Additive Measurement in the Domain of Eventualities:
The case of the nominal additive *more*
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'Please, sir,' replied Oliver, 'I want some more.'
Charles Dickens, 'Oliver Twist', chapter 2.

`Take some more tea,' the March Hare said to Alice, very earnestly.

`I've had nothing yet,' Alice replied in an offended tone, `so I can't take more.'

`You mean you can't take *LESS*,' said the Hatter: `it's very easy to take *MORE* than nothing.'

Louis Carol. Alice in Wonderland, Chapter 7 ("The mad tea-party").

0. Introduction

The English particle *more* is usually discussed in the literature with respect to its comparative meaning, as in (1), with an AP (see e.g. Kennedy 1999) or in (2), with an NP (see e.g. Hackl 2000):

(1)   Mary is more intelligent than John

(2)   Mary bought more books than John

However, *more* has another, so far un-discussed use, as an additive particle. Consider the ambiguous (3):

(3)   Yesterday John interviewed three students. Today he interviewed more (students)

(3) has two readings. On the first, comparative readings, the second sentence is true if John interviewed today more than three students (e.g. 4). On the second, additive reading, the second sentence is true even if John interviewed today any number of additional students, crucially, also *less* than three students, i.e. two, or even one student. Let us call *more* on this additive reading nominal $more_{add}$.

It is this ambiguity of *more*, of course, as an additive or a comparative particle, which Luis Carol takes advantage of in the dialogue between the March Hare and Alice quoted in the motto above.[1] On the other hand, in Oliver Twists' famous request for 'some more' above, *more* seems to have the additive reading only. Oliver is not asking to get now more gruel than he got before, but simply to get now some gruel, in addition to what he got before.

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[1] Thanks to Olga Kagan for pointing out this quote to me.

Other languages, like modern Hebrew, German, Italian, French, Chinese, Russian and Spanish, use two different lexical items for these two readings of *more* (see for example, Greenberg 2008 for modern Hebrew, König 1977 and Umbach 2008 for German, and Tovena & Donazzan 2008 for French, Italian and Chinese). In this paper, though, I concentrate on the English nominal *more*$_{add}$, and examine its distribution and interpretation.

The main observation I make (in section 1) is that nominal *more*$_{add}$ has a double nature. On the one hand, it is indeed 'nominal', as it associates with a nominal predicate, obeys constraints in the domain of individuals, and expresses the operation of summing the individuals in the denotation of this nominal predicate in its assertion and presupposition (e.g. in the additive reading of (3) it adds the students interviewed today, to the students interviewed yesterday). On the other hand, there are also a number of constraints in the domain of eventualities that nominal *more*$_{add}$ has to obey. These constraints indicate that *more*$_{add}$ expresses addition of eventualities as well, by summing the eventualities in the assertion and the presupposition. In this sense, the English *more*$_{add}$ is similar to the split measure phrase (MP) construction in Japanese, described and analyzed in Nakanishi 2007, which is also subject to constraints in both the nominal and verbal domain (though the constraints on nominal *more*$_{add}$ are different).

In section 2 I combine Moltmann's 2004 treatment of adnominal *together,* as associated with an additive measure function, and Nakanishi's 2007 treatment of split MP constructions in Japanese, as associated with a derived measure function (in the sense of Krifka 1989, 1998), and propose that the semantics of *more*$_{add}$ involves a *derived additive measure function*. Given this claim, *more*$_{add}$ expresses indirect measurement of the sum of eventualities in the assertion and presupposition, by measuring the sum of participants in these eventualities. The individuals measured are thus treated as the values of a homomorphism from eventualities to their participants (Krifka 1989, 1998).

The relationship between the presupposed and asserted eventualities with *more*$_{add}$ is subtle. On the one hand, they can differ in a variety of respects (e.g. in their agents, their space time locations, and even in the verbs which characterize them). However, there are also a number of constraints on this relationship. Section 3 is devoted to clarify one such constraint, which requires that summing the asserted and presupposed eventualities results in an eventuality which not only plural and 'larger' (by virtue of having a larger number of participants), but is one which can be also considered 'more developed'. The discussion in this section clarifies that the operation of nominal *more*$_{add}$ is to indicate that the extent to which the summed eventuality develops depends on the measurement (e.g. the cardinality, volume, weight, etc.) of the sum of the participants in its subevents.

Section 4 integrates the observations and suggestions in the previous sections, and the comparison with the compositional semantics of Japanese split MP construction, offered in Nakanishi 2007, to propose the denotation and compositional interpretation of nominal $more_{add}$.

The paper concludes in section 5, which summarizes the main findings with respect to the semantics of $more_{add}$ and which discusses its analysis within the wider context of cross categorical and cross typal measurement in different languages. This section also suggests several directions for further research, like the possibility to extend the analysis of nominal $more_{add}$ (as in (3)) to verbal $more_{add}$ (as in *I slept some more*), the relationship between additive and comparative *more*, the cross linguistic manifestation of event-based additivity, and the focus sensitivity of $more_{add}$.

1. Initial observations and intuitions

To start evaluating the distribution and interpretation of $more_{add}$ it is helpful to compare it with its much more well-studied additive counterpart *too*.[2] Compare, for example, (3), repeated here, on the additive reading of *more* (i.e. with $more_{add}$) and (4), with *too*:

(3)   Yesterday John interviewed three students. Today he interviewed more (students)

(4)   Yesterday John interviewed three students. Today he interviewed students too.

On the surface, the effect of these two additive particles is very similar. For example, both (3), with $more_{add}$ and (4), with *too,* seem to assert the existence of individual students, and in addition to presuppose the existence of students. Indeed, a proposal along this line is made in König's 1977 analysis of *noch*, the German counterpart of $more_{add}$.[3]

However, a closer look shows that there are differences between the two particles. One such difference is that the nominal predicate associated with $more_{add}$, in the assertion should characterize the individuals in the presupposition as well. For example, hearing the second sentence in (5), with $more_{add}$ we seem to presuppose Mary has spoken with some English teachers, and thus naturally understand that John, referred to in the preceding sentence, is an English teacher. In contrast (6), with *too* does not give rise to such an implication:[4]

(5)   Mary has already spoken with John. Tomorrow she will speak with some more
        English teachers.

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[2] I do not intend to examine the semantics of *too* in this paper. The goal is only to give a descriptive comparison of *too* and $more_{add}$ so the characteristics of $more_{add}$, analyzed in the sections below, are clearer.

[3] A modified version of this proposal, maintaining the additivity of *noch* in the domain of individuals, is proposed in Umbach 2008.

[4] In fact, the implication we get in (6) with *too* is that John is *not* an English teacher.

(6)   Mary has already spoken with John. Tomorrow she will speak with some English teachers too.

The requirement that the same nominal predicate appears in the assertion and presupposition of *more*$_{add}$, but not with *too*, is also seen in (7) and (8). (7) is odd under the additive reading and has the comparative reading only (unless we independently presuppose that there are monkeys that we saw). In contrast (8) is perfectly fine:[5]

(7)   In the morning we saw 3 zebras. At noon we saw more monkeys (comparative only)

(8)   In the morning we saw 3 zebras. At noon we saw monkeys too.

On the other hand, in contrast to the nominal predicates associated with *more*$_{add}$, which should be maintained in both the assertion and presupposition, the *individuals* in the denotations of these nominal predicates cannot be the same, and in fact, cannot even overlap. Here again *more*$_{add}$ is different from *too*. Consider, for example, (9):

(9)   a.   Today John spoke with 4 students. Tomorrow Mary will speak with 4 more students.

         b.   Today John spoke with 4 students. Tomorrow Mary will speak with 4 students too.

If N_1 is the set of students that Mary will speak with, and N_2 is the set of students that John spoke with, then in (9a), with *more*$_{add}$, but not in (9b), with *too,* $N_1 \cap N_2 = \varnothing$. I.e. Mary will necessarily speak with 4 *different* students.

Other constraints on *more*$_{add}$ are especially interesting, since, although this particle seems to syntactically combine with a nominal predicate (e.g. *students* in (3)), these constraints concern the domain of eventualities (which are in the denotation of verbal predicates). One such constraint is illustrated by comparing (3), repeated here, to (10):

(3)   Yesterday John interviewed three students. Today he interviewed more (students)

(10)   Today John interviewed three students. Yesterday he interviewed more (students).

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[5] The focus pattern of the sentences with *more*$_{add}$ in this paper is one where the nominal argument (e.g. *students* in (3) or *English teachers* in (5)) is not focused. Instead, other elements in the sentences get a (rise) fall-rise intonation (e.g. *today* in (3) or *tomorrow* in (5)). In addition, *more*$_{add}$ is focused as well. This makes *more*$_{add}$ similar to *too*, which Krifka 1999 takes to be associated with contrastive topics (see also the end of section 5).

However, Umbach 2008, who examines this focus pattern for the German correlate of *more*$_{add}$, namely *noch*, shows that another focus pattern is possible, where *noch* is not focused, which implies that an element of another type is added. In this focus pattern, then, the nominal predicates in the assertion and presupposition *do* differ.

In English, though, the latter focus pattern is less good with *more*$_{add}$. (ii), for example, does not sound as felicitous as (i) (unless we assume that John drank some beer before the evening):

(i) In the morning John drank beer. [In the evening]$_F$ he drank [more]$_F$ beer

(ii) In the morning, John drank wine. In the evening he drank (??more) beer.

There is a clear meaning difference between these two sentences. Unlike (3), (10) has the comparative reading only (John interviewed more than three students), and the additive reading, i.e. $more_{add}$, seems infelicitous in it. Notice that in contrast, *too* in (11) is as felicitous as in (4), repeated here, and has the same interpretation:

(4)   Yesterday John interviewed three students. Today he interviewed students too.

(11)   Today John interviewed three students. Yesterday he interviewed students too.

With $more_{add}$, then, but not with *too,* temporal order matters: We can add 'forward' (e.g. from yesterday to today), but not 'backward' (from today to yesterday). This is the first indication that in the case of $more_{add}$ we do not presuppose the existence of individuals, but of eventualities. For example, we don't want to say that $more_{add}$ triggers the presupposition that there are existing individuals in the denotation of the nominal predicates (e.g. individual students in (3)) before the reference time of the assertion, since this kind of presupposition is met in the infelicitous (10) as well. Instead, in sentences like (3) and (10) we seem to presuppose that there is an *eventuality* of interviewing students before the reference time of the assertion. Indeed, this kind of presupposition seems to be met in the felicitous (3), but not in the infelicitous (10). [6]

Tovena & Donazzan 2008 make a similar claim about the semantics of the additive particles *encore* in French, *ancora* in Italian and *zai* in Chinese. They take the temporal priority of the eventuality in the presupposition of these particles to be a central part of their theory. Specifically, they claim that these particles take a time (the reference time), and a property of eventualities, and trigger the presupposition that a property of eventualities is salient and used in the context, which is predicated both of the reference time and of a prior time.

However, a closer look shows that the *'prior* time' component is not a necessary condition on the felicity of the nominal $more_{add}$ in English. Instead, the presupposed eventuality can also hold 'at the same time' of the asserted eventuality. This is indicated by the felicity of the additive reading in sentences like (12)-(14):

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[6] There are some cases where 'adding backwards' does work. This typically happens when we use a typical 'list', or 'counting' intonation, as in the following conversation:

(i)   A: How many students did you interview this week ?
     B: Well, let's see… Today I interviewed 4 or 5 students… Yesterday I interviewed 3 more…All in all I think I interviewed around 7 or 8.

A preliminary direction for accounting for such uses of $more_{add}$ is to suggest that, given the salient 'counting' or 'listing' intonation in (iA), the relevant eventuality we have is not that of interviewing, but of counting, or listing the number of interviews. In this case, then, the relevant presupposed eventuality, that of counting three interviews, is indeed prior to the asserted eventuality, although the temporal location of these 3 interviewing eventualities themselves is later.

In this respect, it is interesting to note that Umbach's 2008 discussion of *noch* suggests that this particle is sensitive to the 'order of mentioning'. *More_{add}*, then, seems to differ from *noch* in that sensitivity to the 'order of mentioning' requires a special intonation and context. In normal context, and with neutral intonation it is sensitive to the temporal order of the eventualities involved.

(12)   This morning Danny interviewed 3 students in his office. At that time Susan interviewed some more students in the library

(13)   At 6.00 sharp Danny noticed 3 wolves near the car and 2 more (wolves) just behind the tent.

(14)   That party was a disaster! I had to deal at the same time with 4 children crying and 3 more fighting and screaming!

Given these examples we may say that $more_{add}$ triggers the presupposition that there is an eventuality involving different members of the nominal argument, whose running time is prior or equal to (i.e. not later than) the reference time of the assertion.

But isn't such an existential presupposition too weak ? For example, saying that the presuppositions of (15) and (16) is that *there is* a eventuality where John ate bread, which is not later than today, or that *there is* an eventuality where John read books, which is not later than this week, respectively, seems too weak, as these presuppositions can be met too easily, or even trivially: Most probably, there is a past eventuality where John ate bread and a past eventuality where John read books:

(15)   Today John ate some more bread

(16)   John read 2 more books this week

This potential problem with defining the presupposition of $more_{add}$ is very similar to the one pointed by Kripke (ms.) with respect to *too*. Kripke shows that if the presupposition of triggered by *too* in (17) is that *there is* an individual (different from John) who is having dinner in New York, we wrongly predicts that this sentence could be easily uttered out of the blue, as there are probably always people different from John who are eating dinner in New York:

(17)   John is having dinner in New York too

Kripke thus suggests that the presupposition of *too* is stronger, requiring that an individual with the relevant property is contextually salient. One may suggest, then, a similar modification for the semantics of $more_{add,}$ according to which it triggers the presupposition that a contextually salient eventuality with different members of the nominal argument exists (whose time is not later than the reference time of the assertion). Thus, for example, the presupposition of (16) would be that there is a contextually salient eventuality where John is eating bread, whose time is no later than today.

In section 3 below I will show that this modification is, in fact, not needed. Before doing that, however, let us describe some more facts about $more_{add}$. An interesting point to note is that the

eventualities in the assertion and presupposition of $more_{add}$ need not be characterized by the same verb. This is seen from the felicity of $more_{add}$ in sentences like (18a)-(18c):[7]

(18) a. John baked 3 cakes. Then he bought one more

b. John heard 5 birds. Then he saw 2 more

c. I found 4 coins on the ground. Then I received 2 more from my father.

Crucially, however, not 'anything goes' here. That is, not any two verbs can appear in the assertion and the presupposition. Compare the felicitous sentences in (18) with the infelicitous ones in (19):

(19) a. John baked 3 cakes. #Then he ate one more

b. John heard 5 birds. #Then he fed 2 more

c. I found 4 coins on the ground. #Then I lost 2 more

Unlike (18a)-(18c), (19b)-(19c) are odd on the additive reading. The difference between these cases seems to be that, although the eventualities in the assertions and presuppositions in (18) are characterized by different verbs, they can be nonetheless characterized by a single 'superset' predicate, e.g. 'preparing' cakes in (18a), 'noticing' the birds, in (18b) and 'getting' coins in (18c). This is not the case in (19): 'baking' and 'eating', 'hearing' and 'feeding' and 'finding' and 'loosing' do not seem to be easily characterized by the same predicates. The use of $more_{add}$, then, seems to require that the asserted and the presupposed eventualities are, or at least can be, characterized by the same verbal predicate. This is either the predicate in the assertion itself, or, when the verbal predicate in the assertion and presupposition differ, a 'superset' predicate.[8]

Let us summarize these initial observations. The particle $more_{add}$ is subject to two constraints in the nominal domain: The nominal predicate that $more_{add}$ associates with has to stay constant in the assertion and presupposition. On the other hand, the sets denoted by the nominal predicate should not overlap. Two further constraints concern the domain of eventualities. First, the eventualities in the assertion and presupposition of sentences with $more_{add}$ are or can be, characterized by the same predicate (which is either the predicate in the assertion, or some 'superset' predicate). In addition, the eventuality in the presupposition cannot be temporally later than the

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[7] See Tovena & Donazzan 2008 for a similar observation w.r.t. the additive particles in French, Italian and Chinese.

[8] Tovena & Donazzan (2008) make a similar claim about the additive particles in French, Italian and Chinese. According to them these particles trigger the presupposition that a certain property of eventualities, predicated of a prior time, and which is a hypernym of the property characterizing the asserted eventuality and the antecedent, is contextually salient.

This characterization of the presupposition, however, does not seem to fit the semantics of the English $more_{add}$. Above we have already seen that the 'prior time' component need not necessarily be part of the interpretation of $more_{add}$. In addition, as we shall see in section 3 below, the requirement that a hypernym of the property characterizing the asserted and presupposed eventualities is contextually salient, is not enough to ensure the felicity of $more_{add}$.

asserted one. (In section 3 below we examine a further constraint in the domain of eventualities that *more_{add}* has to obey).

   We can, of course, try to give truth conditions for sentences with *more_{add}* which will capture each of these requirements separately, but this will not help answering the main question we are facing with *more_{add}*. The question is how come additivity of individuals in the denotation the nominal predicate associated with *more_{add}* leads to additivity in the verbal domain, i.e. in the domain of eventualities. In the next section I start answering this question by proposing, following Krifka 1989, 1998, and Nakanishi 2007, that *more_{add}* involves a derived additive measure function, which indirectly measures eventualities by measuring the sum of the participants in their subevents. This proposal will also enable us to account for the nonoverlap requirement on the participants in the presupposed and asserted eventualities, observed above, and for other properties of *more_{add}*.

   In section 3 I will discuss another constraint on the domain of eventualities that *more_{add}* has to meet, and in section 4 I will turn to give the compositional semantics of *more_{add}*.

2. Nominal *More_{add}* involves a derived additive measure function

I want to suggest that through the addition and growth of the nominal set (the set of individuals) *more_{add}* expresses addition and growth in the domain of eventualities. More precisely, suppose e_1 is the asserted eventuality, and e_2 is the presupposed one, then nominal *more_{add}* is used to sum the participants in these two eventualities, e_1 and e_2, and through the growth of this set of individuals it indirectly indicates how a third eventuality, e_3, which is the result of summing e_1 and e_2, also grows.

   The more precise understanding of this suggestion is inspired by Molmann's analysis of adnominal *together*, as involving an additive measure function, and by Nakanishi's 2007 treatment of split measure constructions in Japanese, as involving a derived measure function (in the sense of Krifka 1989, 1998). Nakanishi's analysis is especially relevant to our case because it is based on the fact that, similarly to the behavior of sentences with *more_{add}* in English, the Japanese split MPs construction is subjects to constraints in both the nominal and eventualities domain (although, as we shall see below, the constraints are not identical). Let me start, then, with a brief review of the relevant parts in Nakanishi's theory.

2.1 Nakanishi 2007: Derived measure functions in the semantics of the split MP construction in Japanese

Nakanishi examines the difference between two constructions involving measure phrases in Japanese, namely the non-split and the split measure phrase (MP) constructions, as in (20) and (21), respectively, which differ in whether or not the measure or classifier word (e.g., *3*, or *3 liters*) forms a constituent with the measured element denoted by the noun (e.g. *students* or *water*):

(20)　a.　[Gakusei san-nin]-ga ie-ni kaet-ta (koto)1

　　　　　[student three-CL]-NOM home-to go-PAST (the fact that)

　　　　　'Three students went home.'

　　b.　Gakusei-ga ie-ni san-nin kaet-ta (koto)

　　　　student-NOM home-to three-CL go-PAST

(21)　a.　[Mizu san-rittoru]-ga tukue-nouede kobore-ta (koto)

　　　　　[water three-liter]-NOM table-on spill-PAST

　　　　　'Three liters of water spilled on the table.'

　　b.　Mizu-ga tukue-nouede san-rittoru kobore-ta (koto)

　　　　water-NOM table-on three-liter spill-PAST (Nakanishi, 2007, p. 236)

Nakanishi shows that both the split and the nonsplit MP constructions obey a constraint in the nominal domain. Specifically, both can only appear with measure phrases like '3 kilos', '3 liters', 'three meters', or the numeral '3', but not measure phrases like '20 carat' or '3 degrees'. The two types of measure phrases were discussed in Krifka 1989, 1998, and Schwarzschild 2002, among others, who show that in English, only the first type of phrases can appear in 'pseudopartitive' constructions, as in (22). Schwarzschild also shows that only the second kind of measure functions can appear in nominal compounds, as in (23):

(22)　a.　3 liters of water / 3 meters of rope

　　b.　# 20 carats of gold /　20 degrees Celsius of water

(23)　a.　# a 3 liter water / a 3 meter rope

　　b.　20 carat gold / 20 degree Celsius water

According to Krifka 1989, 1998, the measure functions which can appear in constructions like (22) must be extensive. Extensive measure functions are additive: If $f(x) = d_1$ and $f(y) = d_2$, then $f(x+y) = d_1+d_2$. *3 liter*s indeed involves such an additive function: summing 3 liters of water with 2 liters of water gives 5 liters of water. In contrast, *20 degree* is not additive: summing 20 degree water with 10 degree water won't give us 30 degree water.

　　In contrast to Krifka, Schwarzschild 2002 characterizes the distinction between the two types of measure phrases in terms of monotonicity. Monotonic measure functions are those functions which preserve the part-whole structure of the measured element:

　　…if a quantity of oil has a certain volume, then every proper subpart of it will have a lower volume and

superparts will have larger volumes. On the other hand, if the oil has a certain temperature, there is no reason to expect that proper parts of it will have lower temperatures. We will call a property **monotonic** if it tracks part-whole relations. Volume is monotonic and temperature is non-monotonic. (p. 226)

In her analysis of measure constructions in Japanese Nakanishi 2007 follows Schwarzschild's monotonic / nonmonotonic distinction, which she formalizes as in (24):

(24)   A measure function μ is monotonic relative to domain I iff:

   (i) there are two individuals x, y in I such that x is a proper subpart of y and

   (ii) $\mu(x) < \mu(y)$ (Nakanishi 2007, p. 239)

Nakanishi claims, then, that both split and non-split MP constructions must appear with monotonic measure functions in the sense of (24), which track the part-whole relations in the measured substances. However, she shows, the two constructions are not the same. The split construction is also subject to constraints in the domain of eventualities, which the non-split construction is not subject to. Specifically, the VPs in the split MP construction cannot be 'once only' predicates (like *kill Peter* or *break the chair*), or individual level predicates (like *be a male*), and plural subjects in these constructions cannot get a collective reading. Nakanishi claims that these facts can be naturally explained if we extend the monotonicity constraint that the split MP construction has to meet, from the nominal domain to the verbal domain, as in (25). I.e. if we require that the measure function with the split MP construction tracks part-whole relations also in the domain of denotations of VPs, namely the domain of eventualities.

(25)   A measure function μ is monotonic relative to domain E iff:

   (i)   there are two eventualities e_1, e_2 in E such that e_1 is a proper subpart of e_2 and

   (ii) $\mu(e_1) < \mu(e_2)$ (Nakanishi 2007, p. 245)

In her analysis Nakanishi follows Schwarzschild's 2002 approach to measurement (which I follow in this paper as well), according to which measure constructions involve a measurement scheme, expressed by a non overt measure function μ. These kinds of functions are obtained from the relationship between the measure phrase and the measured element. For example, in the case of *five ounces of gold* this measurement function is μ:weight, in the case of *three feet of rope* it is μ: length and in the case of *three feet of snow* it is μ:depth.

The functions just mentioned measure elements in the individual domain. To ensure that the split MP construction obeys the monotonicity constraint on the domain of eventualities in (25), Nakanishi proposes that it involve a covert *derived* measure function, e.g. μ': cardinality, μ':volume, μ': weight, etc. which combines with a degree word, e.g., 3 individuals, 3 liters, 3 kilos, etc. These

functions μ' are *derived* measure functions because they indirectly measure eventualities. Following ideas in Krifka 1989, 1998, this is done by assuming that such functions applies to the range of a homomorphism h from the domain of eventualities to the domain of individuals, and more specifically, from eventualities to their participants, where the assumption is that for all eventualities, μ'(e) = μ(h(e)).

The monotonicity requirement is taken by Nakanishi to be a presupposition on such derived measure functions. Thus, for example, the Japanese (26), with a split measure phrase, is interpreted as in (27) (ignoring tense), where μ is 'cardinality', and *h* is the homomorphism from eventualities to their agents:

(26)   Otokonoko-ga huta-ri   odot-ta (koto)

       boy-NOM   two-CL dance-PAST

       'Two boys danced.'

(27) $\exists e \exists x[*boy(x) \wedge Ag(e)=x \wedge *dance(e) \wedge \mu(h(e))=2$ individuals]

       <u>Presupposition:</u> μ:cardinality must be monotonic w.r.t. the range of h.

2.2 Derived measure functions in the semantics of *more_add*

Turning now back to nominal *more_add* in English, I propose that it also involves a derived measure function μ', and that here too μ' can be 'cardinality', 'volume', 'weight', etc., as in (28)-(30), respectively:

(28)   In the morning John spoke with 3 students. At noon he spoke with 3 more.

(29)   In the morning John drank 3 liters of water. At noon he drank 2 liters more.

(30)   In the morning John bought 3 kilos of potatoes. At noon he bought 2 kilos more.

Unlike the Japanese split MP construction, though, the measure function involved in the interpretation of *more_add* is *additive* in a very specific way: it measures the sum of cardinality, weight, volume, etc. of the participants in the asserted and presupposed eventualities.

This additivity component in the semantics of *more_add* makes it similar to adnominal *together*, as analyzed in Moltmann 2004. According to Moltmann, the function of *together* in adnominal position, as in (31)-(33) is to induce a numerical cumulative measurement (like 'weight' or 'income', 'number of papers by..") on the group associated with *together*:

(31)   John and Mary together weigh 200 pounds

(32)   John and Mary together earn more than 100,000$ a year

(33)   John and Mary together have published 10 papers.

Specifically, Moltmann claims, adnominal *together* combines with an additive measure function, and its contribution is "to specify that adding the measurements of the members of the group yields the measurement expressed by the measure phrase (e.g. that adding the wages of John and Mary per year amounts to 100,000 $) (p. 295), or that "the sum of the number of articles published by John and the number of articles published by Mary is (at least) 10" (p.306).

I suggest that the measure function involved with *more$_{add}$* is also additive, but it differs from the function associated with adnominal *together*, as analyzed by Moltmann 2004, in two respects. First, while with *together* the elements which are summed and measured (e.g. John's and Mary's wages) are part of the assertion of the sentence, with *more$_{add}$*, only one of these elements is present in the assertion, and the other one is presupposed, and many times has to be accommodated. Second, and more importantly, the definition of the additive measurement function that Moltmann takes to be associated with *together* does not make reference to eventualities, as Moltmann takes this function to apply to individuals.[9] In contrast, my claim is that the measure function associated with *more$_{add}$* is not only additive, but also derived, in the sense of Krifka 1989, 199, i.e. that by measuring (the sum of) individuals it indirectly measures (the sum of) eventualities.

Combining, then, Nakanishi's 2007 use of derived measure functions (in the semantics of the split MP construction in Japanese), and Moltmann's 2004 use of additive measure functions (in the semantics of adnominal *together* in English), I propose that *more$_{add}$* is associated with *a derived additive measure function*. Specifically, suppose indeed that e_1 is the eventuality in the assertion with *more$_{add}$*, e_2 is the presupposed eventuality, and summing e_1 and e_2 results in an e_3, then the use of *more$_{add}$* indirectly measures the summed eventuality e_3 by measuring the (cardinality / weight / volume etc. of the) sum of the participants in its two subevents, the asserted eventuality e_1 and the presupposed one, e_2.

Given this suggestion, then, the truth conditions of a sentence like (34) are given in (35), where the two presuppositions, relate (a) to the existence of the eventuality e_2 and (b) to the summed and larger eventuality e_3. Here too μ is 'cardinality':

(34)   (Three boys sang). Two more$_{add}$ boys danced.

(35)   <u>Truth conditions of *Two more$_{add}$ boys danced*</u>

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[9] Moltmann analyzes another use of *together*, in adverbial position (as in *John and Mary sat together*), as involving eventualities. According to her in this position the measured entity is the sum of eventualities involved, and this sum is said to constitute an 'integrated whole'. The measure function used by Moltmann for adverbial *together*, then, is different from the one used for adnominal *together* in applying to eventualities and not individuals, and in not being additive. As seen below the measure function I will define for *more$_{add}$* is different from both these functions defined by Moltmann for adnominal and adverbial *together*.

Assertion: $\exists e_1, x, t$ [dance $(e_1) \wedge$ *boy $(x) \wedge$ Agent$(e_1) = x \wedge \tau(e_1) \subset t \wedge t<n \wedge \mu$ (Agent(e_1))) = 2 individuals]

Presuppositions:

(i) $\exists P_2, e_2, d_2, y$ [$P_2(e_2) \wedge$ *boy $(y) \wedge$ Agent $(e_2) = y \wedge \tau(e_2) \leq t \wedge \mu$ (Agent(e_2))) = d_2]

(ii) $\exists P_3, e_3, z, d_3$ [$P_3 (e_1) \wedge P_3 (e_2) \wedge * P_3 (e_3) \wedge e3 = e_1 + e_2 \wedge z= x+y \wedge$*boy $(z) \wedge$ Agent$(e_3) =z \wedge \mu$(Agent (e_3))) = $d_3 \wedge d_3$ = 2 individuals + d_2]

According to these truth conditions, the assertion of (34) is essentially the same as that of the Japanese split MP construction in (26) above, given in (27). But, the presuppositions triggered by *more$_{add}$* are different. First, it is presupposed that there is a P_2 eventuality e_2, whose time is prior or equal to the reference time of the assertion, and which has a plural individual boy as an agent, whose cardinality is some degree d_2, i.e. some number of individuals. Second, it is presupposed that e_1, e_2 are in the denotation of a P_3 predicate, that their sum, e_3, is in the denotation of *P_3, and that the agent of e_3 is the sum of the agents of e_1 and e_2. Crucially, the cardinality of the agent of e_3 is required to be the sum of the cardinality of the agent of e_1, namely 2 individuals, plus the cardinality of the agent of e_2.

Notice that the nominal predicate in the assertion and presupposition in (35) remains constant (namely the plural predicate *boy). In contrast, the fact that e_2 is in the denotation of a predicate P_2, which need necessarily be 'dance', as in the assertion, is meant to capture the observation above that the verbs in the assertion and presupposition need not be the same. On the other hand, not anything goes here: all eventualities, e_1, e_2 and e_3 have to be characterized by the same predicate, P_3 (which in the case of the summed eventuality e_3 is plural, and marked with *). This is meant to capture the fact that if the verbs in the assertion and presupposition differ, the eventualities in their denotation should be nonetheless characterized by the same predicate, typically, a 'superset' predicate. In (34) such a superset predicate can be *performed*.

2.3 Some consequences

2.3.1 Additivity vs. monotonicity

The truth conditions in (35) correctly capture the fact that if (36) is the proposition which satisfies the presupposition of (37), then the number of boys who danced is 3+2= 5:

    (36)   Three boys danced in the morning

    (37)   Two more boys danced at noon.

The additivity of the measure function in (35) can also account for the felicity difference between sentences as in (38) and (39):

(38)   a.   This morning John bought 3 kilos of potatoes. Now he bought 2 kilos more

           b.   3 Liters of water spilled on the carpet. 2 liters more was spilled on the bed.

(39)   a.   This morning John bought 20 carat gold. #Now he bought 12 carat more

           b.   30 degree water was spilled on the carpet. #10 degree more was spilled on the bed

In section 2.1 above we noted that Schwarzschild 2002 takes measure phrases like *20 carat* or *30 degree* to be non-monotonic, and shows that they cannot appear in pseudopartitive constructions. Remember also that Nakanishi 2007 accounts for the incompatibility of MP constructions in Japanese with such phrases by explicitly inserting a presupposition requiring the measure function to be monotonic. We might, then, follow this line and take the contrast in (38)-(39) to show that, like pseudopartitives in English and MP constructions in Japanese, sentences with *more_{add}* in English are compatible with monotonic measure functions only.

However, whereas according to Nakanishi the split measure construction in Japanese obeys also a monotonicity constraint in the domain of eventualities (phrased by Nakanishi in (25) above), this does not seem to be the case for sentences with *more_{add}* in English. Nakanishi posits this constraint on split measure functions to account for the fact that it is incompatible with single occurrence and individual level verbs, and does not allow for a collective reading for plural subjects. But, as seen from the felicity of (40), with the single occurrence predicate *kill John* and (41) with the individual level predicate *be American*, and from the possible collective reading of (42), the English *more_{add}* does not seem to obey this monotonicity constraint:

(40)   (2 people killed Mary) 3 more people killed John

(41)   (I have 7 foreign students in my class. 4 students are French). 3 more students are American

(42)   (2 students made a table). 3 more students made a chair (collective reading possible).

We are thus faced with a somewhat confusing situation, where *more_{add}* is similar to the Japanese split MP construction in obeying a monotonicity constraint in the nominal domain, but differs from it in not obeying such a constraint in the eventuality domain, although, like the Japanese construction, we take it to indirectly measure eventualities.

I suggest that the way to account for this situation is to assume that the constraint on the types of measure phrases with *more_{add}*, seen in (38)-(39), should not be captured by stipulating that these functions must be monotonic, but by derived it from the presupposed additivity of the measure function. The requirement in the truth conditions in (35) above that $\mu(h(e_3)) = \mu(h(e_1)) + \mu(h(e_2))$

can only be met with measure phrases like *30 kilos* or *30 liters,* but not with *30 degrees* or *30 carats*. In (39a) and (39b), for example, it is not the case $\mu(h(e_3)) = \mu(h(e_1)) + \mu(h(e_2))$, since the temperature of the water which was spilled in the asserted and presupposed eventualities is not 30+10=40. Similarly, the gold John bought yesterday and today is not 20+12= 32 carat**.**

In this sense, it seems that it is better to define the measure functions involved in the semantics of *more_{add}* using Krifka's 1989, 1998 notion of additivity, mentioned above, instead of Schwarzschild's notion of monotonicity. The truth conditions in (35) above, then, amount to saying that the derived measure function with *more_{add}* has to be additive in Krifka's 1989, 1998 terms.

2.3.2 Non-overlap of participants

Remember that one of the observations in section 1 above was that that the set of individuals which are participants in the asserted and presupposed eventuality with *more_{add}* cannot overlap. To guarantee the non-overlap relation it is not enough that the agents of e_3 are the sum of the agents of e_1 and e_2 (this requirement can be met even if some of the agents of e_1 and e_2 overlap). What does guarantee the non-overlap is the further requirement that the cardinality of the agent of e_3 equals the cardinality of the agent of e_1 and the cardinality of the agent of e_2. If, for example, the assertion is that 3 boys danced, and the presupposition is that 4 boys danced, then if even one boy participated in both eventualities, then the number of boys participating in e_3 is not 3+4=7, as required. The nonoverlap of the sets, then, need not be stipulated in the truth conditions, but can be derived from the additivity of the measure function*,* as already required in e.g. Krifka 1989, 1998 and Moltmann 2004:

(43)   A measure function *f* is additive iff $\neg$ x O y and

$f(x) = n$ & $f(y) = m \rightarrow f(x$ SUM $y) = n+m$ (Moltmann 2004, p. 296)

3.3.3 Measure functions with vague or unspecified values

The claim that sentences with *more_{add}* always involve a derived additive measure function means that we want to maintain this interpretation even when there is no precise measure phrase in the sentence, as in (44), with *a bit*, in (45), with *some* and in (46), with a bare plural only:

(44)   (I ate 20 cookies yesterday). Today I ate a bit more.

(45)   (Yesterday John spoke with 5 / some students). Today he spoke with some more students

(46)   (Yesterday John spoke with 5 / some students). Today he spoke with more students

A bit is a relative and vague measure phrase. Intuitively, it denotes a degree which is small relative to some other contextually salient degree. In (44), this contextually salient degree is supplied by the

degree phrase *20* in the preceding sentence. Hence *a bit more* seems to imply that the number of cookies I ate today is small relative to 20 cookies (e.g. I ate 3 or 4 more cookies).

The cases in (45), with the quantifier *some*, and (46), with no degree phrase or quantifier at all, are more interesting. I suggest that the assertion in both these cases is that John spoke with a certain, unknown, number of students. That is, the value of the measure function μ:cardinality is a degree d (number of individuals) which is existentially quantified over. This suggestion is compatible with Krifka's 2001 suggestion that the interpretation of a bare plural, e.g. *apples* in a sentence like *Mary ate apples*, is a set of individual apples with an existentially quantified over degree (cardinality) n.

Given this suggestion, both (45) and (46) assert that there is an eventuality e_1 where John spoke with students, whose cardinality is some number of individuals, d_1 and presuppose that (a) there is an eventuality e_2, (whose time is not later than the reference time of the assertion), which involves students whose cardinality is some number of individuals, d_2, and (b) that there is an eventuality e_3, which is the sum of e_1 and e_2, which involve the students participating in e_1 and e_2, where, crucially, the cardinality of these students is given by the sum of students participating in e_1 and those participating in e_2, i.e. $\mu(h(e_3)) = d_1+d_2$.

The fact that *more_{add}* need not combine with precise measure phrases, shows, then, that its main operation is to indicate that the growth of the summed eventuality e_3 is dependent on the degree on a scale (the cardinality, weight, volume, etc.) of the sum of degrees measuring the participants in its two subevents: the presupposed eventuality and the asserted eventuality which is added to it. This goal is achieved even if we do not know what the actual cardinality, weight or volume of any of these participants is, and more formally, even if we do not know what the exact values of any of these measure functions are.

3. **A further constraint on the domain of eventualities**

3.1.   An additional constraint on *more_{add}*

The truth conditions suggested in (35) above, however, are still not enough. This is illustrated by the felicity difference in (47) and (48):

(47)   I baked three cakes for the party. John will bake more (cakes).

(48)   I baked three cakes for my son's birthday party. A woman I know in New York
     will bake more (cakes) for her son's party

(47) is ambiguous between the comparative reading (John will bake more than three cakes), and the additive one (he can buy 2 cakes). In contrast, uttered out of the blue, (48) lacks the additive reading, and the salient reading we get is the comparative one (the woman in New York will bake more than three cakes). Crucially, *more$_{add}$* is infelicitous in (48) although the presuppositions described in section 2.2 above are met with this sentence, just as they are met with the felicitous (47): In both cases (a) there is an eventuality e_2 involving cakes whose time is not later than the reference time of the assertion. (b) we can sum e_1 and e_2 into a plural baking cakes eventuality e_3, whose agent is the sum of agents of e_1 and e_2 (me and the New Yorker woman), and whose theme is the sum of the cakes involved in e_1 and e_2. (c) we can take the number of cakes involved in the plural summed eventuality e_3 to be the sum of the number of cakes of e_1 and of e_2. All these, however, are not enough to make *more$_{add}$* felicitous in (48). It seems, then, that *more$_{add}$* has to meet an additional constraint.

I suggest that this additional constrain concerns again the domain of eventualities. Intuitively, with *more$_{add}$* the asserted and presupposed eventualities should be summed together so they create a single eventuality. Baking cakes for the same party can be intuitively considered a single eventuality (even if this is done by two different agents). In contrast, baking cakes for two distinct parties, by two different people in two distinct places is not naturally considered a single eventuality. Intuitively, this is why *more$_{add}$* is felicitous in (47), but not in (48).

This intuition is supported by the infelicity of *more$_{add}$* in (49) as well:

(49)   The prime minister has 3 children. I have more.

Like (48), (49) has the comparative reading only, and the additive reading is infelicitous in it. Intuitively, this is because the prime minster having children, and I having children cannot be summed together into a single eventuality of having children.

Notice this constraint of *more$_{add}$* is not trivial, and does not seem to result from the mere fact that this particle expresses addition. For example, unlike *more$_{add}$*, the additive *too* is felicitous in sentences similar to (48) and (49):

(50)   a.   I baked three cakes for my son's birthday party. A woman I know in
                New York will bake three cakes for her son's party too.

         b.   The prime minister has 3 children. I have 3 children too.

The additive *more$_{add}$*, then, but not *too*, requires the summing of the eventualities in the assertion and presupposition to result in an intuitively single eventuality.

Trying to capture this 'single eventuality' intuition, however, is not an easy challenge. Following independent claims (see e.g. Landman 2000, Kratzer (forthcoming)) we assume that, as happens with summing of individuals (Link 1983), summing of two eventualities, e.g. e_1+e_2 should

result in a *plural*, complex eventuality e_3, and not in a singular one. Given the 'unique role requirement' (see, e.g. Landman 2000), this is even more clearly the case if we also have two agents, as in (47) (I+JOhn). Let me examine, then, several potential solutions to this challenge.

3.2 Modeling the summed eventualities as groups (Landman 1996, 2000)

The first solution is to assume that the summed eventuality e_3 with *more*$_{add}$ is in fact not plural but indeed singular, by using Landman's 1996, 2000 groupification operator ↑. Landman reduces collectivity to singularity, and distributivity to plurality. Using this approach we may want to take the summed eventuality e_3 to be a group of eventualities e_1 and e_2, with a group of individuals as a singular theme of this event. In case e_1 and e_2 have two different agents, we apply ↑on their sum too, and take them then to form a group as well.

For example, in (51) we will take the summing of the presupposed and asserted eventualities to results in a singular eventuality of interviewing a group of 8 students, which is done collectively by John and Mary, i.e. John and Mary act as a group with respect to the interviewing students event.

(51)   John interviewed 3 students in the office. Mary interviewed 2 more students in the library

The infelicity of (48) will be explained by assuming that, under normal circumstances, me and the woman in New York do not form a group, and are not collectively involved in one eventuality (we do not have any common decision, shared responsibility for the eventuality etc.). Similarly, in (49) me and the prime minister do not seem to act as a group with respect to the state of having children.

This direction is supported by the existence of cases where the infelicitous presence of *more*$_{add}$ improves if we put the sentence in a scenario which makes a collective reading contextually salient. Consider, for example, (52):

(52)   John wrote 3 papers. Mary wrote more (papers).

Consider two scenarios. In the first, I tell my husband that I have many friends in the academia, who work hard on writing papers, and I continue by uttering (52). Crucially, the salient reading of *more* in this scenario is comparative (Mary wrote more papers than John, i.e. more than 3 papers), and the additive reading is infelicitous. In contrast, if (52) is uttered after we discuss a certain departmental project that John and Mary are part of, the additive reading becomes much better. In this scenario John and Mary can be said to have a common goal (e.g. writing many papers, so the project will get more money), so their sum can be turned into a group. The summing of the asserted and presupposed writing papers eventuality, then, leads to a grouped, singular eventuality of writing (a group of) papers, with a group of John and Mary as an agent, and allows the felicity of *more*$_{add}$.

However, the 'singular, grouped' approach cannot be the right way to capture the intuitive constraint on $more_{add}$. This is because there are also many cases where $more_{add}$ is felicitous although no real group reading seems reasonable. Consider, for example, (53) and (54):

(53) (What happened to the cookies you baked?) Well, my nephews were here and ate most of them. Later I had a meeting with my student, and she ate some more.

(54) The hurricane killed 4 people in this village. A week later two more people were killed by robbers.

In (53) it is hard to take 'my nephews' and 'my students' to form a group (they may even not know of each other). Thus, eating the cookies in the jar is not naturally considered a collective action of my nephews and my student. This is even clearer in (54), since we won't tend to consider the inanimate hurricane which killed four people, and the animate robbers who killed two people a week after as a group. Here too we cannot talk about collective action or decision. Nonetheless $more_{add}$ is perfectly felicitous in these sentences. Requiring a group reading with $more_{add}$, then, seems too strong.

3.3 Modeling the summed eventualities as substantive pluralities (Kratzer (forthcoming)).

A second potential way to capture the intuitive 'single eventuality' constraint on $more_{add}$ is to follow Kratzer's (forthcoming) approach to the collectivizing adverb *together* (see also Lasersohn 1995). Kratzer's view is that, despite the collectivizing effect of *together*, the eventualities it associates with are pluralities, and not singularities. However, they are special kinds of pluralities, which Kratzer calls 'substantive pluralities':

> … an account of substantive pluralities can be given while maintaining a standard mereological account of pluralities…Collective actions are actions by pluralities that have no subactions by anybody but those very same pluralities. Likewise, collective states have plural possessors who are also the possessors of all of their substates (Kratzer (forthcoming) chapter 4)

Trying to apply this approach to the semantics of $more_{add}$, we may want to require that, the summed eventuality e_3 is plural, but it has no subevent which has less than the plurality of individuals as agents. In the case of (55), for example, we would say that the summed eventuality e_3 of 'interviewing 8 students' is really a plural event, with a plural agent John+Mary, but it is understood as 'collective' or 'singular' because it has no subevent, which is also an 'interviewing 8 students' event, which has only John or only Mary as agents:

(55)   John interviewed 5 students. Mary interviewed 3 more students.

However, adopting this strategy for the semantics of $more_{add}$ faces two problems. First, there are cases the condition is met, but $more_{add}$ is infelicitous. Consider (56):

(56)   John weighs 90 kilograms. Mary weighs 60 kilograms more (comparative only)

If we sum John's state of weighing 90 kilos, and Mary's state of weighing 60 kilos, we get to the summed state of John and Mary weighing 150 kilos, where there is indeed no sub-state of this state, which has less than the sum of John and Mary as the 'possessors'. But this is not enough to make (56) felicitous under the additive reading. (To make it felicitous we need a stronger scenario, e.g., one where we check whether John and Mary can both enter an elevator with a limited weight capacity).

Second, there are cases where the condition is not met, but $more_{add}$ is felicitous, as in (57):

(57)   John interviewed some students. Mary interviewed some more.

In (57) the summed eventuality is 'interviewing some students'. But crucially, $more_{add}$ is felicitous although there *is* a subevent 'interviewed some studnets' that has less than John+Mary as an agent, e.g. the subevent e_1, where Mary interviewed some students, as well as the subevent e_2 where John interviewed some students. Kratzer's 'substantive pluralities' condition, then, seems to be both too weak and too strong than the additional constraint on $more_{add}$ we are interested in.

3.4 The summed eventuality as 'more developed' than its subevent

Given the difficulties of the two solutions above to capture the conditions on the felicity of $more_{add}$, I suggest a third one. Until now we focused on the fact that the asserted and presupposed eventualities are summed into a third (plural) eventuality, which is in the denotation of the same verbal predicate, and which is 'larger' than its subevents by virtue of the fact that the degree measuring its participants is higher: the cardinality (or weight, volume, etc.) of these participants is the sum of the cardinality (or weight, volume, etc.) of the participants in its two subevents.

However, another intuition we want to capture concerns the incrementality that the use of $more_{add}$ seems to trigger. Intuitively, using $more_{add}$ leads not only to a larger and plural eventuality, but also to a more *developed* eventuality. Take again (3) above, repeated here as (58):

(58)   Yesterday John interviewed three students. Today he interviewed some more

Intuitively, the eventuality e_3, is not only a sum of the two eventualities in the assertion and the presupposition, which results in a larger set of students being interviewed. It can be considered also a more 'developed' eventuality than its presupposed subevent, as it leads to some progress. For

example, we may easily assume that we are in the process of interviewing new students for the department, so the more students are interviewed, the more developed the situation is.

We will hypothesize, then, that for $more_{add}$ to be felicitous the eventuality e_3, which is the sum of the asserted and presupposed eventuality e_1 and e_2, should be considered more developed than its presupposed subevent e_2, and write this as $e_3 >_{developed} e_2$.

The main support for this hypothesis is the fact that cases where $more_{add}$ is infelicitous significantly improve if we put them in scenarios where adding e_1 to e_2 can be indeed understood as correlating with or leading to some development. For example the additive reading of (48) above significantly improves if we utter this sentence in a context where some rich man suggest to donate a certain sum of money for poor children for every birthday cake baked in the world. Thus, adding e_1 (the New York woman's of the cakes) to e_2 (my baking of the cakes) results in a more developed eventuality e_3, since it leads to a larger amount of money we can get. Similarly, consider (59) in the two contexts examined above:

(59) (Scenario A: John and Mary are friends of mine, who work in different place. They work very hard. John wrote 3 papers). Mary wrote more papers (comparative only)

(Scenario B: John and Mary work in the same departmental project.

John wrote 3 papers). Mary wrote more papers (additive reading possible)

We can sum the two writing papers eventualities in scenario A. But this will merely lead to a plural eventuality, with a larger number of papers as themes, and not to an eventuality which is seen as more developed. In contrast, doing the same in scenario B leads also to an eventuality which can be considered 'more developed'. This can be expressed by using 'the more…the more…' construction, for example, 'The more papers there are the better the status of the departmental project is / the higher chance the project will get funded' etc. Indeed in scenario A we would not tend to use the 'The more… the more…" construction.

Similarly, consider (49), above, repeated here as (60):

(60)   The prime minister has 3 children. I have more (children)

 (60) is infelicitous out of the blue, since the larger number of children involved in the summed eventuality does not correlate or lead to a higher degree on another scale measuring an eventuality. Thus, e_3 is not taken to be 'more developed'. In contrast, if we put (60) in a scenario where me and the prime minster want to make sure we have enough children for a birthday party, then (60) is fine. In this case the summed state can be considered more developed, since the growth of the number of children involved in it correlates with another state being more developed, e.g. the party being more successful. This can be intuitively expressed by saying "the more children we have, the more successful the party is".

It is important to notice that, in contrast to the 'groups-based' suggestion, in section 3.2 above, requiring e_3 to be 'more developed', we can safely consider it to be a plural eventuality. In addition, if the eventualities in the asserted and presupposition have two different agents, we do not need to assume that they form a real group and work collectively. For example, in the 'rich man' scenario for (48) above, which makes $more_{add}$ felicitous, the summed eventuality e_3 can be considered more developed, even if me and the woman in New York do not work collectively: e.g. we are not aware at all of each other, and are not even aware of the fact that the birthday cakes we bake are counted for some purpose. Similarly, the hurricane and the robbers in (54) above do not form a group or work collectively, but the summed eventuality e_3 can be still considered more developed, in this case negatively more developed: there are more tragedies in the village, the village needs more help, people are more worried, etc.

The 'more developed' suggestion can also naturally explain the fact that, unlike the infelicitous cases of $more_{add}$ discussed in this section, when the agent of the assertion and presupposition is the same it is usually easy to consider the summed eventuality e_3 more developed, and no special context is needed. This is because if a single individual is the agent of an event involving a higher number of participants, this usually leads to some development relating to this participant. Crucially, however, there are also cases where $more_{add}$ is infelicitous where a single agent is involved. Such cases can be also naturally explained by the 'more developed eventuality' suggestion. Consider (15), repeated here as (61):

(61)   Today John ate some more bread

Remember that in section 1 we wondered whether it is enough to take the eventuality in the presupposition triggered by $more_{add}$ to be existentially quantified, or whether a stricter condition, requiring contextual saliency of this eventuality, is needed, so the presupposition will not be trivially met. Presupposing that there is an eating bread eventuality by John, which is not later than today's eating bread, seems trivial. Indeed, in a context where it is reasonable to assume that John is used to eat bread from time to time, or that he eats bread every day, (61) sounds odd.

But, in fact, the problem in this case does not lie in the fact that the presupposed eventuality is existentially closed and not contextually salient. This is indicated by the fact that, in the same context, the additive reading of (61) is odd even where a prior eating-bread eventuality is explicitly mentioned, and is thus contextually salient, as in (62):

(62)   (Context: John is used to eat bread every day) Yesterday John ate 3 slices of bread.
        Today he ate some more.

Thus, the reason for the infelicity of (61) in the context where we know that John is used to eat bread regularly is different. I suggest that the requirement that the summed eventuality e_3 to be

more developed than its subevent e_2 can explain this infelicity. Specifically, in such a context summing the two eating bread eventualities, yesterday and today, is not perceived as 'more developed' than John's eating bread yesterday. Specifically, the larger amount of bread involved in the summed eventuality does not naturally correlate with or lead to a higher degree in another scale. But if we put the sentence in a context where e_3 is taken to be more developed, *more$_{add}$* will become felicitous. Suppose, for example, that we know that John is fat, and has to keep a certain diet. In this context adding the bread he ate today to the bread he ate yesterday we can imagine that the more bread he eats, the fatter he gets, or the more worried we are, or the more certain we are that he cannot control himself, etc.. Alternatively, suppose John is known to be anorectic or depressed, then the more bread he eats, the healthier we think he is, the happier we are, etc. Crucially, in such situation the status of *more$_{add}$* is much better. This I because in both cases we have a situation where the higher cardinality of the participants in the summed eventuality correlates with or leads to a higher degree on another scale which characterizes some eventuality or state. Indeed, this is what enables the use of the 'the more… the more..' construction.

Notice, that in contrast to (62), the very similar (63) is much more naturally felicitous, even in the context above, where all we know is that John is used to eat bread.

(63)   John ate 3 slices of bread this morning. At noon he ate some more

To get a felicitous additive reading in (63), we do not need to assume special contexts where John is on a special diet, or that he is anorectic, as in (62) above. This is because in (63) one can quite easily correlate the larger amount of bread that John with a higher degree on another scale, e.g. the scale which measures the degree to which John is full, the one which measures how much bread is left in the bread box, etc.. These are exactly the kind of inferences that are harder to get in (62) (unless we use special contexts).

The difference between (62) and (63) further indicates that we should not take the felicity of *more$_{add}$* to depend on considering the summed eventuality e_3 a singular eventuality. The sum of John's eating bread this morning and this noon is not any more 'singular' than the sum of John's eating bread yesterday and today. It is true that the former can be considered 'John's eating bread today', but in the same way the latter can be considered 'John's eating bread this week'. Instead, the requirement that the plural summed eventuality e_3 is considered more developed than its presupposed subevent e_2 correctly distinguishes (62) from (63), since it is more easily met in the latter than in the former sentence.

Notice, finally, that the requirement that the summed eventuality e_3 is more developed than the presupposed eventuality e_2, is compatible with the possibility that this eventuality is not *fully*

developed. That is, e_3 itself can be considered a part of an even more developed eventuality. This correctly predicts the felicity of sentences like (64):

(64) (What happened to all the cookies you have baked?) Well, John ate 3. Then Mary arrived and ate 4 more. Later on my nephews arrived and ate 2 more. (So there are only 3 left)

Given the discussion above, the criterion that should hold for a plural eventuality (with a certain degree measuring its participants) to be considered more developed than its subevent (with a lower degree measuring its participants), is that the higher degree in the scale measuring the participants in the summed eventuality should reasonably lead to a higher degree on another scale. This criterion is heavily dependent on real world knowledge and contextual support, and capturing it seems to require using a modal component of 'normal expectations' or 'reasonable causal relations'. I will not attempt to integrate this criterion into the truth conditions of sentences with $more_{add}$, but at this stage use the pre-theoretic requirement that $e_3 >_{developed} e_2$, since indeed in all cases where we intuitively cannot consider e_3 to be more developed than e_2, $more_{add}$ is infelicitous.[10]

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[10] One may attempt to capture the 'more developed' requirement on e_3 by using the notion of a stage-of (as opposed to the part-of) relation between eventualities, introduced in Landman's 1992 analysis of the progressive (see also Sharvit 2003, Rothstein 2004 and Ladnman 2008). According to Landman 1992 "An event is a stage of another event if the second can be regarded a more developed version of the first, that is, if we can point at it and say "It's the same event in a further stage of development"" (Landman 1992, p. 23). Although, like the 'more developed' relation above, the stage-of relation seems to be based on intuitive and pre-theoretical notions, as well, it may be better since it is independently argued to play a role in the semantics of other constructions. One may require, then, that e_2 is not only a part of e_3, but also a stage of it, and replace , $e_3 >_{developed} e_2$ in (66) with $e_2 <_{stage} e_3$.

However, there are problems in using the stage-of relation in the semantics of $more_{add}$. According to Landman 2008 an event e is a stage of e' if (a) e is a part of e' and (b) if e is 'cross temporally identical' to e', where the relation of 'cross temporal identity' is defined (in Landman & Rothstein 2008), as in (i):

(i) An event e_1 is **cross-temporally identical to** e_2, $e_1 \sim e_2$ iff e_1 and e_2 count as 'one and the same event', i.e. for counting purposes e_1 and e_2 count as **one** event.

For example, Landman & Rothstein 2008 say that "if you and I dance the Emperor's waltz together, and no other dance, we waltz once: the waltzing at the beginning of the Emperor's waltz, and the waltzing towards the end do not count as separate waltzings. ". Thus, when asked 'how many times did you waltzed? " The answer will be 'once'.

Given this 'cross temporal identity' condition on the stage-of relation, however, we cannot require that in (66) $e_2 <_{stage} e_3$. For example, in the case of (47) we cannot say that we have only one eventuality of baking cakes. Instead, we seem to have (at least) three eventualities, the presupposed eventuality e_2 (my baking cakes yesterday), the asserted eventuality e_1, (John's baking cakes today), and the summed eventuality e_3, (baking the cakes by John+me).

The problem seems to result from the fact that, in the case of $more_{add}$, we are dealing with plural eventualities, Landman 2008 emphasizes that the definitions he gives are only relevant for singular eventualities, and that he ignores plurality of eventualities altogether. In addition, in Landman's examples the eventualities differ in their run time only (so we have indeed only cross *temporal* identity), whereas with $more_{add}$, they may also differ in their participants, locations, and even the verbs characterizing them. This makes it harder to count the relevant eventualities, e_2 and e_3 as 'one and the same' event in different stages of development.

A related problem is that the stage-of relation is meant to capture development in time: the eventuality develops as its proceeds in time, i.e. as its run time gets lengthened. This is also very clear in Landman's 2008 theory, in which e is a stage of e' if it is a proper part of e', where 'proper part' entails temporal inclusion between the run times of the eventualities. In contrast, what makes e_3 more developed is not the addition of run time, but the addition of participants involved. Moreover, as noted in section 1 above, the asserted and presupposed eventualities may even have the same run time.

Both problems with using the stage-of relation in the semantics of $more_{add}$ seem to result from the fact that this relation is indeed originally defined for singular eventualities only, whereas with $more_{add}$ we are systematically dealing

We thus take the truth conditions of (65) above, to be (66), where what is added to the second presupposition is the requirement that $e_3 >_{developed} e_2$, which is underlined in (66):

(65)   Two more$_{add}$ boys danced.

(66) Truth conditions of *Two more$_{add}$ boys danced*

Assertion: $\exists e_1, x, t$ [dance $(e_1) \wedge$ *boy $(x) \wedge Ag(e_1) = x \wedge \tau(e_1) \subset t \wedge t<n \wedge \mu (Ag(e_1))$ = 2 individuals]

Presuppositions:

(i) $\exists P_2, e_2, y, d_2$ [$P_2(e_2) \wedge$ *boy $(y) \wedge$ Agent $(e_2) = y \wedge \tau(e_2) \leq t \wedge \mu (Ag(e_2)) = d_2$]

(ii) $\exists P_3, e_3, z, d_3$ [$P_3 (e_1) \wedge P_3(e_2) \wedge$ *$P_3 (e_3) \wedge e3 = e_1 + e_2 \wedge z= x+y \wedge$*boy $(z) \wedge$ $Ag(e_3) =z \wedge \mu (Ag (e_3)) = d_3 \wedge d_3 = 2$ individuals $+ d_2 \wedge \underline{e_3 \geq_{developed} e_2}$]

The more general conclusion to draw from this discussion is that the operation of *more$_{add}$* is to indicate that the extent to which a certain summed eventuality develops, depends on the sum of the degrees (cardinality, weight, volume, etc.) of the participants in the asserted and presupposed subevents of this eventuality. The larger the sum of the measurement of the participants in the subevents are, the more developed the summed eventuality is.

4.   The compositional semantics of nominal *more$_{add}$*

We are now in a position where the observations, intuitions and representations suggested above can be integrated to give the denotation and compositional interpretation of *more$_{add}$*. Specifically, I take *more$_{add}$* to be an overt realization of a derived measure function μ, which triggers the presuppositions discussed above, and which combines properties of nominal and verbal measure functions. To understand that, let us start by looking at the compositional semantics of sentences with nominal and verbal measure functions, discussed in Nakanishi 2007.

4.1 Compositional derivation of sentences with nominal and with verbal measure functions

I follow Nakanishi 2007, in assuming that syntactically, measure functions, like μ: cardinality, μ: spatial length, μ:volume, etc. first combine with degree phrases, such as *three (individuals), three kilometers,* etc., of type d (the type of degrees), and then the combination of μ and the degree phrase

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with a plural eventuality, the result of summing two eventualities. It may be useful, then, for further research to concentrate on defining a stage-of relation for plural eventualities as well, which might be able capture the 'more developed' relation in the semantics of *more$_{add}$*.

combines with the predicate of the measured element. In the case of a nominal measure constructions, such as *two meters (of) rope*, the measured element is in the denotation of a nominal predicate, type <e,t>. Thus the type of μ, is <d, <<e,t>, <e,t>>>, and its denotation is as in (67) (Nakanishi adds the presupposition that μ is monotonic w.r.t. P, which I ignore here):

(67) $[\mu_{NP}] = \lambda d_d. \lambda P_{<e,t>}.\lambda x_e. P(x) \wedge \mu(x) = d.$ (Nakanishi, 2007, p. 263)

The derivation of *two meters (of) rope*, then, is in (68):

(68) Derivation of *two meters of rope:*

Two meters$_d$ → *2 meters*

$\mu_{<d, <<e,t>, <e,t>>>}$ → $\lambda d_d. \lambda P_{<e,t>}.\lambda x_e. P(x) \wedge \mu(x) = d$

Two meters+ μ $_{<<e,t>,<e,t>>}$ → $\lambda P_{<e,t>}.\lambda x_e. P(x) \wedge \mu(x) = 2$ meters

Rope$_{<e,t>}$ → $\lambda x. rope(x)$

Two meters (of) rope$_{<e,t>}$ → $\lambda P_{<e,t>}.\lambda x_e. P(x) \wedge \mu(x)$ → $\lambda x_e. rope(x) \wedge length(x) = 2$ meters

(Nakanishi 2007, p. 263)

In the case of verbal measure functions, as in *walk two meters*, Nakanishi follows Krifka 1989, 1998 in taking the measure function to be derived. That is, such a measure function does not measure the walking eventuality directly, since events themselves do not have spatial length, only their spatial paths do. Thus, it is the range of a homomorphism on the eventuality which is measured, in this case, the range of the homomorphism from eventualities to their paths. In such cases, then, the combination of μ and the degree phrase combine with a verbal predicate, type <v,t> (where v is the type of eventualities), and measures the range of the homomorphism applied to the eventuality in the denotation of this verbal predicate. The type of the verbal measure function μ, then, is <d, <<v,t>,<v,t>>>, and its denotation is (69) (Here too I delete Nakanishi's monotonicity presupposition):

(69) $[\mu_{VP}]: \lambda d_d. \lambda P_{<v,t>}.\lambda e.P(e) \wedge \mu(h(e)) = d$ (Nakanishi 2007, p. 265)

To illustrate how such a verbal measure function operates let us examine the derivation of the sentence *John walked 3 meters.* To do that I will follow Rothstein's 2001 theory of predication, according to which intransitive verbs denote set of eventualities with a free variable, type e, as the value of the external thematic role. For example, the denotation of the verb *walk* is $\lambda e. walk(e) \wedge$ *Agent(e) = x*. A rule of predicate formation then applies at the VP level, and raises the type of the predicate from type <v,t>, to type <e, <v,t>>, by lambda abstracting over the x variable, so we get $\lambda x.\lambda e. walk(e) \wedge Agent(e) = x$. After the denotation of the external argument is fed in, we are left again with a set of eventualities, type <v,t>. Then existential closure (e.g. Heim 1981) applies, to give type t.

Given these assumptions, the derivation of *John walked three meters* is as in (70), where *h* is 'spatial path' (and tense is ignored):

(70)   Derivation of *John walked three meters*

three meters$_d$ → *3 meters*

μ $_{<d, <<v,t>,<v,t>>}$ → $\lambda d_d. \lambda P_{<v,t>}.\lambda e.P(e) \wedge \mu(h(e))= d$

μ *three meters$_{<<v,t>,,v,t>>}$* → $\lambda P_{<v,t>}.\lambda e.P(e) \wedge \mu(h(e)) = 3$ *meters*

Walk$_{<v,t>}$ → $\lambda e.walk(e) \wedge Agent(e) = x$

Walk μ three meters$_{<v,t>}$ → $\lambda e.walk(e) \wedge Agent(e) = x \wedge length(h(e)) = 3$ *meters*

walk μ three meters $_{<e,<v,t>>}$ → $\lambda x. \lambda e.walk(e) \wedge Ag(e) = x \wedge length(h(e)) = 3$ *meters*
(**by predicate formation)**

John walked μ three meters$_{<v,t>}$ → $\lambda e.walk(e) \wedge Ag(e) = j \wedge length(h(e)) = 3$ *meters*

John walked three meters$_t$ → $\exists e.walk(e) \wedge Ag(e) = j \wedge length(h(e)) = 3$ *meters*
(**Existential closure)**

"There is a walking eventuality, whose agent is John and the spatial length of its path is 3 meters"

As to the MP constructions in Japanese, Nakanishi shows that whereas the non-split MP construction syntactically combines with a nominal predicate, and hence its type and denotation are equal to those of nominal measure functions (as in (67) above) , the split MP construction adjoins to a verbal projection (though it is c-commanded by the host NP, which is in a higher position). Thus, the type of μ in this kind of construction is like the verbal measure function as also type <d, <<v,t>,<v,t>>>, and its denotation is just as in (69), where *h* is the homomorphism from eventualities to individuals, namely the individuals in the denotation of the nominal predicate c-commanding μ.

4.2 The denotation of *more$_{add}$*

We now turn to *more$_{add}$*. I take this particle to be an overt realization of a measure function μ, which triggers the presuppositions discussed in the sections above.

From the point of view of its compositional semantics, though, the interesting thing about this particle is that it seems to combine the characteristic of the nominal and the verbal measure functions in (67) and (69) above. That is, unlike the split MP construction in Japanese, and similarly to the nominal measure function and to the Japanese non-split MP construction, the degree word +

more$_{add}$ (e.g., *3 more* in *I ate 3 more cookies*) syntactically combines with a *nominal* predicate (e.g. *cookies*) type <e,t>, and not with a verbal predicate. However, similarly to the split MP construction, the degree word + *more*$_{add}$ does not merely measure the individuals in the denotation of this nominal predicate. Rather, it indirectly measures the development of an eventuality e_3 (the sum of the asserted and presupposed eventualities) by measuring the sum of individuals in the denotation of the nominal predicates which are participants in the subevents of e_3.

These facts can be captured by assuming that *more*$_{add}$ is of type <d,< <<e,t>, <<e,<v,t>>, <v,t>>>>>, with the denotation in (71). The presuppositions discussed above are now defined in a single clause:

(71)   Denotation of *more*$_{add}$:

$\lambda d_1. \lambda Q_{<e,t>}.\lambda P_{1<e,<v,t>>}.\lambda e_{1v}. [\exists x [Q(x) \wedge P_1(x)(e_1) \wedge \mu(h(e_1)) = d_1]]$

Presupposition: $\exists e_2, e_3, P_2, P_3 d_2, y,z [P_2(y)(e_2) \wedge Q(y) \wedge \mu(h(e_2)) = d_2 \wedge \tau(e_2) \leq t$

$\wedge P_3(x)(e_1) \wedge P_3(y)(e_2) \wedge *P_3(z)(e_3) \wedge e_3 = e_1 + e_2 \wedge Q(z) \wedge z=x+y \wedge \mu(h(e_3)) = d_1 + d_2 \wedge e_3 >_{developed} e_2]$

In (71) Q is a nominal predicate, and P_1, P_2 and $*P_3$ are a verbal ones, expressing a relation between individuals and eventualities. The homomorphism *h* maps eventualities to their participants, and μ is a measure function which can be 'cardinality', 'weight', 'volume' etc. μ measures the range of *h*, i.e. it measures the participants in the P eventualities in the assertion and the presupposition, which are also in the denotation of the nominal predicate Q.

To illustrate the operation of *more*$_{add}$, given this suggested denotation, let us examine two example derivations (in both of which tense is, again, ignored). We start from a case where *more*$_{add}$ combines with an external argument. (To shorten this illustration I introduce the presupposition only at the denotation of *more*$_{add}$ and at the end of the derivation):

(72)   Derivation of *3 more students danced*:

3$_d$ → 3 individuals

more$_{<d,< <<e,t>, <<e,<v,t>>, <v,t>>>>>}$ → $\lambda d_1. \lambda Q_{<e,t>}.\lambda P_{1<e,<v,t>>}.\lambda e_{1v}. [\exists x [Q(x) \wedge P_1(x)(e_1)$ $\wedge \mu(h(e_1)) = d]]$

Presupposition: $\exists e_2, e_3, P_2, P_3 d_2, y,z [P_2(y)(e_2) \wedge Q(y) \wedge \mu(h(e_2)) = d_2 \wedge \tau(e_2) \leq t \wedge$ $P_3(x)(e_1) \wedge P_3(y)(e_2) \wedge *P_3(z)(e_3) \wedge e_3 = e_1 + e_2 \wedge Q(z) \wedge z=x+y \wedge \mu(h(e_3)) = d_1 + d_2$ $\wedge e_3 >_{developed} e_2]$

3 more $_{< <<e,t>, <<e,<v,t>>, <v,t>>>>}$ → $\lambda Q_{<e,t>}.\lambda P_{1<e,<v,t>>}.\lambda e_{1v}. [\exists x [Q(x) \wedge P_1(x)(e_1) \wedge$ $\mu(h(e_1)) = 3$ individuals$]]$

3 more students $_{<<e,<v,t>>, <v,t>>}$ $\rightarrow \lambda P_{1<e,<v,t>>}.\lambda e_{1v}.$ [$\exists x$ [student(x) $\wedge$ $P_1(x)(e_1)$ $\wedge$

$\mu(h(e_1))$ = 3 individuals]]

dance $_{<v,t>>} \rightarrow \lambda e.$ dance(e) $\wedge$ Agent (e) = x

dance $_{<e,<v,t>>} \rightarrow \lambda x.\lambda e.$ dance(e) $\wedge$ Agent (e) = x **(by predicate formation)**

3 more students danced $_{<v,t>}$ $\rightarrow \lambda e_{1v}.$ [$\exists x$ [student(x) $\wedge$ dance(e_1) $\wedge$ Agent (e_1) = x $\wedge$

$\mu(h(e_1))$ = 3 individuals]]

3 more students danced $_t$ $\rightarrow \exists e_1 \exists x$ [student(x) $\wedge$ dance(e_1) $\wedge$ Agent (e_1) = x $\wedge$

$\mu(h(e_1))$ = 3 individuals] <u>Presupposition:</u> $\exists$ e_2, e_3, P_2, P_3 d_2, y,z [$P_2(y)$ (e_2) $\wedge$

student(y) $\wedge$ μ (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) $\wedge$ $e_3 = e_1$

+ e_2 $\wedge$ student(z) $\wedge$ z=x+y $\wedge$ μ (h(e_3)) = 3 individuals+ d_2 $\wedge$ $e_3 >_{developed} e_2$]

(Existential closure)

<u>Assertion:</u> There is a dancing eventuality e_1, whose agent is three individuals who
are students

<u>Presupposition:</u> There is a P_2 event, e_2, which is temporally not later the reference
time of the assertion, and whose agent is a student 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 agent is the students which are agents to e_1 and of e_2, with
cardinality of 3 individividuals+d_2. Finally, this summed eventuality e_3 is more
developed than e_2.

Next, we move to a sentence where *more_add* operates on the internal argument, as in (75):

(73)   John saw three more students

To give the derivation of such a sentence I will modify a bit Rothstein's representation of transitive
verbs. In Rothstein's system a verb like *see* is of type <e,<v,t>> and its denotation is *λx. λe. see (e)*
∧ Theme(e) = x ∧ Agent(e) =y. The denotation of the VP (e.g. *see Mary*) then raises from type <v,t>
to type <e, <v,t>> by predicate formation, i.e. from *λe. see (e) ∧ Theme(e) = Mary ∧ Agent(e) =y*
to *λy.λe. see (e) ∧ Theme(e) = Mary ∧ Agent(e) =y*.

In contrast to Rothstein 2001, Kratzer assumes that the denotation of transitive verbs does
not make reference to theme role. This is based on the assumptions that (a) all thematic relations are
cumulative (Krifka 1992, 1998, Landman 1996, 2000), but that (b) unlike the agent role, which is
cumulative, the proposed theme role is not cumulative, as it cannot be summed. Kratzer's motivates
this latter assumption by considering a planting-a tree eventuality, which has three subevents: John's
digging of the hole, Mary's placing the tree in the hole, and Bill's covering the root with soil. In this

case the agent of the planting eventuality can be considered the sum of John, Mary and Bill, but the theme of this eventuality is not the sum of the hole, the tree and the soil (but rather the tree alone). Hence, Kratzer assumes that the theme of an eventuality is not introduced by a theme role (and in fact, there is no 'theme role' at all), but rather by the denotation of the transitive verb, which denotes as a relation between eventualities and their internal arguments.[11] According to Kratzer, then, the denotation of a verb like *see* is $\lambda x.\ \lambda e.\ see\ (e) = x$.

I will combine Rothstein's theory of predication (and the use of her predicate formation rule), with Kratzer's view of internal arguments. This will give us the following denotations for the verb *see*, the V' *see Mary* and the VP *see Mary*:

(74) $[see]_{<<e,<v,t>>} \rightarrow \lambda x.\ \lambda e.\ see(e) = x \land Agent(e) = y$

$[see\ Mary]_{<v,t>} \rightarrow \lambda e.\ see(e) = Mary \land Agent(e) = y$

$[see\ Mary]_{<v,t>} \rightarrow \lambda y.\lambda e.\ see(e) = Mary \land Agent(e) = y$ (**by predicate formation)**

Given these assumptions, the derivation of a sentence like *John saw three students* is as in (75). The denotation of *three more students* as just as in (72) above, so I here copy this denotation in (75), with the presupposition of *more_{add}*:

(75) Derivation of *John saw three more students:*

3 more students $_{<<e,<v,t>>,\ <v,t>>} \rightarrow \lambda P_{1<e,<v,t>>}.\lambda e_{1v}.\ [\exists x\ [student(x) \land P_1(x)(e_1) \land \mu(h(e_1)) = 3\ individuals]]$

Presupposition: $\exists e_2, e_3, P_2, P_3\ d_2, y,z\ [P_2(y)\ (e_2) \land student(y) \land \mu\ (h(e_2)) = d_2 \land \tau(e_2) \le t \land P_3(x)(e_1) \land P_3(y)\ (e_2) \land {}^*P_3\ (z)\ (e_3) \land e_3 = e_1 + e_2 \land student(z) \land z=x+y \land \mu\ (h(e_3)) = 3\ individuals+ d_2 \land e_3 >_{developed} e_2]$

saw$_{<e,<v,t>>} \rightarrow \lambda x.\ \lambda e.\ see(e) = x \land Agent(e) = y$

saw 3 more students $_{<v,t>} \rightarrow \lambda e_{1v}.\ [\exists x\ [student(x) \land see(e_1) = x \land Agent(e_1) = y \land \mu(h(e_1)) = 3\ individuals]]$

saw 3 more students $_{<e,\ <v,t>>} \rightarrow \lambda y.\lambda e_{1v}.\ [\exists x\ [student(x) \land see(e_1) = x \land Agent(e_1) = y \land \mu(h(e_1)) = 3\ individuals]]$ **(by predicate formation)**

John saw three more students$_{<v,t>} \rightarrow \lambda e_{1v}.\ [\exists x\ [student(x) \land see(e_1) = x \land Agent(e_1) = John \land \mu(h(e_1)) = 3\ individuals]]$

John saw three more students$_t \rightarrow \exists e_1 \exists x\ [student(x) \land see(e_1) = x \land Agent(e_1) = John \land \mu(h(e_1)) = 3\ individuals]$ Presupposition: $\exists e_2, e_3, P_2, P_3\ d_2, y,z\ [P_2(y)\ (e_2) \land$

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[11] According to Kratzer, this relation is cumulative. For example, the sum of an event where I plant roses, and an event where I plant tulips is an event where I plant roses and tulips.

$$\text{student}(y) \wedge \mu\,(h(e_2)) = d_2 \wedge \tau(e_2) \leq t \wedge P_3(x)(e_1) \wedge P_3(y)\,(e_2) \wedge {}^*P_3\,(z)\,(e_3) \wedge e_3 = e_1$$
$$+ e_2 \wedge \text{student}(z) \wedge z = x + y \wedge \mu\,(h(e_3)) = 3\ \text{individuals} + d_2 \wedge e_3 >_{\text{developed}} e_2]$$

(**Existential closure**)

<u>Assertion:</u> There is a seeing 3 students eventuality e_1, whose agent is John

<u>Presupposition:</u> There is a P_2 event, e_2, which is temporally not later than the reference time of the assertion, and whose agent is students with cardinality d_2, 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 seeing eventuality e_1 and e_2, whose agent is the students which are agents to e_1 and e_2, with cardinality of 3 individiduals+d_2, and this summed eventuality e_3 is more developed than e_2.

<u>4.3 An apparent problem: potential variations between external and internal arguments with *more*_{add}</u>

The derivation of (72), with the intransitive verb *danced* seems to give us the right results. But, on the surface, there seems to be a problem with the derivation of *more*_{add} with transitive verbs, as in (75). In all the examples with transitive verbs we looked at so far, the individual in the denotation of the nominal predicate associated with *more*_{add} in the assertion played the same thematic role as in the presupposition. For example, in (3), repeated here as (76), the individual students in the both the assertion and presupposition play the internal role of the verbal predicates, and in (42), repeated here as (77), the individual boys in both the assertion and presupposition play the external, agent role:

 (76) Yesterday John interviewed 3 students. Today he interviewed more

 (77) (2 students made a table). 3 more students made a chair

The problem seems to be that, given the denotation of *more*_{add} above, and the derivation in (75), this invariability of the thematic roles between the assertion and presupposition is not guaranteed. For example, whereas *3 more students* is the internal argument of the verb in the assertion of (75), the derivation does not guarantee that the students participating in the presupposed eventualities, e_2 and e_3 are also the internal arguments of the Q and ${}^*Q$ verbal predicates. Take for example P_2 in the presupposition in (75). The presupposition requires that the individual students (with cardinality d_2) are participants in the eventuality e_2 ($P_2\,(y)\,(e_2)$), but it does not specify whether these participants are given by the external or internal argument of P_2. This is because P_2 (like P_1) is of type $<e,<v,t>>$. Thus, it can be a transitive verb, like *see* or *hear*, in which case the students participating in the e_2 eventuality are the internal argument of the predicate, as in the assertion. Crucially, however, this predicate can also be a VP, which as claimed above is also of type $<e, <v,t>>$ (using

Rothstein's predicate formation rule), in which case the students participating in the e_2 eventuality would constitute the external argument.

The question seems to be, then, whether there is a way to modify the denotation of *more_add*, which will make sure that once the individuals in the denotation of the nominal predicate that *more_add* associates with in the assertion constitutes an internal (external) argument, this nominal argument will constitute the internal (external) argument in the presupposition as well (e.g. by indexing the individual x variable with the right type of argument[12]).

However, a closer look shows that, in fact, no such modification of the definition of *more_add* should be made. This is because along cases like (76) and (77), where the thematic roles stay constant along the assertion and presupposition, we also find cases where we get variability in the thematic roles, as in (78) and (79):

(78)   (What happened to all the cookies you baked ?). Well, I baked 10 cookies. 3 cookies fell into the sink and got wet. At noon John arrived and ate 5 more cookies. So there are only 2 left.

(79)   (Where are all the students you invited?) John speaks with 4 of them in the living room. 3 more (students) will join us later on for dinner.

In (78), *5 more cookies* is the internal argument of the verb *ate*, while *3 cookies* in the presupposition is the external argument of *fell into the sink*. In (79) the situation is reversed: the measured individual in the assertion is the external argument of *join*, and the correlate in the preceding sentence satisfying the presupposition is the internal argument of *speaks with*.

Sentences like (78) and (79), then, show that the apparent problem with the denotation of *more_add* in (71) is actually an advantage. This denotation, then, correctly predicts that the assertion and presupposition of *more_add* can differ not only in the verbs characterizing the eventualities, but also in the thematic roles that the measured element plays.

5. **Concluding remarks and directions for further research**

Nakanishi 2007 concludes her paper by pointing out that an advantage of her theory is that some of the components in it, namely using measurement in different domains and the use of homomorphisms from the domain of eventualities to other domains, are relevant not only for her

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[12] See Nakanishi 2007 (pp. 269-272) for a proposal along those lines which is meant to account for internal-external roles variations in the split MP construction in Japanese.

analysis of split MP construction in Japanese, but can be extended to other constructions in other languages. The examples she cites are pluractional markers cross linguistically (Lasersohn 1995), comparative constructions in English and Japanese (Nakanishi 2004), and the interpretation of the quantified expression *for the most part* in English (Nakanishi & Romero 2005).

I believe that the analysis of the so far un-studied nominal additive particle *more*$_{add}$, proposed in this paper, further illustrates the usefulness and explanatory power of these components. In this sense, the contribution of the present paper is not limited to understanding this specific construction in English, but it can further contribute to the research on cross categorical and cross typal measurement and addition in different languages.

The main claim I made with respect to the semantics of nominal *more*$_{add}$ in English is that the range of constraints in the nominal and verbal domain on the interpretation and distribution of this particle can be accounted for by assuming that this particle denotes a derive additive measure function, in the sense of Krifka 1989, 1998 and Nakanishi 2007. Thus, *more*$_{add}$ measures the sum of individuals (in the denotation of the nominal predicate associated with it) in the assertion and presupposition, but this is done in order to indirectly express measurement and development of the eventualities involved. The individuals measured, then, are treated as participants in the asserted and presupposed eventualities, i.e. as the values of a homomorphism from eventualities to their participants, and the result of the additive measurement operation is to indicate to that the extent to which summed eventuality develops is dependent on the number of participants in its subevents.

Nominal *More*$_{add}$, then, is similar to the split MP construction in Japanese, as analyzed in Nakanishi 2007, since both are subjects to constraints in the nominal and verbal domains, and both denote derived measure functions. However, there are a number of interesting differences between the two constructions, which the discussion in the paper highlighted. First, the measure function μ' in the Japanese construction is covert, while I claimed that *more*$_{add}$ is an overt realization, in fact a lexicalization of μ'. Second, whereas the only presupposition triggered by μ' in the Japanese construction is its monotonicity, *more*$_{add}$ triggers a number of presupposed requirements regulating the subtle relationships between the asserted and presupposed eventualities (for example, the requirement that the summing of these eventualities results in a more developed eventuality, that the presupposed eventuality is not temporally later than the time of the assertion, etc.). Third, a central component of the measure function denoted by *more*$_{add}$ is its additivity, which allows a natural explanation of the incompatibility of *more*$_{add}$ with measure phrases like *20 carat* or *20 degrees Celsius*, with no need to stipulate that the function is monotonic (Schwarzschild's 2002), contra the Japanese MP construction. The central status of the additivity of the measure function also explains the fact that *more*$_{add}$ can combine with vague measure phrases, and even with no explicit measure

phrases at all. Thus, the main goal of $more_{add}$ is to indicate that the measurement of the summed eventuality is dependent on the measurement of the sum of participants in its subevents. This goal is achieved even if the value of the measurement is vague or unknown. Finally, whereas syntactically, the measure function in the Japanese construction adjoins to the verbal expression, the measure function denoted by nominal $more_{add}$ must associate with a nominal expression. This is reflected by the fact that, unlike the measure function in the Japanese split construction, which has the same type as verbal measure functions (namely <d, <<v,t>,<v,t>>>, the type of nominal $more_{add}$ makes reference to the nominal argument (it is type <d,< <<e,t>, <<e,<v,t>>, <v,t>>>>>). The denotations of the two functions differ respectively, too.

The paper raises many questions and directions for further research. Let me conclude the paper by briefly discussing five such directions.

Perhaps the most urging direction to develop is to extend the analysis of nominal $more_{add}$, proposed in this paper, to cases of verbal $more_{add}$, as in (80a)-(80c), where *more* does not associate with a nominal predicate, but modifies intransitive verbs, or transitive verbs whose internal argument is already filled:

(80) a. In the morning Mary ran 4 kilometers. In the evening she ran 3 kilometers more

b. In the morning Mary slept 4 hours. In the afternoon she slept 2 hours more

c. Mary started cooking the chicken. John cooked it a bit more.

Giving a full description and analysis of the distribution and interpretation of sentences with verbal $more_{add}$ is a large task, which is beyond the scope of this paper. However, a reasonable direction is to suggest that, similarly to nominal $more_{add}$, the operation of verbal $more_{add}$ is also to express additive measurement: here too we can say that we start with two eventualities, e_1 (asserted) and e_2 (presupposed), which are summed together into a larger and more developed eventuality e_3. But, unlike the operation of the nominal additive, here it is not the growth of the cardinality / weight / volume etc. of the participants in the subevents which indirectly measures the growth and development of the summed eventuality. Rather, we measure other things, and hence the development is done along other dimensions. For example, in (80a) it is spatial length, in (80b) it is temporal length and in (80c) it is the degree to which the chicken is cooked, which are measured, respectively.

Following Krifka 1989, 1998 and Nakanishi 2007, then, the measure functions with verbal $more_{add}$ as in (80), are similar to the ones with nominal $more_{add}$ in being *derived*, since they do not measure the eventuality directly, but rather the range of homomorphisms from eventualities to their spatial paths, their run times, or their abstract directed paths (e.g. the directed path from 'not cooked'

to 'cooked', see Krifka 1998). On the other hand, since $more_{add}$ + the degree phrase in such cases does not combine with a nominal predicate, but modifies the verbal predicate directly, its type would be identical to that of the verbal measure functions, and the split MP construction in Japanese, suggested in Nakanishi 2007, and its denotation also will change accordingly.

Further research should examine whether this kind of suggestion can be further developed to account for the full range of facts concerning verbal $more_{add}$, and for the various ways it differs from nominal $more_{add}$. Two examples of such differences are (a) the fact that verbal, but not nominal $more_{add}$, can measure eventualities directly, by counting them, as in (81), i.e. it seems to be able to express also a *non-derived* measure function, and (b) the fact the verbal, but not nominal $more_{add}$ obeys constraints on the lexical aspect of the verbs, as seen in (82a)-(82b), with state and achievement predicates:

(81)   Mary sang this song three times. I sang it twice more

(82)   a. # I have 3 sons some more (cf. I have 3 more sons)

        b. # I found my shoe some more (cf. I found some more shoes)

A second direction for further research has to do with the ambiguity of *more*. Assuming that the denotation of nominal $more_{add}$ is indeed along the lines of (71) above, would not it be preferable to relate this denotation to *more* as a comparative expression? The direction we can develop is to make use of the fact that on both additive and comparative interpretations the denotation of this particle makes reference to degrees (the comparative *more* says that a degree of a certain entity is higher on a certain scale than the degree of another entity, see e.g. Kennedy 1999). The relevant observation is that whenever a sentence with $more_{add}$ is true, the degree which indirectly measures the summed eventuality e_3 is higher than the degree which indirectly measures the presupposed eventuality e_2 (as well as than that of the asserted evente_1). More intuitively, if (83), with $more_{add}$ is true, then this entails (84), with $more_{comparative}$:

(83)   John spoke with 4 students. Mary spoke with some $more_{add}$

(84)   John and Mary spoke with $more_{comparative}$ students than John spoke with

We can try and develop a unified analysis of *more*, which will enable us to derive these two readings. However, the extent to which this task is productive is not clear, since, as mentioned in section 1, at least in the languages where additive particles have been studied, the two readings of *more* are expressed by two distinct lexical items. Examples are German (e.g. Umbach 2008), French, Italian and Chinese (Tovena & Donazzan 2008) and modern Hebrew (Greenberg 2008). Other such languages seem to be Russian, Spanish, Brazilian Portuguese and Arabic. It may be, then, that the relation between the additive and the comparative *more* in English is coincidental. This should be further examined, though.

A third potential question has to do with the fact that in the languages just mentioned, the lexical item expressing event additivity (corresponding to *more$_{add}$* in English) systematically has other meanings as well. One of these meanings corresponds to the English *still* (sometimes called an aspectual additive particle). Here is an example from Hebrew, where both *more$_{add}$* and *still* are translated as *od* (See Greenberg 2008. See also Umbach 2008 for the German *noch* and Tovena & Donazzan 2008 for the Italian *ancora*, the French *encore* and the Chinese *zai*):

(85)   dani   axal od   ugot

Danny ate   more$_{add}$ cakes

"Danny ate more$_{add}$ cakes"

(86)   dani od yaSen

Danny still asleep

"Danny is still asleep"

In fact, although in English the aspectual additive particle is not *more* but *still*, we can nonetheless find *more* in the negative counterpart of *still,* namely the NPI *any**more***, as in (87):

(87)   John is not asleep anymore.

In Greenberg 2008 I suggested that in both cases the additive particle leads to making a certain eventuality larger. However, with nominal *more$_{add}$* and *od,* as in (87), this happens as a result of summing two different subevents of this event, leading to a plural (and more developed) event, whereas with sentences as in (88) it is the very same eventuality which is enlarged, and we end up with a singular (and longer) eventuality. This intuitive idea is empirically supported by the fact that the *still* type of reading is only compatible with homogeneous (stative and imperfective) predicates (e.g. Michaelis 1993), which indeed lead to one and the same eventuality being temporally lengthened. It is theoretically supported by Ippolito's 2007 claim that the eventuality in the assertion of *still* is the very same eventuality in the presupposition (see also Greenberg 2009 for support for this view). In addition, unlike what is suggested for nominal *more$_{add}$*, the aspectual additive does not seem to involve measurement and degrees. Further research should attempt to integrate these intuitions within a unified semantic characterization of event additivity, and to relate the different interpretations of the event-based additive particles to their different syntactic positions (see Tovena & Donazzan 2008 for a proposal).

Further research should also attempt to relate the semantics of *more$_{add}$* proposed above to its focus sensitivity. The focused elements in sentences with *more$_{add}$* are not the nouns associated with this particle, since these are de-accented and can be deleted, but rather various other elements in the sentence, as in (88a)-(88c), respectively, which get a (rise-)fall-rise intonation. In addition *more* is usually stressed as well:

(88)   a.   John interviewed 3 students [Sara]$_F$ interviewed some [more]$_F$

           b. Today I interviewed 3 students. [Tomorrow]$_F$ I will interview some [*more*]$_F$

           c.   In the box there are 10 cookies. [In the oven]$_F$ there are 4 [more]$_F$

This makes the focus pattern of sentences with nominal additivity similar to that of sentences with the additive particle *too* discussed in e.g. Krifka 1999, involving contrastive topics as in (89):

(89)   a.   Today Danny bought books. [Tomorrow]$_F$ he will buy books [too]$_F$.

          b.   Today Danny bought books. [Mary]$_F$ will buy books [too]$_F$.

A preliminary suggestion concerning these facts is that the association with contrastive topics enables the listener to construct in what senses the presupposed eventuality is distinct from the asserted one, e.g. in its participants, its time or its location (see also Umbach 2008 for a discussion of the focus sensitivity of the additive *noch* in German).

      Finally, the semantics of nominal *more$_{add}$* presented in this paper for sentences like (90) should be compared to that of particles with similar effects, like *different*, *additional, further* and *together*. Compare, for example, (93)-(94):

(92)   Mary spoke with 3 students. John spoke with 2 more students

(93)   Mary spoke with 3 students. John spoke with 2 different students

(94)   John and Mary together spoke with 5 students

As mentioned above, *together* received an event based analysis (in e.g. Lasersohn 1995 and Kratzer (forthcoming)) (in addition to an analysis in terms of an additive measure function in Moltmann 2004)). The particle *different* has been given an event based analysis as well (Carlson 1987, Moltmann 1992). But the constraints in the domain of eventualities that these three particles should obey are not the same. For example, unlike *more$_{add}$*, neither *together* and *different* seem to be sensitive to the temporal order of the eventualities they involve. Further research should look more closely at the similarities and differences between the semantics of such particles.

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