Aspectual operators: Temporality, evaluativity, and polarity sensitivity

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Abstract The aspectual operator *still* features interesting properties related to temporality, evaluativity, and polarity sensitivity. This is not unique to *still* but rather true of aspectual operators more generally—very similar properties can be found in *already*, *anymore*, and *yet*. And it is not unique to aspectual operators either—very similar facts have been reported for disjunction, indefinites, minimizers, or numerals. This paper starts from Beck (2020)'s proposal for temporality in *still*; generalizes it to *already*, *anymore*, and *yet*; and then generalizes it even further to capture evaluativity and, partially, polarity sensitivity also, drawing on Mihoc (2021)'s proposal for similar properties in superlative-modified numerals, which in turn draws on previous insights about disjunction, indefinites, minimizers, and other numerals. The result is a new solution to temporality, evaluativity and, partially, polarity sensitivity in *still* that unifies it not just with other aspectual operators but also with disjunction, indefinites, minimizers, and numerals.

Keywords: *still*; *anymore*; *already*; *yet*; temporality; evaluativity; polarity sensitivity; extents; alternatives; exhaustification

1 Introduction

The aspectual operators *already*, *still*, *anymore*, and *yet* each exhibit an interesting set of patterns, and in these patterns they are strikingly similar. First, they resist / require scope under negation, being all either PPIs or NPIs, and thus exhibiting what we may call 'polarity sensitivity 1' (POL1). Second, they all imply: (a) That the positive/negative property they combine with (*be asleep/not be asleep*) is true now; this is what we will call the 'current state' inference (CURR). (b) That the property might not be true at an earlier/later time; this is what we will call the 'other state' inference (OTH). (c) That the property is also true at a later/earlier time; this is what we will call the 'continuity' inference (CONT). And: (d) That the property holds earlier/later than expected; this is what we will call the 'evaluativity' inference (EVAL). Third, they are all degraded in combination with certain predicates, e.g., either *be young* or *be old*, exhibiting what I will argue is a second form of polarity sensitivity, 'polarity sensitivity 2' (POL2).

(1) a. Tim ✓is / #isn't **still** asleep. (POL1)
b. Tim is **still** asleep.
(i) asleep now (CURR)
(ii) not asleep later (OTH)
(iii) also asleep earlier (CONT)
(iv) asleep later than expected (EVAL)
c. Tim is **still** ✓young / #old. (POL2)

(2) a. Tim ✓is / #isn't **already** asleep. (POL1)
b. Tim is **already** asleep.
(i) asleep now (CURR)
(ii) not asleep earlier (OTH)
(iii) also asleep later (CONT)
(iv) asleep earlier than expected (EVAL)
c. Tim is **already** #young / ✓old. (POL2)

(3) a. Tim #is / ✓isn't asleep **anymore**. (POL1)
b. Tim isn't asleep **anymore**.
(i) not asleep now (CURR)
(ii) asleep earlier (OTH)
(iii) also not asleep later (CONT)
(iv) not-asleep earlier than expected (EVAL)
c. Tim isn't ✓young / #old **anymore**. (POL2)

(4) a. Tim #is / ✓isn't asleep **yet**. (POL1)
b. Tim isn't asleep **yet**.
(i) not asleep now (CURR)
(ii) asleep later (OTH)
(iii) also not asleep earlier (CONT)
(iv) not-asleep later than expected (EVAL)
c. Tim isn't #young / ✓old **yet**. (POL2)

There is a rich literature on these aspectual operators.[1] However, from the perspective of the phenomena mentioned above, the various proposals suffer from multiple limitations: They usually engage with CURR, OTH, and CONT, but rarely with EVAL,[2] and almost never with POL2 or POL1.[3] And they usually engaged with just one operator, and the analysis doesn't necessarily translate to the rest.

These limitations become even more apparent when we consider the following: These phenomena don't occur just in aspectual operators. Similar (sets of) patterns have been reported in categories as diverse as disjunction,[4] indefinites,[5] minimizers,[6] and bare,

[1] For example, Horn (1970), Ladusaw (1980: Ch. 5), Löbner (1989), Michaelis (1992), Michaelis (1993), Mittwoch (1993), Israel (1997), Löbner (1999), Krifka (2000), Klein (2007), Ippolito (2007), Umbach (2012), Zimmermann (2018), Thomas (2018), Beck (2020).

[2] E.g., in*still*, it is treated either as going back to a separate meaning, cf., e.g., Ippolito 2007, or as an afterthought orthogonal to the meaning of *still*, cf. e.g. Beck 2020.

[3] In the literature focused on aspectual operators, the only exception that I am aware of is Israel (1997). In the literature focused on POL1, the only tangential discussion that I am aware of are a few lines on *in weeks* in Chierchia (2013).

[4] For POL1-PPI-hood in disjunction, see Spector (2014) or Nicolae (2017).

[5] For POL1-NPI/PPI-hood in indefinites, see Szabolcsi (2004); Krifka (1995); Chierchia (2013), among many others. For POL2 in indefinites, see Cohen & Krifka (2014): *If you eat **some** spinach, I will ✓give you $10 / #whip you* and *If you eat **any** spinach, I will #give you $10 / ✓whip you* (p. 77).

[6] For POL1-NPI-hood in minimizers see Chierchia (2013); Crnič (2011; 2012), among many others. For POL2 in minimizers, see, e.g., Cohen & Krifka (2014), citing Regine Eckardt (p.c.): *If you budge an inch, I will ✓kill / #thank you* (p. 77). Or Crnič (2011): *Everyone that **lifted a finger** to help ✓was rewarded / ?? was wearing blue jeans* (p. 49).

comparative-modified, and superlative-modified numerals[7] also.[8] (Just that in those categories what we have so far labeled 'OTH' is more commonly known as 'scalar implicature'.)

(5) a. Tim ✓a dormi / #n'a pas dormi ici ou là. (POL1)
Tim slept / didn't sleep here or there
b. Tim slept here or there.
(i) not in both places (OTH)

(6) a. Tim ✓got / #didn't get **some** sleep. (POL1)
b. Tim got **some** sleep.
(i) not a lot (OTH)
c. If Tim got **some** sleep, he must be ✓(well) rested / #tired.

(7) a. Tim #slept / ✓didn't sleep **a wink**. (POL1)
b. If you slept **a wink** last night, you're #admitted / ✓disqualified. (POL2)

(8) Tim slept 3 hours.
a. slept 3 (an effect similar to CURR)
b. didn't sleep 4 or more (OTH)

(9) a. Tim ✓slept / #didn't sleep **no more than 3** hours. (POL1)
b. Tim slept **no more than 3 hours**.
(i) it is not the case that he slept no more than 2 (OTH)
(ii) that's little! (EVAL)
c. If Tim slept no more than 3 hours, he must be #(well) rested / ✓tired. (POL2)

(10) a. (i) Tim ✓slept / #didn't sleep **at least 3 hours.** (POL1)
(ii) Tim ✓slept / #didn't sleep **at most 3 hours**. (POL1)
b. (i) Tim slept **at least 3 hours**.
he didn't sleep, e.g., at least 5 (OTH)
that's many! (EVAL)
(ii) Tim slept **at most 5 hours**.
he didn't sleep, e.g., at most 3 (OTH)
that's few! (EVAL)
c. (i) If Tim slept **at least 3** hours, he must be ✓(well) rested / #tired. (POL2)
(ii) If Tim slept **at most 3** hours, he must be #(well) rested / ✓tired. (POL2)

In this paper I argue that the co-occurrence of this set of phenomena in even just one of the items mentioned above calls for an integrated solution; that their recurrence across many items of the same category calls for a unified approach; and that their recurrence across items of very different categories calls for a very general approach. The goal of this paper is to trace out the lines of such an integrated, unified, and general approach.

In §2 I go over a recent presupposition + alternatives-and-exhaustification solution by Beck (2020) that addresses CURR, OTH, and CONT in *still*; discuss its possible extension to the other aspectual operators also; and outline its limitations for both—recurring stipulations for CURR, OTH, and CONT, and no solution for EVAL, POL2, or POL1. In §3 I go

[7] For EVAL in *no Adj-er* comparatives, see Nouwen (2008) (who cites Jespersen 1949, 1966, who cites Stoffel 1894). For POL1-PPI-hood in superlative-modified numerals, see Geurts & Nouwen (2007); Spector (2014; 2015); Cohen & Krifka (2014); Mihoc (2020). For EVAL in superlative-modified numerals, see Mihoc (2021). For POL2 in superlative-modified numerals, see Cohen & Krifka (2014); Mihoc (2021). For experimental verification of both, see Mihoc & Davidson (2021).

[8] Many of these categories have been reported to carry an ignorance (IG) effect as well. We will put it aside for now, though we will return to it briefly later.

over a recent alternatives-and-exhaustification solution by Mihoc (2021) for superlative-modified numerals that captures all the phenomena in a unified way, using insights from the literature on disjunction, indefinites, and especially minimizers. In §4 I present the main contribution of this paper—a new alternatives-and-exhaustification solution to aspectual operators using lessons from both Beck (2020) and Mihoc (2021). The proposal concretely offers an integrated, unified, and general solution for CURR and OTH, CONT, EVAL, and POL2 in aspectual operators, and also the beginnings of a similar solution for POL1. In §5 I present the conclusions and also discuss some open issues.

2 An existing solution for aspectual operators

In this section we will discuss an existing proposal by Beck (2020) for *still*; its possible extension to the remaining aspectual operators *already*, *anymore*, and *yet*; but also its limitations for all.

Beck aims to unify the various shared uses of German *noch* and English *still*. Among other things, it redefines the state-of-the-art for the temporal uses of *still*. However, as I will argue, the solutions for CURR, OTH, and CONT suffer from certain issues; these issues are exposed even more starkly when we consider the *already*, *anymore*, and *yet* also; and there is no solution for and EVAL, POL2, or POL1.

More concretely, Beck proposes that aspectual *still* has the meaning in (11). (For a detailed composition tree, see Figure 1.) Based on this, a simple utterance such as *It is still raining* winds up with the truth conditions in (12a), capturing CURR. Because of the presence of the scalar element t, Beck argues that it also winds up with the implicature in (12b), capturing OTH.[9] Finally, because of the presupposition in the meaning of *still*, it also winds up with the presupposition in (12c), capturing CONT. (Here and going forward: $\prec$ / $\succ$ = 'is immediately before/after'; t_0 = 'utterance time' / 'now'; t_{-1} = 'time (immediately) before now'; and t_{+1}' = 'time (immediately) after now'.)

(11) $[\![\text{still}]\!] = \lambda t_i^* . \lambda t_i . \lambda P_{\langle i,t\rangle} : t^* \prec t \wedge P(t^*).\ P(t)$

(12) [[It is still raining]]

a. $\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$
raining now (CURR)

b. $\neg\exists e[t_{+1} \subseteq \tau(e) \wedge \text{rain}(e)]$
not raining later (OTH)

c. $\exists e[t_{-1} \subseteq \tau(e) \wedge \text{rain}(e)]$
also raining earlier (CONT)

This proposal captures CURR-OTH-CONT in *still*.

Moreover, although Beck doesn't state so, playing with similar pieces seems to give us a story for *already* also—we just need to reverse the direction of OTH and CONT by replacing $t_{+/-1}$ with $t_{-/+1}$.

(13) $[\![\text{already}]\!] = \lambda t_i^* . \lambda t_i . \lambda P_{\langle i,t\rangle} : t^* \succ t \wedge P(t^*).\ P(t)$ ($\succ$ = 'is immediately after')

(14) [[It is already raining]]

a. $\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$
raining now (CURR)

[9] Beck also invokes a weak *presupposition* about the future. I am not convinced that that is needed. Unfortunately, I won't be able to discuss this any further in this paper.

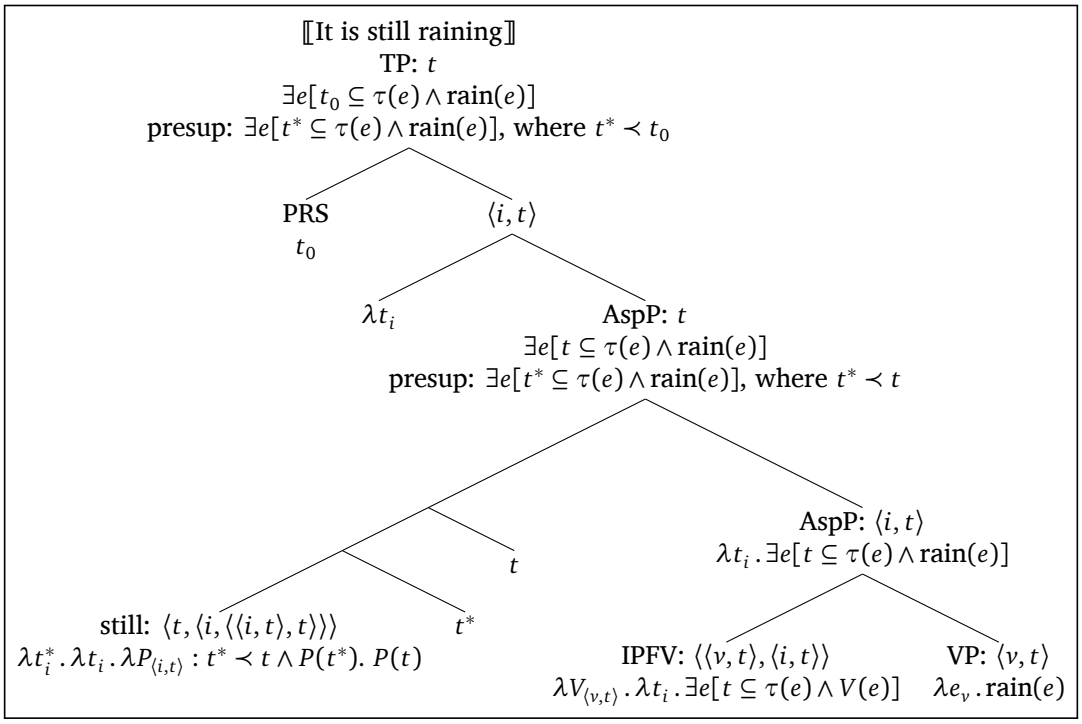


Figure 1: *Still* according to Beck (2020).

b. $\neg\exists e[t_{-1} \subseteq \tau(e) \wedge \text{rain}(e)]$
not raining earlier (OTH)

c. $\exists e[t_{+1} \subseteq \tau(e) \wedge \text{rain}(e)]$
also raining later (CONT)

And, in fact, playing with this gives us a story for *anymore* also—we just need to add a negation into the property condition in the presupposition:

(15) $\llbracket\text{anymore}\rrbracket = \lambda t_i^* . \lambda t_i . \lambda P_{\langle i,t\rangle} : t^* \prec t \wedge \neg P(t^*).\ P(t)$

(16) ⟦It isn't raining anymore⟧

a. $\neg\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$
not raining now (CURR)

b. $\neg\neg\exists e[t_{-1} \subseteq \tau(e) \wedge \text{rain}(e)]$
raining earlier (OTH)

c. $\neg\exists e[t_{+1} \subseteq \tau(e) \wedge \text{rain}(e)]$
also not raining later (CONT)

And the same game gives us a solution for *yet* as well:

(17) $\llbracket\text{yet}\rrbracket = \lambda t_i^* . \lambda t_i . \lambda P_{\langle i,t\rangle} : t^* \succ t \wedge \neg P(t^*).\ P(t)$

(18) ⟦It isn't raining yet⟧

a. $\neg\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$
not raining now (CURR)

b. $\neg\neg\exists e[t_{+1} \subseteq \tau(e) \wedge \text{rain}(e)]$
raining later (OTH)

c. $\neg\exists e[t_{-1} \subseteq \tau(e) \wedge \text{rain}(e)]$
also not raining earlier (CONT)

However, although we seem to obtain the desired results, I will argue that these come at a cost, both in the case of Beck's *still* as well as in the case of our Beck-style *already*, *anymore*, and *yet*.

The first potential issue comes from CURR. Due to their suppletive status, it is natural to assume that *still-anymore* and *already-yet* are pairwise truth-conditionally equivalent (see, e.g., Israel 1997). However, on the meanings provided above these operators are *all* truth-conditionally equivalent.

The second potential issue concerns CURR in interaction with OTH. On Beck's meaning for *still*, it yields truth conditions that simply assert that some event is true at t_0. Beck notes that t_0 belongs to a scale of times, and this naturally activates scalar alternatives based on other times. However, note that the truth conditions are not monotonic—stating that the property of raining holds at t_0 does not entail that it held at t_{-1} or that it will hold at t_{+1}. The consequence is that the set of scalar alternatives is not a set ordered by entailment. This is an unusual feature.[10] Even so, suppose we embrace it. Then we must also embrace the consequences. First, the fact that we will need an implicature calculation mechanism that can exclude not just stronger alternatives but also alternatives that are simply not entailed. This is not hard to find: With Beck, we can simply adopt Chierchia et al. (2012)'s 'silent *only*' exhaustivity operator O, which excludes all the alternatives that are not entailed. However, *this* has the consequence that we have to find a way for the implicature calculating mechanism to ignore the alternatives based on earlier/later times (depending on the operator). This is quite a bit harder to do. Beck ends up saying that O only excludes the 'pragmatically open alternatives' which, for *still*, are the ones concerning the future. But this is a stipulation. This stipulative status becomes even more apparent when we consider the other aspectual operators also, because for some of them we have to make this assumption in the opposite direction. In short, it feels like we are missing something.

The third potential issue concerns CONT. On Beck's meaning for *still*, it presupposes that the event under consideration was also true before t_0. While this assumption matches what we need for *still*, it is a stipulation. Again, its stipulative nature becomes even more uncomfortable as we seem to need to adjust it in the opposite direction for *already*. And even more uncomfortable as we seem to need to adjust it further by also throwing in a negation for *anymore* and *yet*. Once again, it feels like we are missing something.

In addition to these, there is no solution for EVAL,[11] POL2, or POL1.

3 An existing solution for disjunction, indefinites, minimizers, numerals

In this section we will review a recent alternatives-and-exhaustification solution by Mihoc (2021) for superlative-modified numerals that captures all the phenomena in an integrated, unified, and general way, using insights from the literature on disjunction, indefinites, and especially minimizers.

[10] As Beck herself notes, "scalar implicatures are usually said to work on alternatives on a scale of logical strength" (p. 20, fn. 7). See also Matsumoto (1995) for the idea that a fundamental condition on Horn-sets is ordering by monotonicity.

[11] Beck, citing Ippolito (2007), mentions that *It is still morning* conveys that it is early(/ier) than expected (p. 2), and derives this by invoking focus on *morning* (pp. 22-23). Relatedly, citing a reviewer citing Michaelis (1993), Beck also mentions that *It is still raining* may suggest that it should have stopped raining, that 'it is unexpected that the sentence predicate holds as late as the topic time" (p. 21, fn. 8), but does not offer a solution for this. Both these sound like EVAL. Given that Beck's reasoning for the former case doesn't really extend to the latter, I believe it would be fair to say that no solutiont is in fact offered for EVAL.

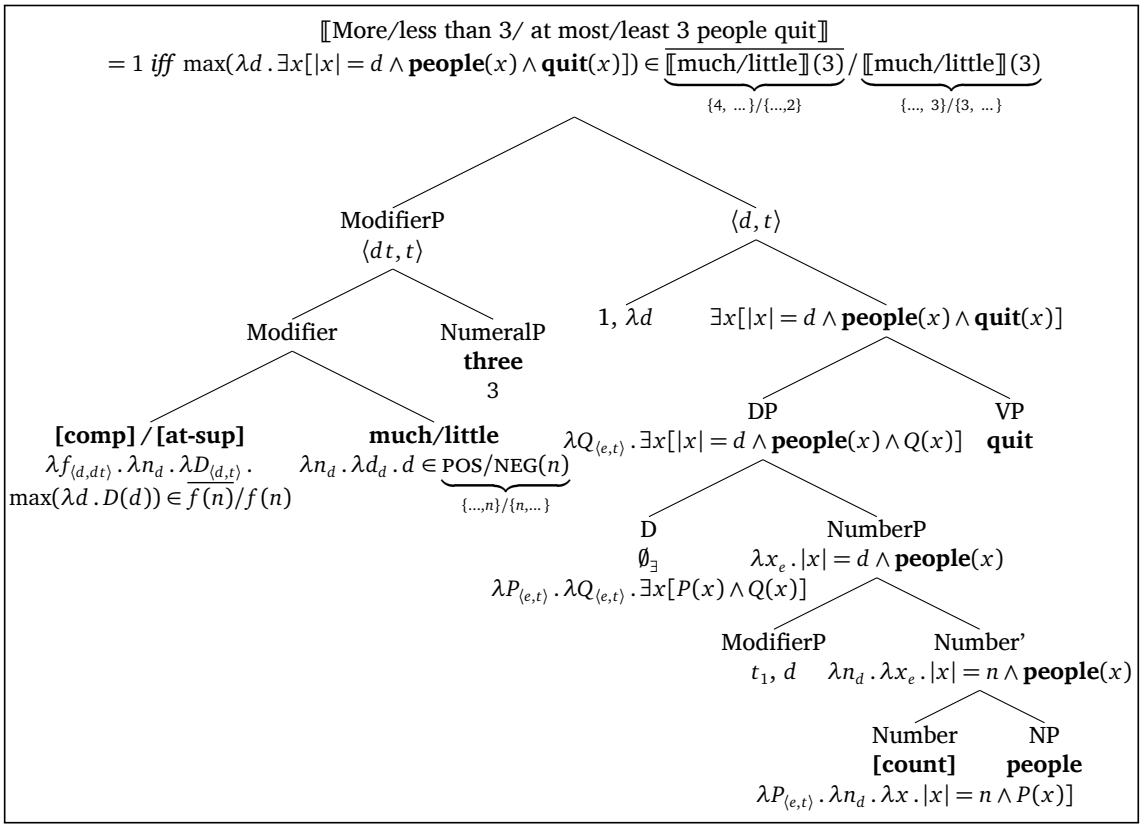


Figure 2: Comparative- and superlative-modified numerals according to Mihoc (2021). By replacing ModifierP near Number' with NumeralP (from higher up) one also obtains the syntax and semantics of bare numerals.

Mihoc aims to resolve claims that superlative-modified numerals are very different from comparative-modified and bare numerals while being very similar to disjunction, indefinites, or—as she adds—minimizers. Among other things, the proposal offers a general solution to the absence of CURR and the presence of OTH, EVAL, POL2, and POL1, drawing on previous observations and/or analyses concerning similar facts in disjunction, indefinites, minimizers, and/or other numerals.

More concretely, Mihoc proposes that the key to all these patterns in superlative-modified numerals lies with identifying the right truth conditions, alternative generation mechanism, and alternative use mechanism.

Even more concretely, the proposal is that a superlative-modified numeral of the form *at most n* and a superlative-modified numeral of the form *at least n* yield the truth conditions below. (For a detailed composition tree, see Figure 2.) These truth conditions crucially rely on a definition of *much/little* as functions that map a degree to its positive / negative extent (POS, NEG) on a scale of degrees (cardinalities, etc.)—that is, the set of degrees less/greater than or equal to the degree (see Kennedy 1997; 2001's algebra of extents, itself inspired from Seuren 1984). As a result, they contain reference to both a scalar element—the numeral being modified—as well as a domain—the set of degrees in the positive/negative extent of the numeral—and this naturally activates scalar alternatives, SA, and subdomain alternatives, DA.

(19) At most/least 3 people quit.

a. $\max(\lambda d\,.\,\exists x[|x| = d \wedge P(x) \wedge Q(x)]) \in \overbrace{[\![\text{much/little}]\!](3)}^{\{..., 3\}/\{3, ...\}}$ (assertion)

b. $\{\max(\lambda d\,.\,\exists x[|x| = d \wedge P(x) \wedge Q(x)]) \in [\![\text{much/little}]\!](m) \mid m \in S\}$ (SA)
c. $\{\max(\lambda d\,.\,\exists x[|x| = d \wedge P(x) \wedge Q(x)]) \in D' \mid D' \subsetneq [\![\text{much/little}]\!](3)\}$ (DA)

Mihoc reasons that active alternatives must be factored into meaning. She argues that for superlative-modified numerals this is done in multiple ways.

To begin with, the SA are factored in via Chierchia (2013)'s contradiction-based silent exhaustivity operator O(nly).[12] In essentially classical Horn (1972) fashion,[13] the result is a strengthening of *at most/least 5* to *not at most/least 4/6*, that is, to *exactly 5*. This is a problem, since—unlike bare numerals—superlative-modified numerals do not convey this exact meaning.[14] Mihoc argues this meaning is in fact not generated as it clashes with another meaning arising from superlative-modified numerals, an ignorance (IG) meaning yielded by O applied to the DA. This explains why, unlike bare numerals, superlative-modified numerals do not actually have a counterpart of CURR. Still, this mechanism—or a form of contextual scale pruning related to it—is able to produce a weaker strengthening of *at most/least 5* to, for example, *not at most/least 3/7*. This accounts for how superlative-modified numerals give rise to OTH.

But, in addition to being used by O, Mihoc proposes that the SA are also used by a modified version of Chierchia (2013) / Crnič (2011; 2012)'s 'silent *even*' exhaustivity operator E. This *modified* E asserts that an exhaustive interpretation of its prejacent is less likely than the *exhaustive* interpretations of all the *entailed* alternatives(, and presupposes that there is a *strengthened* interpretation of one of the entailed alternatives that is true[15]). Mihoc shows how this naturally derives EVAL and POL2.

As for the DA, Mihoc argues, following Chierchia (2013), that these are factored in via O.[16] In a plain negative context, this is vacuous; with the help of ban on a use of the DA that does not lead to a properly stronger meaning, this leads to POL1. In a seemingly episodic context, this gives rise to contradiction; however, with the help of a null, matrix-level, epistemic necessity modal, this gives rise to ignorance (IG; see also fns. 8 and 12)—an attested effect.

It looks like this analysis of superlative-modified numerals provides most of the ingredients we need for a more general approach to these phenomena in aspectual operators.

4 A new solution for aspectual operators

In this section we will use the lessons from the Beck (2020)/Beck (2020)-style's analysis of aspectual operators and the lessons from Mihoc (2021)'s analysis of superlative-modified numerals to develop a more general theory of temporality, evaluativity and, partially, also polarity sensitivity in aspectual operators.

[12] Beck (2020) was invoking Chierchia et al. (2012)'s silent exhaustivity operator EXH, often also called contradiction-free O(nly), which asserts the prejacent and negates all the non-entailed alternatives. The difference is not relevant here, though it is very relevant for correctly modeling, for example, the connection between the IG effect of superlative-modified numerals signaled in fn. 8 and POL1.

[13] As a grammatical operator, O can also be embedded. This is a difference from the traditional, Gricean view of implicatures where they are assumed to be a matrix phenomenon. This difference, however, is not crucial here.

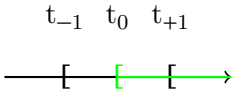
[14] See Krifka (1999) and all the literature on superlative-modified numerals since.

[15] Mihoc (2021) doesn't really discuss this presupposition much but, if one does think about it, this presupposition might actually have to be modalized. The reason is because an utterance of, e.g., *At most 3 people quit* doesn't really presuppose that, e.g., O(*At most 5 people quit* = *Exactly 5 people quit*, but simply that there are worlds compatible with the speaker's expectations where this is true. I won't be able to discuss this further here, but it is something that it might be interesting to explore in future work.

[16] Mihoc argues this is done in pre-exhaustified form, but this detail is not crucial here.

4.1 Truth conditions, alternative generation, alternative use

We will adopt Israel (1997)'s view that the suppletive pairs *still-anymore* and *already-yet* are denotationally equivalent. We will also adopt Mihoc (2021)'s view that items such as *at least/most n* or *still/already*, that intuitively seem to point to intervals and that come in pairs, are defined relative to positive/negative extents. In particular, I propose that *still-anymore* are defined relative to a negative extent of times (times after and including the relevant time), and *yet-already* are defined relative to a positive extent of times (times before and including the relevant time). More concretely, *still-anymore* are Aspectual Phrase modifiers that take in a property of times P and a time t and yield true iff there exists a time t' such that this time is in the negative extent of t and P is true at this time; given the content of P, this winds up saying that the runtime of the event under discussion overlaps with the negative extent of t. Similarly, *already-yet* are Aspectual Phrase modifiers that take as an argument a property of times P and a time t and yield true iff there exists a time t' such that this time is in the positive extent of t and P is true at this time; again, given the content of P, this winds up saying that the runtime of the event under discussion overlaps with the positive extent of t.[17] For a detailed composition tree, see Figure 3. For an example of the resulting truth conditions, see below. (Here and going forward, the figures on the top-right of each example provide an orientative scale of times, with the negative/positive extent referenced in the truth conditions or in the alternatives being highlighted in green. For the negative examples, the scale also marks the complement set of this extent.) Just as in the case of numerals, these truth conditions make reference to both a scalar element—below, t_0—and a domain—below, the positive/negative extent of t_0. As for superlative-modified numerals, this naturally activates SA and DA.

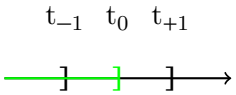


(20) It is still raining.

a. $\exists t'[t' \in \overbrace{\text{NEG}(t_0)}^{\{t_0, t_{+1}, \ldots\}} \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$ (assertion)

b. $\{\exists t'[t' \in \text{NEG}(t_i) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]\}$ (SA)

c. $\{\exists t'[t' \in D' \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \mid D' \subsetneq \text{NEG}(t_0)\}$ (DA)



(21) It is already raining.

a. $\exists t'[t' \in \overbrace{\text{POS}(t_0)}^{\{\ldots, t_{-1}, t_0\}} \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$ (assertion)

b. $\{\exists t'[t' \in \text{POS}(t_i) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]\}$ (SA)

c. $\{\exists t'[t' \in D' \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \mid D' \subsetneq \text{POS}(t_0)\}$ (DA)

[17] Note that, on this approach, the basic meaning of *still-anymore* is built atop a lower-bounded interval and that of *already-yet*—atop an upper-bounded interval. Interestingly, the only other analysis that I am aware of that associates these aspectual operators with some interval, Israel (1997), connects *still-anymore* to an *upper*-bounded interval and *already-yet* to a *lower*-bounded interval. As we will see, on the present analysis this intuition is cashed out in a different way, through the interaction of the assertion with its entailing and entailed alternatives.

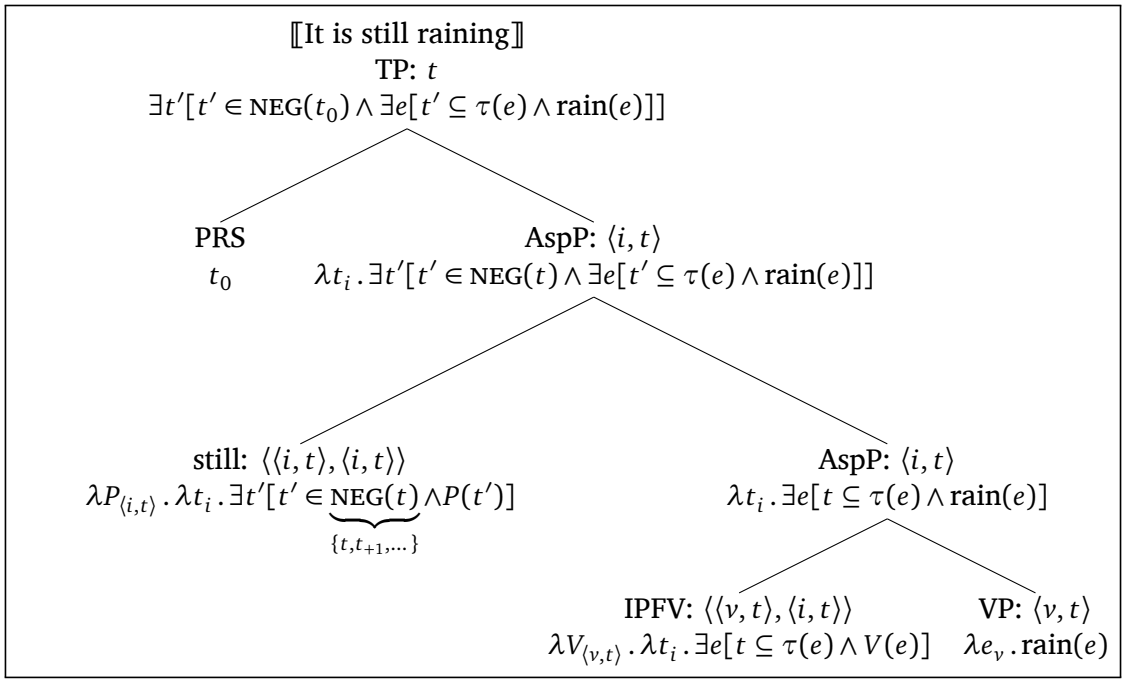
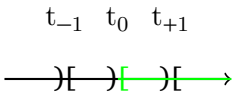
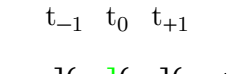


Figure 3: *Still* according to this paper. *Mutatis mutandis*, also *already*, *anymore*, *yet*.



(22) It isn't raining anymore.

a. $\neg\exists t'[t' \in \overbrace{\text{NEG}(t_0)}^{\{t_0,t_{+1},\dots\}} \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$ (assertion)
b. $\neg\{\exists t'[t' \in \text{NEG}(t_i) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]\}$ (SA)
c. $\{\neg\exists t'[t' \in D' \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \mid D' \subsetneq \text{NEG}(t_0)\}$ (DA)



(23) It isn't raining yet.

a. $\neg\exists t'[t' \in \overbrace{\text{POS}(t_0)}^{\{\dots,t_{-1},t_0\}} \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$ (assertion)
b. $\{\neg\exists t'[t' \in \text{POS}(t_i) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]\}$ (SA)
c. $\{\neg\exists t'[t' \in D' \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \mid D' \subsetneq \text{POS}(t_0)\}$ (DA)

Like Mihoc, we will also adopt Chierchia (2013)'s 'silent *only*' exhaustivity operator O and the modified version of Chierchia (2013) / Crnič (2011; 2012)'s 'silent *even*' exhaustivity operator E. O asserts the prejacent and says that all of those among its alternatives that are true are entailed—that is, all its non-entailed alternatives are false. The modified version of E presupposes that the prejacent has entailed alternatives (different from itself) and then asserts the prejacent and adds that it is less likely/expected—by some contextual measure—than all of those among its alternatives that are entailed.

(24) $[\![\text{O}]\!](C_{\langle\langle s,t\rangle,t\rangle}, p_{\langle s,t\rangle}, w_s)$
true iff $p(w) \wedge \forall q \in C[q(w) \rightarrow p \subseteq q]$ (assertion)

(25) $[\![\text{E}]\!](C_{\langle\langle s,t\rangle,t\rangle}, p_{\langle s,t\rangle}, w_s)$

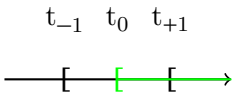
a. true iff $p(w)$ (assertion)
b. defined iff $\exists q \in C[q \neq p \wedge q(w)]$ (existential presupposition)
c. defined iff $\forall q \in C[p \subseteq q \rightarrow p \prec q]$ (scalar presupposition)

Moreover, also following Mihoc, who in turn follows Crnič (2012), we will assume that both the prejacent and the SA used by E are used in a way that interprets the scalar element exhaustively, as if rendered non-monotonic by exhaustification via O, and likelihood/expectedness is assessed relative to context.

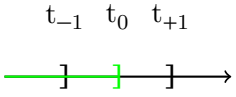
As we will see, with these assumptions in hand, and continuing to follow the reasoning from superlative-modified numerals, we will be able to provide a more general solution for CURR, OTH, and CONT, while also solving EVAL, POL2, and—to some extent—POL1.

4.2 Deriving CURR and OTH

As we can see below, CURR and OTH arise from exhaustification via O relative to the SA. In particular, for *still* and *already*, the truth conditions lead via SA-implicature to OTH, and the two together lead to a meaning of CURR.

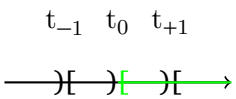


(26) $[\![O_{SA}(\text{It is still raining})]\!]$
$O_{SA}(\exists t'[t' \in \text{NEG}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]])$
true iff
$\exists t'[t' \in \text{NEG}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\neg\exists t'[t' \in \text{NEG}(t_{+1}) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$ (not raining later; OTH)
$\Rightarrow \exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$ (raining now; CURR)

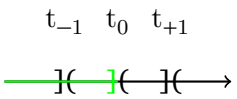


(27) $[\![O_{SA}(\text{It is already raining})]\!]$
$O_{SA}(\exists t'[t' \in \text{POS}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]])$
true iff
$\exists t'[t' \in \text{POS}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\neg\exists t'[t' \in \text{POS}(t_{-1}) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$ (not raining earlier; OTH)
$\Rightarrow \exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$ (raining now; CURR)

For *anymore* and *yet*, the truth conditions entail CURR and, together with the SA-implicature, that also yields OTH.



(28) $[\![O_{SA}(\text{It isn't raining anymore})]\!]$
$O_{SA}(\neg\exists t'[t' \in \text{NEG}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]])$
true iff
$\neg\exists t'[t' \in \text{NEG}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$ (not raining now; CURR)
$\neg\neg\exists t'[t' \in \text{NEG}(t_{-1}) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \exists e[t_{-1} \subseteq \tau(e) \wedge \text{rain}(e)]$ (raining earlier; OTH)



(29) $[\![O_{SA}(\text{It isn't raining yet})]\!]$
$O_{SA}(\neg\exists t'[t' \in \text{POS}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]])$
true iff
$\neg\exists t'[t' \in \text{POS}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$ (not raining now; CURR)
$\neg\neg\exists t'[t' \in \text{POS}(t_{+1}) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \exists e[t_{+1} \subseteq \tau(e) \wedge \text{rain}(e)]$ (raining later; OTH)

The fact that the status of CURR is not always that of an entailment and the status of OTH is not always that of an implicature might seem surprising. Indeed, on the Beck/Beck-style meanings we saw before, CURR was always derived as an entailment and OTH as an implicature. However, I would argue that what we are seeing here might really be no different than what happens with bare numerals. (See Figure 2 for details about the way these classic, lower-bounded, Link 1987 truth conditions might arise.) In the positive example, the CURR-like meaning of 3 is derived through a combination of the truth conditions + the SA-implicature. However, in the negative example the truth conditions directly entail it. Thus, this feature of the proposal for aspectual operators might actually capture something deep about their meaning.

(30) $[\![O_{SA}(\text{Tim found 3 puppies})]\!]$
$O_{SA}(\exists x[|x| = 3 \wedge P(x) \wedge F(T,x)])$
true iff
$\exists x[|x| = 3 \wedge P(x) \wedge F(T,x)] \wedge$
$\neg\exists x[|x| = 4 \wedge P(x) \wedge F(T,x)] \wedge$ (not four; OTH)
$\Rightarrow |\lambda x\,.\,P(x) \wedge F(T,x)| = 3$ (exactly three; 'CURR')

(31) $[\![O_{SA}(\text{Tim didn't find 3 puppies})]\!]$
$O_{SA}(\exists x[|x| = 3 \wedge P(x) \wedge F(T,x)])$
true iff
$\neg\exists x[|x| = 3 \wedge P(x) \wedge F(T,x)] \wedge$
$\neg\exists x[|x| = 4 \wedge P(x) \wedge F(T,x)] \wedge$ (not three; 'CURR')
…[18]

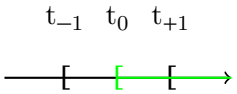
Moreover, unlike the Beck/Beck-style non-monotonic truth conditions, our monotonic truth conditions ensure that we do not have to stipulate which of the SA O must negate—the default that it negates all the non-entailed SA already yields all the desired OTH inferences.

4.3 Deriving CONT, EVAL, and POL2

As we can see below, CONT, EVAL, and POL2 can be derived from exhaustification via E relative to the SA. In particular, CONT arises from the existential presupposition of E, and EVAL/POL2—which turn out to be two faces of the same coin—arise from the scalar presupposition of E. The assertion component of E also yields a uniform CURR across the four operators, interestingly strengthening the CURR effect we already obtained for *still* and *already* from O before. (Below, ✓= fits common expectations and ✗= doesn't fit common expectations. As mentioned above when we qualified the definition of E, the O

[18] This actually yields the implicature that he found exactly two. See Mihoc (2021) for some suggestions why this implicature is in fact blocked.

inside of the prejacent and SA refers to the fact that the scalar element is really used in an exact sense.)



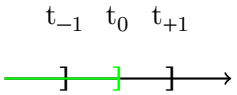
(32) $[\![\mathrm{E}_{\mathrm{SA}}(\text{It is still raining})]\!]$
$\mathrm{E}_{\mathrm{SA}}(\exists t'[t' \in \mathrm{NEG}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]])$

a. true iff
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{NEG}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]]$
$\Rightarrow \exists e[t_0 \subseteq \tau(e) \wedge \mathrm{rain}(e)]$ (raining now; CURR)

b. defined iff
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{NEG}(t_{-1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]]$
$\Rightarrow \exists e[t_{-1} \subseteq \tau(e) \wedge \mathrm{rain}(e)]$ (also raining earlier; CONT)

c. defined iff
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{NEG}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]] \prec$
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{NEG}(t_{-1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]]$
$\Rightarrow \exists e[t_0 \subseteq \tau(e) \wedge \mathrm{rain}(e)] \prec \exists e[t_{-1} \subseteq \tau(e) \wedge \mathrm{rain}(e)]$
('raining now less expected than raining earlier')
($\Rightarrow$ 'raining later than expected'; EVAL)

Note: For *Tim is still* ✓*young* / #*old*:
(i) 'young now less expected than young earlier' ✓
(ii) 'old now less expected than old earlier' ✗



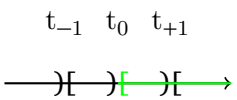
(33) $[\![\mathrm{E}_{\mathrm{SA}}(\text{It is already raining})]\!]$
$\mathrm{E}_{\mathrm{SA}}(\exists t'[t' \in \mathrm{POS}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]])$

a. true iff
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{POS}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]]$
$\Rightarrow \exists e[t_0 \subseteq \tau(e) \wedge \mathrm{rain}(e)]$ (raining now; CURR)

b. defined iff
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{POS}(t_{+1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]]$
$\Rightarrow \exists e[t_{+1} \subseteq \tau(e) \wedge \mathrm{rain}(e)]$ (also raining later; CONT)

c. defined iff
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{POS}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]] \prec$
$\exists t'[\mathrm{O}_{\mathrm{SA}}(t' \in \mathrm{POS}(t_{+1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]]$
$\Rightarrow \exists e[t_0 \subseteq \tau(e) \wedge \mathrm{rain}(e)] \prec \exists e[t_{+1} \subseteq \tau(e) \wedge \mathrm{rain}(e)]$
('raining now less expected than raining later')
($\Rightarrow$ 'raining earlier than expected'; EVAL)

Note: For *Tim is already* #*young* / ✓*old*:
(i) 'young now less expected than young later' ✗
(ii) 'old now less expected than old later' ✓



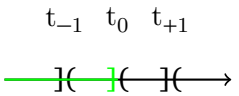
(34) $[\![\mathrm{E}_{\mathrm{SA}}(\text{It isn't raining anymore})]\!]$
$\mathrm{E}_{\mathrm{SA}}(\exists t'[t' \in \mathrm{NEG}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \mathrm{rain}(e)]])$

a. true iff
$\neg\exists t'[O_{SA}(t' \in \text{NEG}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \neg\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$ (not raining now; CURR)

b. defined iff
$\neg\exists t'[O_{SA}(t' \in \text{NEG}(t_{+1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \neg\exists e[t_{+1} \subseteq \tau(e) \wedge \text{rain}(e)]$ (also not-raining later; CONT)

c. defined iff
$\neg\exists t'[O_{SA}(t' \in \text{NEG}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \prec$
$\neg\exists t'[O_{SA}(t' \in \text{NEG}(t_{+1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \neg\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)] \prec \neg\exists e[t_{+1} \subseteq \tau(e) \wedge \text{rain}(e)]$
('not-raining now less expected than not-raining later')
($\Rightarrow$ 'not-raining earlier than expected'; EVAL)

Note: For *Tim isn't* ✓*young* / #*old anymore*:
(i) 'not-young now less expected than not-young later' ✓
(ii) 'not-old now less expected than not-old later' ✗



(35) $[\![E_{SA}(\text{It isn't raining yet})]\!]$
$E_{SA}(\exists t'[t' \in \text{POS}(t_0) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]])$

a. true iff
$\neg\exists t'[O_{SA}(t' \in \text{POS}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \neg\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)]$ (not raining now; CURR)

b. defined iff
$\neg\exists t'[O_{SA}(t' \in \text{POS}(t_{-1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \neg\exists e[t_{-1} \subseteq \tau(e) \wedge \text{rain}(e)]$ (also not-raining earlier; CONT)

c. defined iff
$\neg\exists t'[O_{SA}(t' \in \text{POS}(t_0)) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \prec$
$\neg\exists t'[O_{SA}(t' \in \text{POS}(t_{-1})) \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]]$
$\Rightarrow \neg\exists e[t_0 \subseteq \tau(e) \wedge \text{rain}(e)] \prec \neg\exists e[t_{-1} \subseteq \tau(e) \wedge \text{rain}(e)]$
('not-raining now less expected than not-raining earlier')
($\Rightarrow$ 'not-raining later than expected'; EVAL)

Note: For *Tim isn't* #*young* / ✓*old yet*:
(i) 'not-young now less expected than not-young earlier' ✗
(ii) 'not-old now less expected than not-old earlier' ✓

Earlier we criticized the Beck/Beck-style solutions for *still*, *already*, *anymore*, and *yet* for the fact that we had to stipulate whether the time in the presupposition was before or after the reference time, and also whether the property condition was positive or negative. But on our analysis we seem to have the same features. Howver, on our analysis both these features come from E: E pitches its prejacent up against those of its alternatives that it entails, and this ends up adjusting both the time and the polarity of the condition in the presupposition. The negation is part of the presupposition because the presupposition does not come from *still* but rather from the exhaustivity operator E that exploits *still*. Thus, both the stipulations from before are now in fact derived.

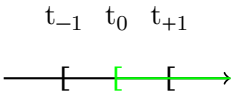
4.4 Suggestions for deriving POL1

Extending Mihoc (2021)'s analysis of superlative-modified numerals to aspectual operators seems to be paying off. As we will see below, it will help us make sense of some

of the POL1 patterns of aspectual operators also. However, many open questions still remain.

4.4.1 Deriving the contrast in negative contexts

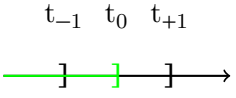
Following the existing alternatives-and-exhaustification approaches to PPI disjunction or PPI indefinites, Mihoc shows that the PPI pattern of superlative-modified numerals can be derived from exhaustification via O relative to the DA also.[19] I believe this solution extends to aspectual operators as well. Consider below the application of O_{DA} to negated *still* or *anymore*. (Recall: As per the definition of a DA, D'_i below are strict subsets of the original domain.) The DA are all entailed, so they cannot be negated. As a result, O is vacuous. The idea is that some items carry a requirement that their DA be used—and also that this must lead to a properly stronger meaning. The combination of these two requirements leads to PPI-hood. If *still* carries an O_{DA}-proper-strengthening requirement but *anymore* does not, this captures their distribution.



(36) $O_{DA}([\![$It isn't $^{\#}$still raining / It isn't raining $^{\checkmark}$anymore$]\!])$

$\overbrace{\neg\exists t'[t' \in \text{NEG}(t_0)}^{\{t_0, t_{+1}, \ldots\}} \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\neg\exists t'[t' \in D'_1 \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\neg\exists t'[t' \in D'_2 \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\ldots$

The same reasoning carries over, *mutatis mutandis*, to *already* and *anymore*.



(37) $O_{DA}([\![$It isn't $^{\#}$already raining / It isn't raining $^{\checkmark}$yet$]\!])$

$\overbrace{\neg\exists t'[t' \in \text{POS}(t_0)}^{\{\ldots, t_{-1}, t_0\}} \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\neg\exists t'[t' \in D'_1 \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\neg\exists t'[t' \in D'_2 \wedge \exists e[t' \subseteq \tau(e) \wedge \text{rain}(e)]] \wedge$
$\ldots$

4.4.2 Deriving the contrast in positive contexts

Following the existing alternatives-and-exhaustification approaches to PPI disjunction or PPI indefinites, Mihoc shows that O_{DA} in a positive context leads to contradiction but, with the last resort insertion of a matrix-level, null, epistemic necessity modal between O_{DA} and its prejacent, the result is an epistemic free choice more commonly known as ignorance. Given that our new meanings for aspectual operators are formally quite similar to those of Mihoc's superlative-modified numerals, the result of O_{DA} would likely be the same. The problem is that, while felicitous in a positive context, simple utterances with *still* and *already* do not give off any obvious modal vibe.

[19] As noted in fn. 16, Mihoc actually uses *pre-exhaustified* DA. However, this is not crucial at this point so, for ease of exposition, we leave it aside.

(38) Tim is **still** / **already** sleeping. (?modal effect)

Moreover, since superlative-modified numerals did not have any NPI counterparts, Mihoc does not offer a solution for NPI-hood. We will not be able to offer one here either. However, if, like Mihoc, we were to follow the general line of reasoning in Chierchia (2013), we might try to look for the contrast in an item's ability to use pre-exhaustified DA vs. not. Indeed, Chierchia argues that, without pre-exhaustification of the DA, the result of O_{DA} for a disjunction or an indefinite in a (null or overt) modal context is generally contradictory. He uses this to explain the contrast in modal contexts between English *ever* and German *irgendein*. If this explanation were to carry over to aspectual operators also, we must expect to find a contrast between our PPI and our NPI items in modal contexts as well. However, *yet* seems to be fine in some modal contexts also, whereas *anymore* is not.

(39) Tim may ✓**still** / ✓**already** be asleep.

(40) Tim **may** ✓**yet** sleep. / Tim **may** be asleep #**anymore**.

This is an interesting issue, and one that is potentially related to the so-called 'positive *anymore*' (see Horn 2013 a.o.). I leave it to future research.

5 Conclusion and outlook

In this paper I proposed a new, unified analysis of temporality, evaluativity, and—to some extent—polarity sensitivity in the aspectual operators *still*, *already*, *anymore*, and *yet*. The account marries insights from the literature on aspectual operators, specifically Beck (2020) and the literature cited therein, with insights from the literature on disjunction, indefinites, minimizers, or numerals, specifically Mihoc (2021) and the literature cited therein, the result being a uniform approach to truth conditions, alternative generation, and alternative use across all these categories.

The account however also has many open issues. Among the most immediately relevant are the following. First, Beck (2020)'s proposal for *still* sought to unify it across its various uses, including non-aspectual uses. We have not been able to engage with any of that here. To what extent will the analysis extend to those uses also? Second, Mihoc (2021)'s proposal for superlative-modified numerals relied on a number of stipulations, some inherited from Crnič (2012)—the use of O(nly) to render the prejacent and scalar alternatives non-monotonic before use by E(ven)—and others new—for example, the idea that, while O(nly) pitches the prejacent up against its non-entailed scalar alternatives, E pitches it up against its *entailed* scalar alternatives. These ideas seem to yield the correct results, but one would want to understand them more. Finally, the analysis of polarity sensitivity was incomplete, both the acceptability and the unacceptability of aspectual operators in positive environments remaining an open puzzle. I leave all these issues to future research.

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