Additivity with Events

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0. Introduction

The English particle *more* is usually discussed in the literature with respect to its comparative meaning, as in (1) and (2):

(1)   *Mary is more intelligent than John* (see e.g. Kennedy 1999, 2005)

(2)   *Mary bought more books than John* (see Hackl 2001)

 But *more* has another use, as an additive particle: Consider (3):

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

(3) is ambiguous between the well-studied comparative reading (where today John interviewed more than 3 students (e.g. 4)), and an additive reading (where today John interviewed additional students (perhaps only 1, or 2)).

Other languages use two different lexical items for these two uses *more*. E.g. Modern Hebrew uses *yoter* for the comparative and *od* for the additive, as in (4):

(4) *etmol dani ri'ayen SloSa studentim. ha-yom hu ri'ayen* **yoter /od**

Yesterday John interviewed three students. Today he interviewed more$_{comparative}$ /more$_{additive}$

This paper offers a semantic analysis of the additive particles *more* in English (*more$_{add}$* henceforth), and *od* in Hebrew. In section 1 I examine some novel observations concerning the distribution and interpretation of *more$_{add}$ / od* as in (3) and (4). In particular I show that, despite their apparent 'nominal' nature, these particles obey constraints in both the nominal and verbal domains. In section 2 I present an analysis of the data, where the main idea I develop is that through the growth of a nominal set (a set of *individuals*), nominal *od / more$_{add}$* indirectly indicates how an *eventuality* grows and develops. More precisely, I claim that nominal *od / more$_{add}$* denotes *a derived additive measure function* (cf. Krifka 1989, 1998, Moltmann 2004, Nakanishi 2007)): It expresses indirect measurement of the development and growth of the sum of eventualities (in the assertion and presupposition), by measuring the sum of individuals participating in these eventualities (using a homomorphism from events to individuals). Section 3 extends the analysis to verbal *more$_{add}$ / od,* as in *dani yaSan od / Danny slept some more*. I propose that verbal *od / more$_{add}$* denotes an additive measure function too, which can be either *derived* – using a homomorphism (measuring the run time, or path of eventualities), or *non-derived* - measuring the cardinality of eventualities directly.

Section 4 summarizes the main claims made in the paper and offers several directions for further research.

1. Basic observations and intuitions

I make the following seven observations with respect to the interpretation and distribution of nominal $more_{add}$ / od:

Observation # 1: Sentences with nominal od / $more_{add}$ seem to have two main implications: an assertion and a presupposition. For example, both the Hebrew and English sentences in (5a) have the assertion and presupposition in (5b) and (5c) (the presuppositional status of the latter is evident from its survival in e.g. the question *Did John interview today more students?*):

> (5)   a.   *etmol dani ri'ayen SloSa studentim. ha-yom hu ri'ayen od studentim*
>
> *Yesterday John interviewed three students. Today he interviewed more$_{add}$ students*
>
> b.   Assertion: John interviewed some students today
>
> c.   Presupposition: There is another occasion where John interviewed students.

Observation # 2: Nominal od / $more_{add}$ is indeed *nominal*: It is associated with a nominal predicate (which can be deleted, if mentioned in the preceding context), as in e.g. (6):

> (6)   *etmol dani axal 3 ugiyot. Ha-yom hu axal od stayim (stey ugiyot)*
>
> *Yesterday John ate three cookies. Today he ate 2 more (cookies)*

But there is a constraint here: The nominal predicate in the assertion should be present in the presupposition. For example, in the context of (7a), (7b) sounds infelicitous:

> (7)   a.   *ha-davar ha-yaxid Se-ra'inu ba-boker haya 3 zebrot.*
>
> *The only thing we saw in the morning was 3 zebras.*
>
> b.   *axar-kax rainu od kofim*
>
> *Later on we saw more monkeys*

Notice that this constraint holds even if we do not explicitly mention the nominal predicate before. For example, a strong implication of (8) is that John is a teacher:

> (8)   *meri dibra im jon. Maxar hi tedaber im od morim*
>
> *Mary spoke with John. Tomorrow she will speak with some more teachers*

Observation # 3: Unlike the nominal predicates, which should stay the same in the assertion and the presupposition of $more_{add}$ / od, the members of the nominal predicate in the assertion and presupposition should be different, so the actual nominal sets should not overlap. For example, the implication of (9) is that Mary will speak tomorrow with different students:

(9)   ha-yom dani diber im 4 studentim. maxar meri tedaber im od 4 stundetim

         Today John spoke with 4 students. Tomorrow Mary will speak with 4 more students

Observation # 4: Nominal od / $more_{add}$ can be modified by an existential quantifier or a numeral, as in (10a)) , or by other measure phrases (two liters, 2 kilos), as in (10b-c):

(10)   a.   etmol dani ri'ayen 3 studentim. ha-yom hu ri'ayen od kama / 2

                 Yesterday John interviewed 3 students. Today he interviewed some / 2 more

         b.   ba-boker dani Sata 3 liter. Axar-kax hu Sata od 2 liter

                 In the morning John drank 3 liters. Later he drank 2 liters more

         c.   kvar kaniti 3 kilo tapuxey adama. Ani ekne od 2 kilo axar kax

                 I've already bought 3 kilos of potatoes. I will buy 2 kilos more later on.

But not any measure phrase is ok here. Specifically, with some measure phrases, like 12 carat, 10 degrees, od / $more_{add}$ is infelicitous:

(11)   a.   etmil dani kana zahav 10 karat.#Ha-yom hu kana od 12 karat

                 Yesterday John bought 10 carat gold. #Today he bought 12 carat more

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

                 was spilled on the bed

Summarizing our observations so far we can see the constraints that od / $more_{add}$ has to meet all involve the nominal domain – the domain of individuals (e.g. constraints concerning the variability of the nominal predicates, the nonoverlap of the sets, the permitted measure phrases measuring the individuals). This is expected, since, after all, nominal od / $more_{add}$ seems to combine with a nominal predicate (as in e.g. more students). But what is interesting (and less expected) is that od / $more_{add}$ also has to meet constraints in the verbal domain (the domain of eventualities). The next three observations illustrate this point.

Observation # 5: Unlike the nominal predicate, the verbal predicates in the assertion and presupposition of $more_{add}$ od / can differ. But crucially, not anything goes here. If the verbal predicates do differ they should be characterized by a common, 'superset' verb (see also Tovena & Donazzan 2008 for a similar observation). This is illustrated in (12):

(12)   a.   dani afa 3 ugot la-mesiba. Meri tikne od axat

John <u>baked</u> 3 cakes for the party. Mary will <u>buy</u> one more ('prepare cakes')

    b.   *dani <u>Sama</u> 5 ciporim. Ve-az hu <u>ra'a</u> od 2*

        John <u>heard</u> 5 birds. Then he <u>saw</u> 2 more ('noticed birds')

    c.   *macati 4 mtabe'ot al ha-arets. Ve-az <u>kibalti</u> od 2 me-aba Seli*

        I <u>found</u> 4 coins on the ground. Then I <u>received</u> 2 more from my father. ('got coins')

When such a common predicate cannot be found, as in the minimally contrasting sentences in (13), *od / more$_{add}$* is much less good:

    (13)   *a.*   *dani <u>afa</u> 3 ugot la-mesiba. #Meri <u>toxal</u> od axat*

               John <u>baked</u> 3 cakes for the party. #Mary will <u>eat</u> one more

        b.   *dani <u>Sama</u> 5 ciporim. Ve-az hu <u>he'exil</u> od 2*

               John <u>heard</u> 5 birds. #Then he <u>fed</u> 2 more

        c.   *macati 4 mtabe'ot al ha-arets. Ve-az <u>ibadeti</u> od 2*

               I <u>found</u> 4 coins on the ground. #Then I <u>lost</u> 2 more

<u>Observation # 6:</u> Temporal order of eventualities with *od / more$_{add}$* matters: The eventuality in the presupposition should not occur later than the one in the assertion. This can be seen from the fact that unlike (3), repeated here, which is ambiguous between the comparative and the additive readings, the minimally contrasting (14) has a comparative reading only. It seems, then, that adding 'backwards' with *od / more$_{add}$* (e.g. from today to yesterday) is infelicitous

    (3)   *etmol dani ri'ayen SloSa studentim. ha-yom hu ri'ayen yoter / od*

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

        (Comparative / additive)

    (14)   *hayom dani ri'ayen SloSa studentim. etmol hu ri'ayen yoter / #od*

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

        (Comparative / # additive)

Notice that the presupposed eventuality need not be temporally <u>prior</u> to the asserted eventuality: it can also hold at the same time, e.g. unlike (14), (15) and (16) are felicitous under the additive reading:

    (15)   *This morning Danny interviewed 3 students in his office. At the same time Susan interviewed some more students in the library*

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

It seems, then, that *od / more_{add}* seems to require that there is some eventuality, which is not later than the asserted eventuality, and which involves different members of the same nominal predicates.

Observation # 7: The use of nominal *od / more_{add}* also indicates ***development*** of an eventuality. Consider, for example (17) and (18):

> *(17)*   *#afiti (3) ugot la-mesiba Sel ha-ben Seli. iSa Se-ani makira be-nu York afta od ugot*
>
>   *la- mesiba Sel ha-ben Sela*
>
>   *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* (Comparative / # additive)

> *(18)*   *# le-dani yeS 3 yeladim.Le-meri is od*
>
>   *John has three children. Mary has more* (Comparative / # additive)

Why are *od / more_{add}* infelicitous in(17) and (18)? Intuitively, not any two unrelated eventualities can be 'added' with *od / more_{add}*. Specifically, summing the asserted and presupposed eventualities should lead to a 'more developed' eventuality. In (17) and (18) this does not happen: If we sum me and the New-York woman's baking cakes, or John and Mary's having children - we end up with plural eventualities, with more participants (cakes, children), but these summed eventualities cannot be considered 'more developed'.

What supports this intuition is the fact that if we create contexts where the summed eventualities *are* considered 'more developed' the additive reading is much better, as in (17') and (18'):

> *(17')*   (Context: Some rich man suggests donating a certain sum of money for poor children
>
>   for every birthday cake baked in the world)
>
>   *afiti (3) ugot la-mesiba Sel ha-ben Seli. iSa Se-ani makira be-nu York afta od ugot*
>
>   *la- mesiba Sel ha-ben Sela*
>
>   *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* (additive reading possible)

> *(18')*   (Context: we need as many children to make a party activity successful):
>
>   *le-dani yeS 3 yeladim. le-meri is od*
>
>   *John has three children. Mary has more.* (additive reading possible)

In these cases, the summed eventualities *can* be considered 'more developed'. We can use the 'conditional comparative' construction (or 'comparative correlative') as a test, as in (19):

> *(19)*   *a.*   *The more cakes are baked, the more money for poor children we have.*
>
>   *b.*   *The more children there are, the more successful the party is.*

Based on Beck's 1997 modalized approach to conditional comparatives I will assume the following characterization of 'a more developed' eventuality:

(20)   *An event e is 'more developed' than an event e' (e $>_{developed}$ e') , iff*

(a) *In w_0 e has a higher number of participants than e'*

(b) *The higher number of participants of e leads to or correlates with a higher degree measuring an eventuality on another scale* (e.g. the growth of the number of cakes baked correlates with / leads to the growth of the sum of money we have for poor children)

Notice that, phrased this way, this 'more developed' constraint can account for the constraint on variability of verbal predicates before (*John baked 3 cakes for the party. Mary will buy one more / #Mary will eat one more*): In the first case we can say "the more cakes are prepared, the more successful the party is". In the second case no reasonable correlation with another scale is made, and no reasonable comparative correlative can be use.

To summarize our observations so far, we observed that nominal *more$_{add}$* has a double nature: it is subjects to constraints in both the nominal and the verbal domains (More specifically, it seems to express summing of both individuals and eventualities in the assertion and presupposition). In addition to capture each of the constraints above, then, the main challenge we are facing is to find a way to capture this double nature. The next section suggests such a way.

2. Analysis

The main intuition I will try to develop in this section is that through the addition and growth of the nominal set (the set of individuals) nominal *od / more$_{add}$* expresses addition, development and growth in the domain of eventualities. More precisely, I will claim that nominal *od / more$_{add}$* denotes a *derived additive measure function* on eventualities.

2.1 Some background:

To understand what a ' derived additive measure function' is, let us first give some separate background concerning additive measure functions, and derived measure functions.

An *additive* measure function is such that if f(x)=d_1 and f(y)=d_2 then f(x+y)= d_1+d_2 (e.g. Krifka 1998). Such measure functions are used, for example, in Motlmann's 2004 analysis of adnominal *together*, as in (21), which says that adding the wage of John per year plus the wage of Mary per year amounts to 100,000 $:

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

Intuitively, nominal *od / more$_{add}$* has an additive component too. Specifically its function is to add measurements of individuals. For example, (22) says that the measurement of the cookies that John ate is 4+3=7:

>   *(22)   John ate 4 cookies in the morning, and 3 more in the afternoon*

This additivity component, however, is not enough to capture the fact observed above, that *od / more$_{add}$* is subject to constraints in the eventuality domain, and seems to sum eventualities as well. To capture that we look at the notion of *derived* measure functions (Krifka 1998, Nakanishi 2007).

First, following, Schwarzschild 2002 and Nakanishi 2007 I take a *non-derived* measure function (μ) to be a nonevent measurement scheme, like μ:cardinality, μ: spatial length, μ:volume, etc. Such a function is used, for example, in Nakanishi's 2007 interpretation of (23a), as in (23b) ("the set of individuals in 'rope' whose measurement (here spatial length) is 2 meters"):

>   *(23)   a.   two meters of rope*
>
>   *b. λx_e. rope(x) $\wedge$ μ (x) = 2 meters (μ:spatial length)*

In contrast, a *derived* measure function (μ') is a function which indirectly measures elements in a certain domain by measuring elements in another domain, which is homomorphically related to the first domain. Such functions are expressed, for example, by adverbial measure phrases as in (24), measuring spatial length and (25), measuring temporal length:

>   *(24)   John walked <u>two meters</u>. –*
>
>   *(25)   John walked <u>for 10 minutes</u> –*

Krifka 1989, 1998 claims that with such expressions do not measure the events directly. This is because events themselves do not have spatial length, only their spatial paths do. Similarly, events themselves do not have temporal length, only their run time do. To get from events to run time or from events to paths, etc. We use a *homomorphism*, *h*. Thus, derived measure functions - μ' – *indirectly* measure events by measuring the range of a homomorphism on events : *$\mu(h(e))$*. For example, in (24) and (25) the measure functions measure the ranges of the homomorphisms from events to their spatial path or their run time, respectively.

Nakanishi 2007, claims that derived measure functions are also relevant for the interpretation of split measure phrases in Japanese. Such measure phrases seem to measure individuals, but they are also subject to constraints in the domain of eventualities (similarly to what observed with the nominal *od / more$_{add}$*). Hence, such measure phrases also involve *derived* measure functions: They *indirectly* measure eventualities, by measuring the range of a homomorphism from events to their individual participants. For example, the interpretation of the Japanese Split measure construction in (26) is (27):

(26)   *Gakusei-ga ie-ni san-nin kaet-ta (koto)*

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

         'Three students went home.'

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

         "There is a (plural) walking home eventuality, whose agent is boys, and the

         cardinality of the individuals participating in this eventuality is 3 individuals".

2.2 Back to nominal *od / more_{add}*

We saw, then that Moltmann 2004 takes adnominal *together* to involve an ADDITIVE measure function, and that Nakanishi 2007 takes split measure phrases in Japanese to involve a DERIVED measure function. I will now integrate these two ideas and claim that Nominal *od / more_{add}* involves a DERIVED ADDITIVE measure function.

More specifically, I follow Schwartzschild 2002 and Nakanishi 2007 in assuming that μ (or μ') is a nonovert measure function (expressing 'cardinality', 'volume', 'temporal length', etc.), which first combines with a degree phrase, type d, and then with the measured element. My suggestion is that nominal *od /more_{add}* is an *overt* lexicalization of a derived additive measure function - μ': which first combines with a degree phrase, type d (e.g. *3* or *3 kilos*), then with a nominal predicate, type <e,t> (e.g. *boys / potatoes)*, and then with a verbal relation (type <e, <v,t>>> , where *v* is the type of eventualities). Hence the type of nominal *od / more_{add}* is **<d,< <<e,t>, <<e,<v,t>>, <v,t>>>>,** and its denotation is as in (28):

(28) **Nominal *od / more_{add}*** $\lambda d_1. \lambda Q_{<e,t>}.\lambda P_{1<e,<v,t>>}.\lambda e_{1v}.$ $[\exists x\ [Q(x) \wedge P_1(x)(e_1) \wedge \mu(h(e_1)) =$ $d_1 \wedge \underline{\exists\ e_2, P_2, d_2, y\ [P_2(y)\ (e_2) \wedge Q(y) \wedge \mu(h(e_2)) = d_2 \wedge \tau(e_2) \leq \tau(e_1)\ \wedge \exists\ e_3, P_3\ z\ *P_3\ (z)}$ $\underline{(e_3) \wedge e_3 = e_1 + e_2 \wedge Q(z) \wedge z=x+y \wedge \mu(h(e_3)) = d_1 + d_2 \wedge e_3 >_{developed} e_2]}\ ]$

In (28) **h** is a homomorphism from eventualities to individuals, the asserted eventuality is e_1, and there are two presuppositions (underlined): the first concerns the presupposed eventuality: e_2, and the second concerns the sum of e_1 and e_2 ($e_1 + e_2$), i.e. e_3: To illustrate how this definition works, consider the compositional derivation of (29), in (30) (to simplify the derivation I add the presupposition at the beginning and end of the derivation only):

(29)   *(4 yeladim Saru). Od 4 yeladim rakdu*

(30) Derivation of *Three more_{add} boys danced***:**

$3_d \rightarrow$ 3 individuals

$more_{<d,<<<e,t>,<<e,<v,t>>,<v,t>>>>>} \rightarrow \lambda d_1. \lambda Q_{<e,t>}.\lambda P_{1<e,<v,t>>}.\lambda e_{1v}. [\exists x [Q(x) \wedge P_1(x)(e_1) \wedge$
$\mu(h(e_1)) = d \wedge \exists e_2, P_2, d_2, y [P_2(y)(e_2) \wedge Q(y) \wedge \mu(h(e_2)) = d_2 \wedge \tau(e_2) \leq \tau(e_1) \wedge \exists e_3, P_3 z$
$*P_3(z)(e_3) \wedge e_3 = e_1 + e_2 \wedge Q(z) \wedge z=x+y \wedge \mu(h(e_3)) = d_1 + d_2 \wedge e_3 \geq_{developed} e_2]]$

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

$3\ more\ boys_{<<e,<v,t>>,<v,t>>} \rightarrow \lambda P_{1<e,<v,t>>}.\lambda e_{1v}. [\exists x [*boy(x) \wedge P_1(x)(e_1) \wedge \mu(h(e_1)) = 3$
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** (Rothstein 2001))

$3\ more\ boys\ danced_{<v,t>} \rightarrow \lambda e_{1v}. [\exists x [*boy(x) \wedge dance(e_1) \wedge Agent(e_1) = x \wedge \mu(h(e_1)) = 3$
individuals]]

$3\ more\ boys\ danced_t \rightarrow \exists e_1 \exists x [student(x) \wedge dance(e_1) \wedge Agent(e_1) = x \wedge \mu(h(e_1)) = 3$
individuals $\wedge \exists e_2, P_2, d_2, y [P_2(y)(e_2) \wedge *boy(y) \wedge \mu(h(e_2)) = d_2 \wedge \tau(e_2) \leq \tau(e_1) \wedge \exists e_3, P_3 z$
$*P_3(z)(e_3) \wedge e_3 = e_1 + e_2 \wedge *boy(z) \wedge z=x+y \wedge \mu(h(e_3)) = 3$ individuals $+ d_2 \wedge e_3 \geq_{developed} e_2]]$

In prose: (29) asserts that there is a dancing eventuality, e_1, whose agent is a plural individual boy, with cardinality of 3 individuals. It has the following two presuppositions: **(A)** There is an eventuality e_2, in the denotation of a verbal predicate P_2 (not necessarily *dance'*), whose run time is prior or equal to that of e_1, and it has a plural individual boy as an agent. The cardinality of this e_2 event is some degree d_2, i.e. some number of individuals. **(B)** There is an eventuality e_3, which is the sum of e_1 and e_2, in the denotation of a verbal predicate P_3 (e.g. *perform*). The agent of e_3 is the sum of the agents of e_1 and e_2 in the denotation of *boy*. The cardinality of the agent of e_3 is the sum of the cardinality of the agent of e_1, plus the cardinality of the agent of e_2, i.e. 2 individuals+d_2, and e_3 is more developed than e_2

2.3 Three Consequences of the analysis:

We can now explain the contrast in measure phrases compatible with *od / more_{add}*, illustrated again in (31):

(31)   a.   *3 Liters of water spilled on the carpet. 2 liters more was spilled on the bed.*

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

The distinction between measure phrases like *3 kilos / 3 liters* as opposed to *12 carat / 10 degrees Celsius* has been already shown to play a role in the felicity of pseudo-partitive constructions (Krifka 1989, 1998 Schwartzschild 2002), as in (32):

> (32)　a. 3 liters of water / 3 kilos of potatoes
>
> 　　　b. #30 degree Celsius of water / # 12 carat of gold

According to Krifka 1989, 1998 *3 liters* is an *additive* measure phrase, whereas *20 degree Celsius* is not additive:[1] for example 3 liters of water + 2 liters of water = 5 liters of water, but 20 degree water + 10 degree water ≠ 30 degree water.

The contrast in (31) follows from the additivity requirement in the presupposition of *more*$_{add}$. With phrases like '30 degree Celsius' the additive component in the presupposition of *more*$_{add}$ ($\mu(h(e_3)) = d_1 + d_2$) cannot be met, the presupposition fails and *more*$_{add}$ is infelicitous. Notice also that the additivity is indeed presupposed and is not part of the assertion (unlike Thomas' 2009 view), since we get the same kind of infelicity under negation, as in (33) (cf. Nakanishi 2007 for a similar argument):

> (33)　# I didn't drink 10 degree Celsius more

A second consequence of the definition concerns the observation above, that an implication of a sentence like (9), repeated here, is that Mary will speak tomorrow with different students:

> (9)　*Today John spoke with 4 students. Tomorrow Mary will speak with 3 more students*

This implication follows from the additivity of the measure function as well. Theories like Krifka 1998 and Moltmann 2004 already took nonoverlap as a precondition on additivity. In our case, for example, if even one of the students that Mary will speak with, was also a student that John spoke with, then the number of students participating in the summed eventuality e_3 is not 4+3=7. I.e. the additivity presupposition fails.

Finally, the claim that *od / more*$_{add}$ always denotes a (derived and additive) measure function, and combines with a degree phrase seems problematic when we consider sentences like (34), where there is no measure phrase, and we don't know anything about the precise degree measuring the number of individuals participating in the interviewing eventuality:

> (34)　*etmol dani riayen kama studentim. hayom hu riayen od (kama)*
>
> 　　　*Yesterday John interviewed some students. Today he interviewed (some) more*$_{add}$

I propose that in such cases the degree argument that *more*$_{add}$ combines with is bound by existential closure, or by *some*. That is, (34) asserts that there is an eventuality, e_1 where John spoke with a certain, d_1 number of students, and presupposes (roughly) that there is another eventuality, e_2,

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[1] Schwartzschild 2002 calls this the monotonic / non-monotonic distinction.

involving a certain, d_2, number of students, and that the number of students involved in the summed (and more developed) eventuality e_3 is the sum of d_1 and d_2.

The general lesson to learn from such cases is that the goal of nominal *od / more*$_{add}$ is to indicate that the development of the summed eventuality depends on the sum of degrees measuring the participants in its subevents. Crucially, this goal is achieved even if we do not know what the actual summed degree is, i.e. even if we do not know what the exact value of the additive measure function is. The main thing is the dependency on the sum of degrees.

3. Extending the analysis to verbal *more*$_{add}$

The analysis of 'nominal' *od / more*$_{add}$ above can be extended now to verbal *od / more*$_{add}$ as in (35):

> *(35) a.   meri raca 4 kilometer. Axar kax hi raca od 3 kilometer*
>
> *Mary ran 4 kilometers. Later she ran 3 kilometers more*
>
> *b.   ba-boker meri yaSna 4 Saot. Axar ha-cohorayim hi yaSna od Saatayim*
>
> *In the morning Mary slept 4 hours. In the afternoon she slept 2 hours more*
>
> *c.   meri hitxila le-vasel et ha-of. Jon biSel oto od kcat*
>
> *Mary started cooking the chicken. John cooked it a bit more.*

I suggest that, as with nominal *od / more*$_{add}$ here too we have an asserted and a presupposed eventuality (e_1 and e_2). In addition, here too the summing of e_1 and e_2 must lead to a 'more developed' eventuality (e_3). As a support for this latter point consider the felicity contrasts in (36)-(38):

> *(36)   ba-boker rina yaSna kcat. ba-erev hi yasna od (kcat)*
>
> *In the morning Mary slept a bit. In the evening she slept some more*
>
> *(37)   # ba-boker rina yaSna kcat. ba-erev sara yasna od (kcat)*
>
> *#In the morning Mary slept a bit. In the evening Sara slept some more*
>
> *(38)   rina raca 10 dakot. Axar kax sara raca od kcat*
>
> *Mary ran for 10 minutes. Then Sara ran some more*

Sentence (36) is felicitous since summing the two sleeping eventualities and their run time can lead to a more developed eventualtity (where we can use a comparative correlative, e.g. "*The longer Mary sleeps, the better she feels later on*"). In contrast, (37) is odd: Summing Mary's and Sara's sleeping eventualities, and their run times, only leads to a plural sleeping eventuality, not to a more developed one. (37) is again felicitous, since although we have two different agents, we can get again a more developed eventuality (e.g. assuming that Mary and Sara participate in a relay race,

and indeed we can use the comparative correlative: *The longer Mary and Sara run, the better are the chances of the group to win*).

Thus, just *like* nominal *od / more_{add},* the verbal *od / more_{add}* also expresses derived additive measurement of a 'more developed' eventuality. But, *unlike* nominal *od / more_{add}*, here other dimensions of the eventuality are measured, and other homomorphisms are used, i.e. we do not measure the individuals participating in the event. In *I ran 3 kilometers more* we measure spatial length of the spatial path of the event. In *I slept 2 hours more* we measure temporal length of the run time of the event, and in *John cooked the chicken a bit more* we measure the degree to which the chicken is cooked, i.e. the range of a homomorphism from events to their abstract directed path (e.g. not cooked-cooked) (see Krifka 1998).

As for the type of verbal *more_{add} / od,* we saw before that [nominal *more_{add} / od* + the measure phrase] combines first with a nominal predicate type $<e,t>$ and then with a relation between individuals and events (type $<e, <v,t>>$). Hence its type was defined as **$<d,< <e,t>, <<e,<v,t>>, <v,t>>>>$**. In contrast, [verbal *more_{add}* + the degree phrase] does not combine with a nominal predicate, but directly with the verbal predicate, type $<v,t>$. Hence its type will be **$<d, <<v,t>, <v,t>>>$.**

This difference leads to a prediction: The fact that the denotation of nominal *more_{add}* , necessarily involves a nominal predicate ($<e,t>$) means that it necessarily denotes a *derived* (indirect) additive measure function – since it measures the individual participants of the eventuality (in the denotation of the nominal predicate). But since [verbal *more_{add}* + the degree phrase] modifies the verbal predicate directly, we can predict that it can also measure it directly. That this prediction is indeed borne out can be seen from the existence of sentences like (39):

(39)   *etmol dani rac 3 pe'amim. ha-yom hu rac od pa'amayim*
            Yesterday John ran 3 times. Today he ran twice more

In such sentences the measure function is *not* derived: it does not measure the range of a homomorphism from eventualities to other domains (to run time, spatial path, etc.). Instead, it indicates direct measurement of the cardinality of the summed eventuality.

We can also predict that with some verbs, when there is no explicit measure phrase, we get potential ambiguities. (39) is a case like this:

(39)   *halaxti od*
            I walked some more:

In (39) we can measure length of run time (e.g. *I walked 3 hours. Later on I walked some more*), length of spatial path (e.g. *I walked 3 kilometers and then I walked some more*), and even cardinality of events: (e.g. *Yesterday I walked 3 times. Today I walked some more*).[2]

    With other verbs, which have less implicit arguments, and less available defined homomorphisms, we can expect less possibilities, For example in (40) we can clearly measure time, but not spatial path (since *sleep* does not have a spatial path arguments):

> *(40)   yaSanti od*
>
>   *I slept some more*

Given this discussion, the denotation of verbal *od / more$_{add}$* is as in (41):

> (41) **Verbal *more$_{add}$*** : $\lambda d_1. \lambda P_{1<v,t>}.\lambda e_{1v}. [P_1(e_1) \wedge \mu(e_1) = d_1 \wedge \exists e_2, P_2, d_2 [P_2(e_2) \wedge \mu(e_2) = d_2 \wedge \tau(e_2) \leq \tau(e_1) \wedge \exists e_3, P_3 *P_3 (e_3) \wedge e_3 = e_1+e_2 \wedge e_3 >_{developed} e_2 \wedge \mu(e_3) = d_1+ d_2]$] (Where μ can be a **derived** measure function, i.e. $\mu' (\mu(h(e))$, or a **non-derived** function)

4. Summary

We saw, then, that both nominal and verbal *od/ more$_{add}$* express additive measurement in the domain of eventualities. More precisely: both are overt realization of measure functions in the eventuality domain, which trigger presuppositions of additivity:

  In the case of *nominal od /more$_{add}$*, a nominal predicate (type <e,t>) is always involved, and the type of the additive measure function is <d,< <<e,t>, <<e,<v,t>>, <v,t>>>>>. Hence this measure function has to be *derived*: That is, it indirectly measures the growth and development of a summed eventuality by measuring the individuals participating in its subevents (using a homomorphism). In contrast, in the case of *verbal od / more$_{add}$* the type of function is <d, <<v,t>, <v,t>>>**,** hence the function can be *derived* or *nonderived*: It can indirectly measure the summed eventuality by measuring the run time or path of the asserted and presupposed subevents (using homomorphisms), or it can directly measuring the cardinality of these subevents (without using any homomorphism).

      The paper raises several directions for further research. First, since the English *more* can express both comparison and eventuality-based additivity, and since both operations have to do with measurement and degrees, one should attempt to find a unified analysis for both readings. Second, in Hebrew (see Greenberg, 2008, 2009B) and in other languages like German (see Umbach 2008),

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-   [2] Similar ambiguities and constraints are reported in Nakanishi 2004, w.r.t. to the Japanese *sugiru* ('too much / too many').

Italian, French and Chinese (see Tovena & Donazzan 2008), the particle expressing additive measurement on eventualities can also express aspectual additivity, which in English is expressed with the word *still*. (42) is an example from Hebrew showing the two uses:

(42)   *a.*   ba-boker dani   yaSan **od**

"In the morning Danny slept some more$_{add}$

b.   ba-boker dani **od** yaSan

"In the morning Danny was still asleep"

In fact, this is seen in English as well, since the negative counterpart of the aspectual additive particle *still,* is the NPI any**more**, as in (43):

(43)   *John is not asleep any**more**.*

There is quite a lot of studies suggesting semantic analyses of *still* its crosslinguistic counterparts (see e.g. König 1977, Mittwoch 1993, Löbner 1989, Krifka 2000, Michaelis 1993, van der Auwera 1993, Ippolito 2007, Greenberg 2009A). Further research should attempt to define a unified semantic operation for both uses in (42), which will be compatible with what is known about aspectual additivity, as in (42b), and derive the differences between the two readings from their different syntactic position (see Tovena & Donazzan 2008 for a preliminary suggestion).

Finally, *od / more$_{add}$* seems similar to particles like *different*, *additional,* and *together*:

(44)   *a.*   *Mary spoke with 3 students. John spoke with 2 more$_{add}$ students*

b.   *Mary spoke with 3 students. John spoke with 2 different students*

c.   *Mary spoke with 3 students. John spoke with 2 additional students*

c.   *John and Mary together spoke with 5 students*

Both *together* and *different* received an event based analysis (in e.g. Lasersohn 1995 and Kratzer (forthcoming)), and in Carlson 1987, Moltmann 1992, respectively). On the other hand, the constraints 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:

(45)   *a.*   *#Today Mary spoke with 3 students. Yesterday John spoke with 2 more$_{add}$ students*

b.   *Today Mary spoke with 3 students. Yesterday John spoke with 2 different students*

c.   *John and Mary together spoke with 5 students this week* (the order doesn't matter).

Further research should attempt to examine more closely the similarities and differences between these particles

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