. Both assert that a larger eventuality e_3 is formed out of two eventualities e_1 and e_2, such that the cardinality of a designated group of individuals participating in e_3 equals the sum of the cardinality of a designated group of individuals participating

[1] In this section I will use Greenberg's notation for this so called incremental or additive use of *more*

in e_1 and the cardinality of a designated group of individuals participating in e_2.

Yet the two analyses differ in important respects. Firstly, the division of labor between assertion and presupposition is different in each. In our analysis, the incremental clause (the statement about the sum eventuality $e_1 \oplus e_2$) is argued to be an assertion. In Greenberg's analysis, it is argued to be part of a presupposition. In the next section, we give arguments that it is not a presupposition since it cannot project through operators such as negation and the antecedent of a conditional. Secondly, in our analysis sentences with nominal *more*$_{add}$ contain a measure function that measures the cardinality of a group of individual in a direct way. The DegP headed by *more*$_{add}$ is generated in the degree argument position of a parametrized determiner MANY, that applies a cardinality measure function to a plural individual in the extension of a NP. In Greenberg's analysis on the other hand nominal *more*$_{add}$ introduces a cardinality measure function in the logical metalanguage in which the truth conditions are represented, and no independent constituent denoting a measure function is introduced in the syntactic structure of the sentence. This measure function μ then applies to the output of a function h that maps an event e to a group of individuals that participate in e (say, as the agents of e). This can be seen in the formalization of the truth conditions (32) in (33) (I underlined the presupposition):

(33)
$$\begin{aligned}
&\exists e_1 \exists x[\text{boy}(x) \wedge \text{dance}(e_1) \wedge \text{agent}(e_1) = x \wedge \mu(h(e_1)) = 3] \wedge \\
&\underline{\exists e_2, e_3, P_2, P_3, d_2, y, z[P_2(y)(e_2) \wedge \text{boy}(y) \wedge \mu(h(e_2)) = d_2 \wedge \tau(e_2) \leq \tau(e_1) \wedge} \\
&\underline{\exists e_3, P_3, z[P_3(x)(e_1) \wedge P_3(y)(e_2) \wedge^* P_3(z)(e_3) \wedge e_3 = e_1 \oplus e_2 \wedge \text{boy}(z) \wedge z = x \oplus y \wedge} \\
&\underline{\mu(h(e_3))) = 3 + d_2 \wedge e_3 >_{developed} e_2]]}
\end{aligned}$$

A conceptual disadvantage of measuring individuals indirectly by first mapping eventualities to individuals and then measuring the output of the mapping, is that the relation between the syntactic position of *more*$_{add}$ (either generated inside a DP or inside an adverbial projection) and the type of measure of the event that *more*$_{add}$ relates to has to be stipulated. Indeed, nothing prevents us *a priori* from interpreting h in (33) as a mapping from events to their temporal trace, and μ as a function measuring durations in hours. In this case, the discourse in (34) would be interpreted as meaning that some students danced for 2 hours in the morning and some students danced for 3 hours in the afternoon, the two events being summed to form a larger eventuality of dancing for 5 hours. Since this interpretation of (34) is not available, we have to stipulate that the morphism h introduced by nominal *more*$_{add}$ can only be a mapping from events to individuals, and that the measure function μ introduced by nominal *more*$_{add}$ can only be the cardinality function. Our analysis is more restrictive in that the fact that nominal *more*$_{add}$ can only relate events to cardinalities of individuals follows from independent syntactic assumptions, namely that the DegP headed by *more*$_{add}$ is generated in the position of the degree argument of MANY inside a DP. There is no semantic specificity to nominal *more*$_{add}$ as opposed to verbal *more*$_{add}$. Any difference between the two follows from their structural position in a syntactic structure.

(34) Two students danced in the morning. Three *more*$_{add}$ students danced in the afternoon.

We conclude this discussion of nominal *more*$_{add}$ by giving its denotation in Greenberg's analysis, using Greenberg's notation:

(35) $[\![more_{add}]\!] = \lambda d.\lambda Q.\lambda P.\lambda e_1.\exists x[Q(x) \wedge P_1(x)(e_1) \wedge \mu(h(e_1)) = d]$
Presupposition:
$\exists e_2, e_3, P_2, P_3, d_2, y, z[P_2(y)(e_2) \wedge Q(y) \wedge \mu(h(e_2)) = d_2 \wedge \tau(e_2) \leq t \wedge P_3(x)(e_1) \wedge P_3(y)(e_2) \wedge *P_3(z)(e_3) \wedge e_3 = e_1 \oplus e_2 \wedge Q(z) \wedge z = x \oplus y \wedge \mu(h(e_3))) = d_1 + d_2 \wedge e_3 >_{developed} e_2]$

Verbal *more*$_{add}$ is given a similar analysis. Consider the truth conditions of (31) (presupposition underlined):

(36) $\exists e_1[\text{ran}(e_1) \wedge \text{cardinality}(e_1) = 2\,\text{events} \wedge \text{agent}(e) = \text{John} \wedge \underline{\exists e_2, P_2, d_2[P_2(e_2) \wedge \text{cardinality}(e_2) = d_2 \wedge \tau(e_2) \leq \tau(e_1) \wedge \exists e_3, P_3[*P_3(e_3) \wedge e_3 = e_1 \oplus e_2 \wedge e_3 >_{developed} e_2 \wedge \text{cardinality}(e_3) = 2\,\text{events} + d_2]]]}$

According to (36), (31) asserts that there is an event e_1 that is the sum of two atomic events of running by John, and presupposes both that there is another event e_2 preceding e_1 such that e_2 is the sum of d_2 atomic events, and that there is an event e_3 that is is the sum of e_1 and e_2 and that is the sum of $d_2 + 2$ atomic events. Greenberg (2010) argues that verbal *more*$_{add}$ has the following denotation:

(37) $\lambda d_1.\lambda P_1.\lambda e_1.[P_1(e_1) \wedge \mu(e_1) = d_1 \wedge \underline{\exists e_2, P_2, d_2[P_2(e_2) \wedge \mu(e_2) = d_2 \wedge \tau(e_2) \leq \tau(e_1) \wedge \exists e_3, P_3[*P_3(e_3) \wedge e_3 = e_1 \oplus e_2 \wedge e_3 >_{developed} e_2 \wedge \mu(e_3) = d_1 + d_2]]]}$

Rather than discuss verbal *more*$_{add}$ in details as we did for nominal *more*$_{add}$, I would like to point to a central part of Greenberg's analysis. In the formula above, we can see the clause $e_3 >_{developed} e_2$. This clause is read 'e_3 is more developed than e_2'. Greenberg's intuition is that the two events that *more*$_{add}$ sums to form e_3 cannot be just any kind of events. They have to be related in a such a way that by summing e_1 and e_2, one forms an event that is a development of e_2, in some sense to be made precise. Greenberg's intuition is meant first to explain the unacceptability of sentences such as (38) and (39):

(38) Mary ran for a while, # then she slept some more.

(39) I found 4 coins on the ground. # Then I lost two more.

According to Greenberg (38) and (39) are unfelicitous because adding an event of loosing two coins to an event of finding four coins does not constitute a development of the latter event. I share Greenberg's intuition, but I would like to understand it as a general pragmatic constraint on question answer congruence. If *more*$_{add}$ is an additive particle, then sentences such as (38) and (39) are meant to be answers to questions such as 'How much did Mary … ' or 'How many coins did you … '; not only this, but the two measures expressed in each conjunct are supposed to be added to one another so that (38) and (39) entail propositions of the form 'Mary … for x hours in total' or 'I … x coins in total'. I would like to suggest that the infelicity of sentences (38) and (39) boils down to the unavailability of plausible questions that (38) and (39) could answer, i.e. questions that are congruent with propositions of the form 'Mary … for x hours in total' or 'I ... x coin in total', where x is understood respectively as the sum of the duration of an event of sleeping and the duration of an event of running, or as the sum of the cardinality of a group coins that were found and the cardinality of a group of coins that were lost. While it is surely interesting to make notions of question answer congruence clear enough to capture the unacceptability of (38) and (39), it seems to me a mistake to encode a notion such as 'more developed' in the form of a primitive relation between events, built in the denotation of $more_{add}$. If anything, one would like to derive the requirement of 'development' from the interaction between the semantics of sentences with $more_{add}$ and general principles of question answer congruence or discourse structure.

4 Some welcome consequences of this analysis

Consider the denotation of $more_{inc}$ again:

(40) $[\![\text{more}_{inc}]\!]^{g,c} = \lambda d.\lambda e'.\lambda D_{\langle d,\langle v,t\rangle\rangle}.\lambda e.$
$\underline{\exists d'\exists D' \in alt(D)[D'(d')(e')]} \wedge D(d)(e) \wedge \exists D'' \in alt(D)[D''(d+\delta)(e \oplus e')])$
where $\delta = \iota d'[\exists D' \in alt(D)[D'(d')(e')]]$

The assertive component of $more_{inc}$ contains two clauses. The first one ($D(d)(e)$) asserts that the relational argument of $more_{inc}$ is satisfied by a pair of eventuality and degree (d, e). The second one asserts that some relation $D'' \in alt(D)$ is satisfied by the sum of the pair (d, e) with a contextually salient pair of degree and eventuality (d', e'). Let us call the first clause the subjacent, and let us call the second clause the incremental clause. In this section, we present some consequences of our analysis of the incremental clause, and give arguments for its assertoric rather than presuppositional status.

As we argued in section 2, the incrementality of $more_{inc}$ can be easily demonstrated with nominal $more_{inc}$. Consider (41):

(41) Two customers bought a laptop yesterday, and one more bought a desktop today.

(41) is infelicitous in a context in which the customer who bought a desktop is one of the two customers who bought a laptop. In order for (41) to be felicitous, there must be three customers buying a computer. The following example shows that adverbial $more_{inc}$ is also incremental:

(42) It rained for two hours in Cambridge. (# In the same time span), it rained for two more hours in Somerville.

Sentence (42) is infelicitous with the adverbial *in the same time span.* This is expected if we require the two hours of raining in Cambridge to be added to the two hours of raining in Somerville to form the duration of a larger event of raining: if two raining events overlap in time, the duration of their sum cannot be equal to the sum of their durations. These facts are predicted by our analysis of $more_{inc}$. (41) is predicted to be false in a context in which only two customers bought computers. As for (42), the use of the adverbial *at the same time* makes the sentence contradictory: the adverbial entails that the event of raining in Somerville was simultaneous to a salient event, while the semantics of $more_{inc}$ requires that this salient event must not temporally overlap with the asserted event. We might then argue that (42) is infelicitous because it is necessarily false.

Since the incremental clause is part of the assertoric components of $more_{inc}$, it can be negated. This allows us to account for the behavior of $more_{inc}$ under negation. Nominal $more_{inc}$ can be negated as *no more*, c.f. (43). Both adverbial and nominal $more_{inc}$ can take the form *any more* when they are realized in the scope of negation, c.f. (44) and (45):

(43) No more students arrived.

(44) I didn't see any more students.

(45) It didn't rain any more.

(43) presupposes that some students arrived at a previous occasion, and asserts that no students arrived afterward. (44) presupposes that the speaker had previously seen some students, and asserts that she didn't see any students afterward. (45) presupposes that it was raining at a previous occasion, and asserts that is it not raining at the time of utterance. Note that in the three cases, the negated incremental clause can be directly denied and does not project from the antecedent of conditionals, showing that it is not a presupposition:

(46) A: No more students arrived.
B: It's false, Bill just arrived.

(47) If no more students had arrived, the class room should have been half empty. But it is full.

(48) A: I did not see any more students.
B: It's false, you're talking to one right now.

(49) If I had not seen any more students, I would have left. But I saw Jane and Michael in the hall.

(50) A: It is not raining any more.
B: It's false, it's pouring right now.

(51) If it were not raining any more, I would go to the grocery store. But it is still pouring.

The possibility to negate the incremental clause is expected in our analysis. The truth conditions we predict for (43), (44) and (45) respectively are as follows, were the subjacent and the incremental clause are conjoined and the conjunction is in the scope of a negation:

(52) $\underline{\exists d' \exists D' \in alt(D)[D'(d')(\mathrm{e_p})]} \wedge \neg \exists d \exists e \exists X[\text{students}(X) \wedge \mid X \mid = d \wedge \text{arrived}(e)(X) \wedge$

$\exists D'' \in alt(D)[D''(e \oplus \mathrm{e_p})(X \oplus \delta)]]$
where $\delta = \iota d'[\exists D' \in alt(D)[D'(d')(\mathrm{e}_p]]$
and $D = \lambda d.\lambda e.\exists X[\text{students}(X) \wedge \mid X \mid = d \wedge \text{arrived}(e)(X)]$

(53) $\underline{\exists d' \exists D' \in alt(D)[D'(d')(\mathrm{e_p})]} \wedge \neg \exists d \exists e \exists X[\text{students}(X) \wedge \mid X \mid = d \wedge \text{see}(e)(X) \wedge \text{agent}(e) = (\mathrm{sp_c}) \wedge \exists D'' \in alt(D)[D''(e \oplus \mathrm{e_p})(d \oplus \delta)]]$
where $\delta = \iota d'[\exists D' \in alt(D)[D'(d')(\mathrm{e}_p]]$
and $D = \lambda d.\lambda e.\exists X[\text{students}(X) \wedge \mid X \mid = d \wedge \text{see}(e)(X) \wedge \text{agent}(e) = (\mathrm{sp_c})]$

(54) $\underline{\exists d' \exists D' \in alt(D)[D'(d')(\mathrm{e_p})]} \wedge \neg \exists d \exists e[\text{rain}(e) \wedge \tau(e) = d \wedge \exists D'' \in alt(D)[D''(d + \delta)(e \oplus \mathrm{e_p})]]$
where $\delta = \iota d'[\exists D' \in alt(D)[D'(d')(\mathrm{e}_p]])$
and $D = \lambda d.\lambda e.\text{rain}(e) \wedge \tau(e) = d$

Note that if the incremental clause were part of the presupposition triggered by *more*$_{inc}$, we would predict its projection under negation. It is not clear what the truth condition of (43)-(45) would then be. Furthermore, classical tests show that the incremental clause does not project, contrary to what we would expect if it were a presupposition:

(55) We only had two beers. They were on the kitchen table and Chuck drank them both. If there were two more beers in the fridge, Chuck would drink them both.

The incremental clause in (55) is plausibly understood as the proposition that there have been four beers in our possession, two on the kitchen table and two in the fridge. If this proposition projected out of the antecedent of the conditional, we would expect (55) to be contradictory. The absence of contradiction shows that the incremental clause does not project, and hence is probably not a presupposition, *pace* Greenberg (2009, 2010).

5 Background assumptions on event semantics and measurement

The last two sections of the paper will be concerned with the analysis of the incompatibility of *more*$_{inc}$ with stative predicates and *in* α *time* measure phrases. These sections will rely heavily on assumptions about event semantics and measurement in natural language that we introduce in this section.

5.1 Plurality and events

Sentences with multiple plural DPs are often ambiguous. (56) for instance, (from Kratzer, 2007) has at least three readings: cumulative, collective and subject distributive:

(56) Two children lifted two boxes.

In its cumulative reading, (56) asserts that at least two boxes were lifted by at least two children, without imposing any requirement on who lifted which box beyond the fact that each child must have lifted at least one box. In its collective reading, (56) asserts that two children were the collective agent of at least one event of lifting two boxes. This can be so for instance if the two boxes were stacked on top of one another, and the two children lifted the stack together. Lastly, under its subject distributive reading, (56) asserts that two children each lifted two boxes, meaning that up to four boxes might have been lifted in total. Kratzer suggests that these three readings should not be distinguished in logical form, i.e. that the same semantic representation should be used to generate each reading. Facts from VP ellipsis are invoked to support this claim. These tests come with an assumption that the elided VP in VP ellipsis must be structurally identical to its antecedent. Hence, if the two VPs can differ in their collective vs. cumulative vs. subject distributive readings, the source of such ambiguity is presumably not structural:

(57) The two boys lifted the two boxes, and the two girls did to.

(58) The two chefs cooked a stew, and the two students did, too. The chefs were very experienced, so they each prepared a Moroccan tagine. The two students worked together on a Boeuf Bourguignon.

Kratzer argues that (57) is true in a situation in which the two boys jointly lifted each of the two boxes, but the two girls each lifted a different one of the two boxes on her own, showing that the same VP structure can generate cumulative and collective readings. Likewise, (58) show that the same VP structure can generate collective and subject distributive readings.

The source of these plural ambiguities, Kratzer argues, should then be traced to differences in the possible extensions of the VPs. In order to understand Kratzer's analysis of the plural ambiguities, we must therefore understand her analysis of the denotation of verbs and verb phrases. Two elements are crucial in this analysis. Firstly, Kratzer argues that the internal arguments of verbs are always introduced by the verbs themselves. By this, we mean that transitive and unaccusative verb heads denote relations between eventualities and individuals, where the individual position is reserved for the individual argument of the verb, as illustrated in the following examples:

(59) $[\![\text{lift}]\!] = \lambda e.\lambda x.\text{lift}(e)(x)$

(60) $[\![\text{lift a box}]\!] = \lambda e.\exists x[\text{lift}(e)(x) \wedge \text{box}(x)]$

Secondly, Kratzer argues that verbs are inherently cumulative. That is, their extensions are closed under mereological sum-formation. Under different assumptions, the extension of the verb *lift* could be as in (61): it is a set of pairs of atomic events of lifting and things being lifted. According to Kratzer however, the extension of *lift* is never such a set but rather its closure under mereological sum formation, (62):

(61) $\{\langle e_1, t_1\rangle, \langle e_2, t_2\rangle, \langle e_3, t_3\rangle\}$

(62) $\{\langle e_1, t_1\rangle, \langle e_2, t_2\rangle, \langle e_3, t_3\rangle, \langle e_1 \oplus e_2, t_1 \oplus t_2\rangle, \langle e_1 \oplus e_3, t_1 \oplus t_3\rangle, \langle e_2 \oplus e_3, t_2 \oplus t_3\rangle, \langle e_1 \oplus e_2 \oplus e_3, t_1 \oplus t_2 \oplus t_3\rangle\}$

Given these assumptions, the cumulative and the collective readings of a sentence such as (57) can be identified as the result of assigning different extensions to the VP *lift two boxes.* Let us assume that there are two boxes in our universe of discourse, b_1 and b_2. The extension of *lift two boxes* might be as follows:

(63) $[\![\text{lift two boxes}]\!]^g = \{\langle e_1, b_1\rangle, \langle e_2, b_2\rangle, \langle e_1 \oplus e_2, b_1 \oplus b_2\rangle\}$

(64) $[\![\text{lift two boxes}]\!]^g = \{\langle e_3, b_1 \oplus b_2\rangle\}$

(65) $[\![\text{lift two boxes}]\!]^g = \{\langle e_1, b_1\rangle, \langle e_2, b_2\rangle, \langle e_3, b_1 \oplus b_2\rangle, \langle e_1 \oplus e_2, b_1 \oplus b_2\rangle, \langle e_1 \oplus e_3, b_1 \oplus b_2\rangle, \langle e_2 \oplus e_3, b_1 \oplus b_2\rangle, \langle e_1 \oplus e_2 \oplus .e_3, b_1 \oplus b_2\rangle\}$

If the extension of the VP happens to be as in (63), the only event of lifting two boxes that is available is a plural event consisting of the sum of two events of lifting a box. Asserting that two children are the agent of such an event can be understood in two ways. It might be the case that the children are agents both of e_1 and e_2, in which case they are agent of $e_1 \oplus e_2$ by virtue of the cumulativity of the relation *agent*. We get a collective reading in which the two boxes were lifted one by one but collectively by the two children. It might also be the case that each child was the agent of one of these events, i.e. the first child was an agent of e_1 and the second the agent of e_2, in which case the two children are still agents of $e_1 \oplus e_2$ by virtue of the cumulativity of the relation *agent*. In this case we get a cumulative reading, since no child lifted two boxes on its own but two boxes were lifted in total, and a total of two children lifted boxes. If the extension of the VP happens to be as in (64), the only possible reading is a collective one, according to which the two children lifted the two boxes collectively and at the same time. If the denotation of the VP is as in (65), all of these readings are possible. In all cases, the logical form of (56) is as follows[2]:

(66) $\exists e \exists x \exists y[\text{children}(x) \wedge \text{boxes}(y) \wedge \mid x \mid = 2 \wedge \mid y \mid = 2 \wedge \text{lifted}(e)(y) \wedge \text{agent}(e)(x)]$

We still have to explain how the subject distributive reading of (56) can be generated. This reading is inconsistent with the LF in (66). Indeed, this LF imposes that the two children be agents of a single event of lifting two boxes, which is inconsistent with the subject distributive reading according to which the children could have lifted up to four boxes, i.e. two boxes each. In order to generate this reading, we need to pluralize the VP which is the sister constituent of the plural subject. Kratzer argues that plural DPs can pluralize their sister constituents, which accounts for the availability of subject distributive reading. We introduce a pluralization operator **, in (67), from Beck (2001), although we apply it to relations of type $\langle e, \langle v, t\rangle\rangle$:

(67) ** is the function: $D_{\langle e,\langle e,t\rangle\rangle} \rightarrow D_{\langle e,\langle e,t\rangle\rangle}$ such that for any R, x, t:
$^{**}R(x)(y) = 1$ iff $R(x)(y) = 1$ or $\exists x_1, x_2, y_1, y_2[x = x_1 \oplus x_2 \wedge y = y_1 \oplus y_2 \wedge {}^{**}R(x_1)(y_1) \wedge {}^{**}R(x_2)(y_2)$

Now, compare the unpluralized VP in (68) and the pluralized VP in (69):

(68) $\lambda x.\lambda e.\exists y[\text{children}(x) \wedge \text{boxes}(y) \wedge \mid x \mid = 2 \wedge \mid y \mid = 2 \wedge \text{lifted}(e)(y) \wedge \text{agent}(e)(x)]$

(69) $^{**}(\lambda x.\lambda e.\exists y[\text{children}(x) \wedge \text{boxes}(y) \wedge \mid x \mid = 2 \wedge \mid y \mid = 2 \wedge \text{lifted}(e)(y) \wedge \text{agent}(e)(x)])$

[2] It is assumed that the predicates *children*, *boxes* and *agent* are inherently cumulative, i.e. are closed under mereological sum formation.

(68) is a relation between events and individuals that holds of an individual i and an event e only if i is the agent of e and e is an event of lifting two boxes. Therefore, the subject distributive reading is impossible to generate. (69) on the other hand can hold of an individual i and an event e in case i is the sum of two individuals u and v, and e is the sum of two events e_1 and e_2, such that u is the agent of e_1, v is the agent of e_2, and e_1 and e_2 each are events of lifting two boxes. Since no constraints in (69) states that e_1 and e_2 should be events of lifting the same boxes, we get a reading in which two children have lifted two possibly different boxes each, which is the desired subject distributive reading. This closes our summary of Kratzer's treatment of plural ambiguities with event semantics.

5.2 Adjectives, degrees and states

Kratzer (2004) proposes to extend her analysis of plural ambiguities using events to the ambiguity of stative sentences such as (70). This part of Kratzer's analysis is going to be of primary importance to our analysis of $more_{inc}$. Consider then (70) uttered in a context where I am pointing to a pile of 100 plates

(70) These 100 plates are light.

In its distributive reading, (70) is an assertion that each of the 100 plates are light. In its collective reading, it is an assertion that the pile of plate is light. Once again, Kratzer argues that this ambiguity is not rooted in the availability of two logical forms for (70), but that each reading correspond to a different extension of the predicate *light*. Kratzer assumes that gradable adjectives such as *light* are relations between states and individuals who find themselves in these states; *light* for instance is a relation between an individual and its state of lightness. Kratzer furthermore seems to assume that (what I will call) dimension states, e.g. states of lightness, are values on a scale and therefore can play the role of degrees in our ontology. That is, Kratzer presumably assumes that the denotation of *light* is:

(71) $[\![\text{light}]\!] = \lambda s.\lambda x.\text{light}(s)(x)$

I will not adopt the latter part of Kratzer's proposal, and I will instead assume that gradable adjectives are relations between states, individuals and degrees, where the degree argument is identified as the result of measuring the state s with an appropriate measure function μ, c.f. (72). The reason for this minor modification to Kratzer's proposal is that it seems to make the analysis of measure phrases with adjective somehow easier, c.f. (73) and (74):

(72) $[\![\text{light}]\!] = \lambda d.\lambda x.\lambda s.\text{light}(s)(x) \wedge \mu(s) \leq d$

(73) $[\![\text{long}]\!] = \lambda d.\lambda x.\lambda s.\text{long}(s)(x) \wedge \mu(s) \geq d$

(74) $[\![\text{2 meters long}]\!] = \lambda x.\lambda s.\text{long}(s)(x) \wedge \mu(s) \geq 2\text{ meters}$

Before we can understand Kratzer's explanation of the ambiguity of (70), we need to introduce additional concepts in the discussion. As we saw earlier, Kratzer accounts for the contrast between collective and cumulative readings of VPs by reducing these readings to different kinds of relations between eventualities and individuals. An event of two boys collectively lifting two boxes is an event that has two boys as its agent and two boxes as its internal argument, and that has no subevent that has only one of the boys as an agent. On the other hand, an event of two boys cumulatively lifting two boxes is an event that has two boys as its agent and two boxes as its internal argument, and that has two subevents in which only one of the boys is lifting a single box. What distinguishes one reading from the other is not what kind of individuals are its agent, but how an event relates to a pair of a plural individual (two boys) and a plural object (two boxes). Kratzer suggests to extend this relational theory of collectivity and cumulativity to the analysis of collective nouns, such as *choir*. What distinguishes a choir of boy, as a collective entity, from the plurality of boys that compose it is that in the first case the boys are the possessor of (i.e. find themselves in) a state of being in a choir. The denotation of the noun 'choir' is therefore as in (75), and its extension might be as in (76), where s_1 is a choir of three boys, s_2 is a choir of three girls, and $s_1 \oplus s_2$ is a plural individual consisting of the two choirs. On the other hand, the non collective noun *boy* might have the denotation in (77) and the extension in (78). Note that $s_3 \oplus s_4 \oplus s_5$ is not a collective group of boys, but just a scattered plurality, since the plural possessor of $s_3 \oplus s_4 \oplus s_5$[3] is not also the possessor of each state that is a part of $s_3 \oplus s_4 \oplus s_5$. We can then give the following definition of a group or cohesive collection of individuals[4]: a plural individual forms a group with respect to a state s if and only if it is the single possessor of s. (79) defines single possessor of states [5].

(75) $[\![\text{choir}]\!] = \lambda x.\lambda s.\text{choir}(s)(x)$

(76) $\{\langle s_1, b_1 \oplus b_2, \oplus b_3\rangle, \langle s_2, g_1 \oplus g_2, \oplus g_3\rangle, \langle s_1 \oplus s_2, b_1 \oplus b_2, \oplus b_3 \oplus g_1 \oplus g_2, \oplus g_3\rangle\}$

(77) $[\![\text{boy}]\!] = \lambda x.\lambda s.\text{boy}(s)(x)$

(78) $\{\langle s_3, b_1\rangle, \langle s_4, b_2\rangle, \langle s_5, b_3\rangle, \langle s_3 \oplus s_4, b_1 \oplus b_2\rangle, \langle s_3 \oplus s_5, b_1 \oplus b_3\rangle, \langle s_5 \oplus s_6, b_2 \oplus b_3\rangle, \langle s_3 \oplus s_4 \oplus s_5, b_1 \oplus b_2 \oplus b_3\rangle\}$

(79) *Single possessor constraint*
If s is a state, and x is the possessor of s, then x is the possessor of any substate of s.

How does this apply to the stative predication in (70)? Kratzer's logical form for (70) is given in (80)[6]. Taking our modifications into account, (80) translates as (81), which asserts that the 100 plates are in the state of lightness s and that this state has a weight less than a contextual standard **pos**:

(80) light(the 100 plates)(s)

(81) light(the 100 plates)(s) $\wedge\ \mu(s) \leq \textbf{pos}$

Kratzer's analysis applies in both cases. The variable s is left free in (80) and (81). It might then take different values depending of what assignment function is used. In

[3] I.e. $b_1 \oplus b_2 \oplus b_3$

[4] Neither this definition nor the examples in (75) to (78) are quoted from Kratzer (2004), although they follow Kratzer's presentation of these notions in this book.

[5] Extrapolating on Kratzer's explicit definition of single agent, Kratzer (c.f. 2004, chapter 4)

[6] Kratzer actually use a symbol to indicate that the predicate *light* is pluralized, although this symbol is redundant in her theory and shown purely for extra explicitness.

one possible assignment, the 100 plates are the single possessors of s, according to the definition in (79). This assignment produces the collective reading of (70). An extension of *light* that makes this reading true is given in (82). Under another assignment, the 100 plates are the possessor of the state of lightness $s_1 \oplus \dots s_{100}$, but this state is the sum of 100 substates of lightness that each have one of the different plates as their possessor. This accounts for the distributive reading of (70). An extension of light that makes this reading true is given in (83).

(82) $\{\langle s, p_1 \oplus \dots \oplus p_{100}\rangle\}$

(83) $\{\langle s_1, p_1\rangle, \dots, \langle s_{100}, p_{100}\rangle, \dots, \langle s_1 \oplus \dots s_{100}, p_1 \oplus p_{100}\rangle\}$

Note that in our revision of the denotation of the adjective *light*, the extension in (83) entails that the measure function introduced by the adjective is applied to the sum of 100 different states. What is measured then? Not the sum of the weight of each plate, since this would then generate a collective reading. We assume that the output of the measure function is the measure of the heaviest weight among the 100 states:

(84) light(the 100 plates)$(s_1 \oplus \dots \oplus s_{100}) \wedge \mu(s_1 \oplus \dots \oplus s_{100}) \leq$ **pos**

(85) $\mu(s_1 \oplus \dots \oplus s_{100}) = \max(\{\mu(s_1), \dots, \mu(s_{100})\})$

Note that the measure function must output the maximal weight because light, being a negative adjective, is upward entailing: if an object x weighs less than a weight w_1, and another weight w_2 is greater than w_1, then x weighs less than w_2. With a downward entailing positive gradable adjective such as *long*, the measure function introduced by the adjective would have to select the smallest value among the measures of each state. Take as an examples the sentence (86), whose distributive reading can be represented by the formula in (87):

(86) These 2 ropes are 2 meters long.

(87) long(the 2 ropes)$(s_1 \oplus s_2) \wedge \mu(s_1 \oplus s_2) \geq 2$ meters

(88) $\mu(s_1 \oplus s_2) = \min(\{\mu(s_1), \mu(s_2)\})$ meters

We have made two claims about measurement and gradable adjectives. The first one is that gradable adjectives introduce a measure function that takes the state argument of the adjective as input and outputs a degree, which is the measure of the state. The second one is that measure functions applied to plural states output the smallest or greatest value (depending on the monotonicity of the adjective) among the set of measures of each of its substate with a unique possessor. These claims will used in our account of the incompatibility of *more*$_{inc}$ with stative predicates.

6 On the incompatibility of *more*$_{inc}$ with stative predicates

More$_{inc}$ is not attested in predicative position with some stative predicates, as can be seen in (89) and (90). Although (89) and (90) are grammatical, their only attested interpretation is comparative. They have no attested incremental interpretation. These examples contrast with similar sentences in which an incremental reading is attested, as in (91):

(89) This rope is two meters longer.

(90) This rope measures two more meters.

(91) There are two more meters of rope in the garage.

What is it that explains the incompatibility of $more_{inc}$ with the relations between degrees and eventuality in (89) and (90)? In order to answer this question, it will help us to compare the relations between degrees and eventualities that are formed by QRing $more_{inc}$ in (89) and (90), with the one that is formed by QRing $more_{inc}$ in (91). The logical forms of sentences (89) to (91) are represented in (92) to (94), respectively. We adopt the syntactic analysis of pseudo-partitive constructions of Schwarzschild (2006), according to which measure phrases occupy the specifier position of a functional projection headed by the preposition *of.*

(92) [[$_{DegP}$ [[two meters] more] e$_p$] [1 [[This rope] [is [long t$_1$]]]]]

(93) [[$_{DegP}$ [[two meters] more] e$_p$] [1 [[This rope] [measures t$_1$]]]]

(94) [[$_{DegP}$ [[two meters] more] e$_p$] [1 [There [are [$_{vP}$ [$_{MonP}$ t$_1$ [$_{Mon'}$ [$_{Mon}$ of] rope]] [$_{v'}$ [$_v$ $\emptyset$] [in the garden]]]]]]]

It can be observed that in (92) and (93), the trace of the DegP is sister of the gradable stative predicate *long* or *measure*, while in (94) the trace of the DegP is in the specifier of the MonP (c.f. Schwarzschild, 2006) which is itself in the extended projection of the NP *rope*. Corresponding to this syntactic difference between (92) and (93) on the one hand and (94) on the other, is a semantic difference. The denotation of the complement of DegP in (92) and (93) is represented in (95). The denotation of the complement of (94) is represented in (96):

(95) $\lambda d.\lambda s.\text{length}(s)(\text{the rope}) \wedge \mu(s) \geq d$ meters c.f. (89) and (90)

(96) $\lambda d.\lambda s.\exists x[\text{rope}(x) \wedge \mu(x) \geq 2 \text{ meters} \wedge \text{in the garage}(s)(x)]$ c.f. (91)

(95) is a relation between states of length and the length of these very same states measured in meters. On the other hand, (96) is a relation between states of rope being in the garage, and the measure of this rope in meters. Hence (95) relates states of *dimension* to their measure, while (96) relates states of location to some measure of the individuals that are the possessors of these states.The crucial difference between these sentences is therefore what is being measured in the relational argument of $more_{inc}$: states of length (of dimension) or physical objects. We argue that because the relational argument of $more_{inc}$relates states to their measure, the incremental clause of sentences such as (89) and (90) is necessarily false, which explains the unacceptability of these sentences.

Consider indeed the truth conditions of sentences (89) and (90):

(97) $\underline{\exists d'\exists D' \in alt(D)[D'(d')(s_p)]} \wedge \exists s[\text{length}(s)(\text{rope}_1) \wedge \mu(s) \geq 2 \text{ meters} \wedge \exists D'' \in alt(D)$
$[D''(\delta+2)(s_p \oplus s)]]$

where $D = \lambda d.\lambda s.\text{length}(s)(\text{rope}_1) \wedge \mu(s) \geq d$ meters
and $\delta = \iota d'\exists D' \in alt(D)[D'(d')(s_p)]$

Presumably, the presupposition of (97) is that s_p is a state of some other rope (call it $rope_2$)being δ meters long, and therefore the incremental clause in (98) is a proposition that the sum state $s \oplus s_p$ is a state of the two ropes being $\delta + 2$ meters long. As it turns out, this proposition is necessarily false:

(98) $\text{length}(s \oplus s_p)(\text{rope}_1 \oplus \text{rope}_2) \wedge \mu(s \oplus s_p) \geq \delta + 2$ meters

Indeed, measure functions applied to non collective states (i.e. states that do not satisfy the single possessor constraint) always distribute over their collective members (those substates that satisfy the single possessor constraints). Hence, $\mu(s \oplus s_p)$ in (98) always equals the smallest member of $\{\mu(s), \mu(s_p)\}$ i.e. the smallest member of $\{\delta, 2\}$. Their incremental clause being necessarily false, (89) and (90) themselves are contradictory and thus judged unacceptable[7].

(91) on the other hand is not predicted to be contradictory. The truth conditions of (91) are:

(99) $\underline{\exists d'\exists D' \in alt(D)[D'(d')(s_p)]} \wedge \exists s\exists x[\text{rope}(x) \wedge \text{in the garage}(s)(x) \wedge \mu(x) \geq 2 \text{ meters} \wedge$
$\exists D'' \in alt(D)[D''(\delta+2)(s_p \oplus s)]]$

where $D = \lambda d.\lambda s.\exists x[\text{rope}(x) \wedge \mu(x) \geq 2 \text{ meters} \wedge \text{in the garage}(s)(x)]$ and $\delta = \iota d'\exists D' \in alt(D)[D'(d')(s_p)]$

Let us assume that s_p is a salient state of some rope being in the garden. Then the presupposition of (91) is the proposition that there is some rope x such that s_p is a state of x being in the garden, and x is δ meters long. The incremental clause of (91) is the proposition that there is some rope z such that $s \oplus s_p$ is a state of z being in the garage and in the garden, and z is $2 + \delta$ meters long. This is true if we take z to be the concatenation of the rope in the garage and the rope in the garden.

Summing up, $more_{inc}$ is unacceptable when it is generated in the position of the degree argument of a stative predicate. In these cases, the VP argument of $more_{inc}$ ends up denoting a relation between states of dimension and their measure, and the distributivity of the measure function built in the relational argument of $more_{inc}$ is inconsistent with its additive semantics. This analysis, if it is right, brings support to the theory of plural ambiguities developed by Kratzer, on which it is built. We rely in particular on Kratzer's distinction between collective states and (non collective) plural states, a distinction that stems from the single possessor constraint.

Let us compare this analysis with Greenberg's. Greenberg (2010) considers two potential yet unattested incremental readings of the sentence (100)

[7] Their negation, being tautological, is no better

(100) # John was ill some more.

In the first reading, we want *$more_{add}$* to relate states of illness to degrees of illness. (100) would then assert that there is a state s_1 of John being d_1 ill, and presuppose that there are two states s_2 and s_3 such that s_2 is a state of John being d_2 ill, and s_3 is the sum of s_1 and s_2, a state of John being $d_1 + d_2$ ill. Greenberg argues that this interpretation of (100) is met with presupposition failure, because the incremental clause can never be true: *sadness* is assumed to be a non additive measure function, hence if s_3 is the sum of s_1 and s_2, it cannot be the case that s_3 is a state that somehow cumulates the sadness of John in s_1 and s_2. Intuitively, from the facts that I was a little ill yesterday and equaly ill today, it does not follow that I was more ill in the time span covering these two days than I was on each day. In the second reading, (100) is intended to be synonymous with 'John was ill for some more time'. Greenberg asks why a temporal additive reading of *$more_{add}$* can be obtained in stative sentences when *$more_{add}$* occurs inside an overt durational measure phrase, while it is not available in (100) when *$more_{add}$* seems to modify the adjective directly. Greenberg recognizes that sentences such as (100) are judged more acceptable by speakers when interpreted with a temporal use of *$more_{add}$* in mind. Greenberg argues that states are homogeneous down to instant and temporally unbounded by default, and that these properties are responsible for the relative unavailability of temporal readings of *$more_{add}$* in (100). The homogeneity of states is observed in inferences such as (101). As for the second property, what is meant by claiming that stative predicates are temporally unbounded by default is that the eventuality time of stative predication is usually taken to overlap of include their reference time.

(101) John was ill throughout the interval I_1. $I_2 \subseteq I_1$. Hence John was ill throughout the interval I_2.

Greenberg claims that this default temporal unboundedness of stative predicates makes it impossible to satisfy the additive presupposition of *$more_{add}$* (i.e. makes it impossible for the incremental clause to be true). Since Greenberg's argument with respect to (101) fits in a few lines, we can quote it in its entirety:

(102) Roughly, this sentence asserts that there is some ill state of John, whose length is some time d_1, which overlaps yesterday afternoon (the reference time of the sentence), and presupposes that there is another state whose length is some time d_2, such that the length of the run time of the state e_3 – the sum of e_1 and e_2 - is the time $d_1 + d_2$. Crucially, since the asserted and presupposed states e_1 and e_2 temporally overlap their reference times, they can also temporally overlap each other, or be temporally adjacent. In such a case, due to the homogeneity of states, we end up with one continuous ill state of John, and not with a state which has two distinguishable substates. Consequently, the run time of e_1 is now also the run time of e_2, and vice versa, so summing the run times of these two states is vacuous. This, in turn, leads to the failure of the additive component in the presupposition, requiring that the length of $\pi(e_1 + e_2)$ is the sum of the length of $\pi(e_1)$ and the length of $\pi(e_2)$.

We have no alternative explanation for the infelicity of (101) in a temporal reading, and have no objection to this analysis for now. It seems that this analysis is also compatible with the semantics that we devised for $more_{inc}$.

Note that Greenberg does not offer an explanation for the unavailability of non temporal uses of $more_{add}$/$more_{inc}$ with states expressing additive measure functions, such as *long*. It is a basic fact of measurement theory that if two rods x and y are non overlapping (they are distinct rods), the length of their concatenation equals the sum of their length, showing that *length* is an additive measure function. Therefore Greenberg's explanation of the infelicity of non temporal reading of $more_{add}$/$more_{inc}$ with non additive adjectives as in (101) does not extend to stative predications with adjectives such as *long*.

7 On the incompatibility of $more_{inc}$ with distributive durational measure phrases

$More_{inc}$ is unattested inside *in α time* measure phrases with achievements and accomplishments:

(103) #Bob found his keys in 5 more minutes.

(104) #Bob made the dessert in 20 more minutes.

Similar sentences with *take α time to* instead of *in α time* as an adverbial modifier have an incremental reading. This contrast suggest that what blocks the incremental reading in (103) and (104) is the adverbial *in α time* itself:

(105) It took Bob five more minutes to find his keys.

In this section we argue that the unavailability of $more_{inc}$ in sentences such as (103) and (104) is due to the distributivity of *in α time* measure phrases. More precisely, we argue that the distributivity of this measure phrase makes the incremental clause of (103) and(104) trivially true, which in turns renders these sentences infelicitous. $More_{inc}$ is attested in sentences such as (105) because *take α time to* measure phrases lack distributivity.

First, let us establish the contrast in distributivity between these two kinds of measure phrases. Consider the following pair of sentences:

(106) Mary built three houses in a month. Rothstein (from 2004)

(107) It took Mary a month to build three houses.

(106) has a collective reading according to which Mary built a total of at least three houses in a period of one month. It also has a distributive reading according to which Mary built at least three houses, each one in a month. (107) however only has a collective reading.

How does this contrast relate to the availability of $more_{inc}$? The truth conditions of (103) and (104) in a hypothetical incremental reading would be as follows:

(108) $\underline{\exists d' \exists D' \in alt(D)[D'(d')(e_p)]} \wedge \exists e[\text{find}(e)(\text{Bob's keys}) \wedge \text{agent}(e) = \text{Bob} \wedge \text{in 5 minutes}(e) \wedge \exists D'' \in alt(D)[D''(\delta + 5)(e_p \oplus e)]]$

where $D = \lambda d.\lambda e.\text{find}(e)(\text{Bob's keys}) \wedge \text{agent}(e) = \text{Bob} \wedge \text{in d minutes}(e)$
and $\delta = \iota d' \exists D' \in alt(D)[D'(d')(e_p)]$

(109) $\underline{\exists d' \exists D' \in alt(D)[D'(d')(e_p)]} \wedge \exists e[\text{make}(e)(\text{dessert}) \wedge \text{agent}(e) = \text{Bob} \wedge \text{in 20 minutes}(e) \wedge \exists D'' \in alt(D)[D''(\delta + 20)(e_p \oplus e)]]$

where $D = \lambda d.\lambda e.\text{make}(e)(\text{dessert}) \wedge \text{agent}(e) = \text{Bob} \wedge \text{in d minutes}(e)$
and $\delta = \iota d' \exists D' \in alt(D)[D'(d')(e_p)]$

We can assume that the alternatives to D in (108) and (109) all have the following form:

(110) $\lambda d.\lambda e.P(e) \wedge \text{in d minutes}(e)$ where P is a property of events

In particular, since the relation D'' in the incremental clause $\exists D'' \in alt(D)[D''(\delta + d)(e_p \oplus e)]$ has this form, the adverbial *in d time* is applied to the plural event $e \oplus e_p$ in the incremental clause. We claim that (103) and (104) are judged to be unacceptable as a consequence.

The adverbial *in d time* is analyzed adapting a proposal by Rothstein (2004). (111) is the denotation of *in* in its temporal adverbial use (that we refer to as in_{temp}) and (112) is the denotation of in_{temp}:

(111) $[\![\text{in}_{temp}]\!] = \lambda d.\lambda P.\lambda e.P(e) \wedge \forall e'[(e' \in \text{ATOM}(P) \wedge e' \leq e) \rightarrow \tau(e') \leq d]$

(112) $[\![\text{in}_{temp}]\!]([\![\text{one hour}]\!]) = \lambda P.\lambda e.P(e) \wedge \forall e'[(e' \in \text{ATOM}(P) \wedge e' \leq e) \rightarrow \tau(e') \leq \textit{one-hour}]$

(113) $\text{ATOM}(P) \equiv$
If P is atomic then $\text{ATOM}(P) = P$
If P is a pluralization of an atomic set then $\text{ATOM}(P) = \{x : x \in P \wedge |\, x\,|_{\langle t,M\rangle} = 1\}$
otherwise, $\text{ATOM}(P)$ is undefined

ATOM is a function from sets of individuals containing atoms to their maximal subset containing only atoms. In (111), in_{temp} applies to (pluralized) atomic predicates of events, and selects the subsets whose atoms have a maximal duration time of less than d.[8] *In d time* applies to atomic predicates or plural atomic predicates, and selects the subsets whose atoms have a maximal duration time of less than *d time*. The semantics of any alternative to the $\langle d, \langle v, t\rangle\rangle$ argument of $more_{inc}$ in (103) and (104) can now be made more precise as:

(114) $\lambda d.\lambda e.Q(e) \wedge \text{agent}(e) = \alpha \wedge \forall e'[(e' \in \text{ATOM}(Q) \wedge e' \leq e) \rightarrow \tau(e') \leq d]$
where Q is a property of events and α is an individual

[8] $|\ |_{\langle t,M\rangle}$ is a measure function that depends on two contextual parameters: a time t and a measure statement M.

Let us consider again the truth conditions of (103):

(115) $\underline{\exists d'\exists D' \in alt(D)[D'(d')(e_p)]} \wedge \exists e[\text{find}(e)(\text{Bob}'\text{s keys}) \wedge \text{agent}(e) = \text{Bob} \wedge \text{in}_{temp}(P)(\text{five minutes})(e) \wedge \exists D'' \in alt(D)[D''(\delta+5)(e_p \oplus e)]]$

where $D = \lambda d.\lambda e.\text{find}(e)(\text{Bob}'\text{s keys}) \wedge \text{agent}(e) = \text{Bob} \wedge \text{in}_{temp}(P)(\text{five minutes})(e)$
and $P = \lambda e.\text{find}(e)(\text{Bob}'\text{s keys})$
and $\delta = \iota d'\exists D' \in alt(D)[D'(d')(e_p)]$

Given the possible forms of the alternatives to D, the incremental clause in (115) will be satisfied only if some property of events Q can be found that satisfies the following conditions:

(116) $Q(e \oplus e_p) \wedge \text{agent}(e) = \alpha \wedge \forall e'[(e' \in \text{ATOM}(Q) \wedge e' \leq e \oplus e_p) \rightarrow \tau(e') \leq (\delta+5)\text{minutes}]$ c.f. (114)

where $\delta = \iota d'\exists D' \in alt(D)[D'(d')(e_p)]$
and $Q \in alt(\lambda e.\text{find}(e)(\text{Bob's keys}))$
and $\alpha \in alt(Bob)$

In the case of (116), this entails that the incremental clause is true iff all parts of $e \oplus e_p$ that are atomic parts of P are events whose duration is less than $\delta + 5$ minutes. However, we know that $\tau(e_p) \leq \delta$ *minutes* and $\tau(e) \leq 5$ *minutes*, and hence that $\tau(e \oplus e_p) \leq \delta + 5$ *minutes*. Moreover, the duration of an event is necessarily greater than the duration of its parts. Therefore, for all atomic event e' in Q that are part of $e \oplus e_p$, it is necessarily true that $\tau(e') \leq (\delta + 5)$ *minutes*. In other words, the incremental clause is trivially satisfied, and contributes no information.

We hypothesize that (103) and (104) are unacceptable because their incremental clause is uninformative. These sentences have the same assertoric content as their minimal pair without *more*:

(117) Bob found his keys in five minutes.

(118) Bob made the dessert in twenty minutes.

We might therefore expect that the two pairs of sentences enter in competition, and that the members of each pair that is the most economical wins the competition.

This part of our analysis agrees with Greenberg's intuitions in Greenberg (2010). Greenberg suggests that the incompatibility of $more_{inc}$ with achievements and accomplishments inside *in α time* is due to the non additivity of the measure function, rather than to the aspectual type of the predicate:

(119) This data seems to indicate, then, that what is relevant for the felicity of verbal $more_{add}$ is not the (a)telicity of the predicate by itself, but rather the interaction of (a)telicity with the (non)additivity of the measure function. Telic predicates are incompatible with verbal $more_{add}$ if this particle denotes a temporal measure function (which cannot be additive in this case), and are compatible

with telic predicates with other measure functions, which can be additive.

Note however that Greenberg does not offer a precise analysis of *in α time* as a non additive measure function. We have suggested that it is indeed the semantics of *in α time* that is responsible for the unavailability of $more_{inc}$ in sentences such as (103) and (104). However, we claim that the property of the measure function that is incompatible with $more_{add}$ is its distributivity, rather than some form of anti-additivity.

8 Conclusion

I have presented an analysis of $more_{inc}$ as a pluractional additive operator. We have seen that the analysis of this expression is a fertile ground for the application of theories of plurality that make use of events, such as Kratzer (2004), thus bringing indirect support to these analyses. This analysis also lays the ground for future research on different aspects of the semantics of $more_{inc}$ and similar pluractional or additive constructions.

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