Different measures for degree achievements*

Christopher Baron // MIT // SNEWS 2018

2 December 2018

1 Introduction

∗ This talk is concerned with the proper analysis of 'degree achievements' (Dowty 1979, henceforth DAs) like *widen*, *darken*, and *straighten*

(1) Gap A widened.

(2) John straightened the bar.

∗ Intuitively, these verbs describe some change in measurement of a gradable property that an entity undergoes

– (1), for example, intuitively means something like: before some event, Gap A's width was less than it is now

∗ A major analysis of DAs is due to Kennedy & Levin (2008, K&L), with much recent work (Sawada & Grano 2011, Menon & Pancheva to appear, Martínez Vera 2018, a.o.) assuming their theory

– Their account is meant to capture the following properties of DAs:

(i) the variable telicity of DAs

(ii) the default interpretations of darken (telic) and widen (atelic), and

(iii) the differential interpretation of measure phrases with DAs

– Essentially, K&L's proposal, based on a non-standard analysis of comparatives discussed by Kennedy & McNally (2005), is that DAs denote special kinds of measure functions that map objects onto the degree to which they've changed in some gradable property over the course of an event

∗ This talk has three main goals:

*cjbaron@mit.edu; ongoing thanks to Roger Schwarzschild, Maša Močnik, Filipe Hisao Kobayashi, Alexis Wellwood, Sabine Iatridou, Martin Hackl, and definitely other people I'm forgetting. Errors are obviously entirely mine.

- To argue that K&L's analysis cannot account for the data it was designed to deal with[1]
- To develop a new semantics for DAs in a radically different framework developed by Wellwood (2015, 2016)
  - ◇ This account will address **(i)** and **(iii)** (fairly) straightforwardly; I will suggest that **(ii)** is a mischaracterization of the relevant property, but likely not have anything good to say about it
- To (briefly) compare this new semantics to Hay, Kennedy & Levin (1999, HK&L), which doesn't face the issues K&L does

∗ As a preview, the meanings K&L, HK&L, and I give for (1) are given below [2]

(3) Gap A widened.

a. $\lambda e.\mathbf{wide}^{\uparrow}_{\mathbf{wide}(A)(\textsc{init}(e))}(A)(\textsc{fin}(e)) \succcurlyeq \textsc{stnd}(\mathbf{wide}_{\Delta})$ K&L

b. $\lambda e.\ \exists d[\mathbf{wide}(A)(\textsc{end}(e)) = \mathbf{wide}(A)(\textsc{init}(e)) + d]$ HK&L

c. $\lambda e.\ \exists s \exists s' \exists d[\textsc{source}(e) = s \ \&\ \textsc{goal}(e) = s' \ \&\ \textsc{wide}(s) \ \&\ \textsc{holder}(s) = A \ \&\ \textsc{wide}(s') \ \&\ \textsc{holder}(s') = A \ \&\ [g(\mu)(s') \succcurlyeq g(\mu)(s) + d]]$ CB

∗ The outline of the talk is as follows: §2 discusses the core data motivating K&L's account; §3.1 lays out their analysis[3]; §3.2 discusses problems that analysis faces; §4 details a new analysis building on Wellwood (2015, 2016), and §5 compares HK&L's and my account, and concludes with open questions

2 Degree achievements: core data

∗ Variable telicity as a property of some verbs is a well-known issue; in some cases, it's pinned on the internal argument of the verb (e.g. *eat apples* is atelic, but *eat the apple* is telic)

∗ Dowty (1979) observed that DAs have variable telicity that seems to be independent from the properties of their arguments

(4) The soup cooled.

a. …for 10 minutes. (ATELIC)

b. …in 10 minutes. (TELIC)

(5) The soup is cooling.

(6) The soup has cooled.

[1] More generally, the arguments here will apply to any analysis that appeals these special measure functions; though I lack the appropriate space and time to do so, the arguments in §3.2 can be extended to the non-standard analysis Kennedy & McNally (2005) sketch for comparatives, effectively showing its lack of viability as an analysis. See also Križ (2011) for additional arguments and discussion.

[2] I use **boldfaced** fonts for measure functions (e.g. something that returns a degree) and SMALLCAPS for everything else in the metalanguage.

[3] Importantly, though, I will largely ignore their account of variable telicity for the moment, since my concerns are more about measurement. Furthermore, I will not discuss much of the previous literature on DAs in any detail; this includes the influential work of Abusch (1986), Winter (2006), and Kearns (2007).

* Temporal *for-* and *in*-adverbials are common diagnostics for atelic and telic predicates respectively (Rothstein 2004, a.m.o); (4) is compatible with both continuations in (4a) and (4b)

* If (5) is understood as implying the temperature of the soup is dropping, without a specific endpoint, then (6) is entailed

  – However, if the context is such that (5) is interpreted as if the soup is decreasing in temperature towards a specific endpoint (say a palatable temperature of 60° from boiling 100°), then (6) isn't entailed with the same endpoint in mind

* It's been argued, though, that not *all* DAs have both atelic and telic interpretations, or have them equally accessible (Kearns 2007, Kennedy & Levin 2008)

* Kearns (2007) noted that the natural (perhaps default) interpretations of the DAs *darken*, *straighten* and *dry* are telic

(7) a. ? The sky darkened, but it didn't become dark.
    b. The sky is darkening, but it hasn't darkened.

(8) a. The gap widened, but it didn't become wide.
    b. # The gap is widening, but it hasn't widened.
    c. The gap between the boats widened {for/$^{??}$in} a few minutes.

* (7a) is odd, it's argued, because it implies that target endstate of darkness has been reached, but the second conjunct contradicts this implication

* *widen* has no such issues in (8a), but (8b) is rather odd; these two data points, taken with the oddity of *widen* with an *in*-adverbial as in (8c), suggest that *widen* is by default atelic

* That default atelicity is overridden with a measure phrase

(9) Gap A widened 8 inches {$^{??}$for/in} a few minutes.

* Importantly, measure phrases are also available to all DAs, even though their positive adjective forms might not permit them

(10) a. Gap A widened (by) 8 inches.
     b. Gap A is 8 inches wide.

(11) a. The soup cooled (by) 17 degrees.
     b. ?? The soup is 17 degrees cool.

* These measure phrases seem to express 'differential' amounts—that is, they measure how much the relevant arguments have changed over the course of some event—similar to their function in comparative clauses

(12) Gap A is 8 inches wider than Gap B is.

* As illustrated by (9), explicit measure phrases render the DAs telic; when left implicit, it seems that contextual and lexical semantic factors affect telicity

3 The standard view: Kennedy & Levin (2008)

3.1 Measures of change

* K&L propose that DAs like *widen* denote a derived measure function related to that of the adjectival core: a 'measure of change' function, a verbal kind of difference function (DFs)

  (13) DIFFERENCE FUNCTIONS: for any measure function **m** from objects and times to degrees on a scale *S*, and for any $d \in S$, $\mathbf{m}^{\uparrow}_{d}$ is a function just like **m** except that
  a. its range is {d' ∈ S: d $\preceq$ d'}, and
  b. for any x and t in the domain of **m**, if $\mathbf{m}(x)(t) \preceq d$, then $\mathbf{m}^{\uparrow}_{d}(x)(t) = d$.

* DFs are intended to return degrees representing the difference between some object and an arbitrary degree d; regardless of the scale structure of the underlying measure function, all DFs use lower-closed scales

* DAs denote a special kind of eventive difference function, a measure of change function (MOCs); we also need an entry for a verbal POS morpheme

  (14) MEASURE OF CHANGE: for any measure function **m**, a measure of change function $\mathbf{m}_{\Delta} = \lambda x \lambda e.\mathbf{m}^{\uparrow}_{\mathbf{m}(x)(\text{INIT}(e))}(x)(\text{FIN}(e))$ ⟨e,vd⟩

  (15) $[\![\text{POS}_{\text{v}}]\!] = \lambda g_{\mathbf{m}_{\Delta}} \lambda x \lambda e.\ g(x)(e) \succcurlyeq \text{STND}(g)$ ⟨⟨e,vd⟩,⟨e,vt⟩⟩

* MOCs are supposed to return degrees measuring the amount an entity has changed in a property **m** over the course of an event

  – Composing with POS_{v} yields functions true of an entity and an event iff the degree to which that object changes over the course of that event exceeds the standard of comparison for the measure of change

* The STND function encoded in POS does all of the work for K&L in dealing with the (a)telicity facts

* First, adjectives are associated with scales of different kinds: some are open (e.g. *wide*), some have maxima (e.g. *straight*), others have minima (e.g. *bent*) (Kennedy & McNally 2005, also Rotstein & Winter 2004)

  – MOCs are associated with scales that have minima by definition; if the underlying scales have maxima, those are inherited by derived MOCs as well

* Second, STND plays its role: if the standard of an MOC is set to the minimum degree, any positive change in some measure as a result of an event will yield truth

  – If it is set to the maximum, only a complete change-of-state will yield truth (i.e. going from not dark to dark for *darken*)

* The final ingredient is INTERPRETIVE ECONOMY[4] (Kennedy 2007), which mandates the use of 'conventional' aspects of meaning before contextual, and thus yields for maximum-standard predicates default telic interpretations.

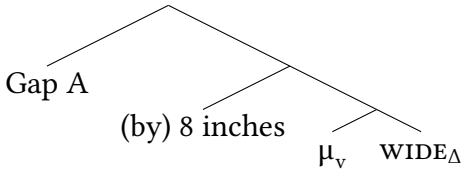
* Incorporating differentials appeals to Svenonius & Kennedy (2006)'s morpheme μ that composes with a measure function and returns a relation between degrees and individuals; we define a verbal form μ_v for DAs

(16) $[\![\mu_v]\!] = \lambda g_{e,vd} \lambda d \lambda x \lambda e.\ g(x)(e) \succcurlyeq d$

* With this, they claim, we can account for (10a), repeated below[5]

(10a) Gap A widened (by) 8 inches.

a.



b. $\lambda e.\ \textsc{wide}_\Delta(A)(e) \succcurlyeq$ 8 INCHES

3.2 Problems

* As it stands, K&L's theory can't deliver what it sets out to; there are two horns to the dilemma

HORN 1: MOCs (and DFs in general) don't actually seem to measure any change[6] and

HORN 2: If we assume MOCs can be made to yield measures of change, we make matters worse for ourselves when trying to account for even the most basic data

* Let's tackle these issues in order: the first is that MOCs don't yield measures of change

* H1: per (13), the derived scales MOCs (and DFs) make reference to consist in degrees *on the same scale* as the original scale

* The change is that everything that is mapped by the original measure function to a degree d' below the minimum degree d on the original scale is mapped to d by the new function

  – That is, we've created a scale that is identical to the original *except* that it now has a lower bound; everything above that lower bound stays the same

[4]This global constraint is defined as follows:

(1) INTERPRETIVE ECONOMY: Maximize the contribution of the conventional meaning of the elements of a sentence to the computation of its truth conditions.

[5]We could take *by* to be the surface realization of μ_v and schönfinkel the arguments around such that the differential degree is the first argument of μ_v, too, but nothing as far as I can tell would hinge on that besides perhaps making some sense of the optionality of *by*. This will come up again in a bit concerning my semantics.

[6]Križ (2011:75, fn.7) notes this, but doesn't, as far as I can tell, take it as seriously as I do, later stating (2011:85) that K&L is the best theory on the market.

* Calcification of the issue:

  (17) CONTEXT: There is a gap between two boats, Gap A. Waves rock the boats, and they are separated; A goes from being 1 inch to being 9 inches.
    a. Gap A widened 8 inches.
    b. $\lambda e.\mathbf{wide}^{\uparrow}_{\mathbf{wide}(A)(\textsc{init}(e))}(A)(\textsc{fin}(e)) \succcurlyeq 8$ inches

* *wide*, as a measure function of type $\langle e,id\rangle$, maps entities at a time to their width at that time; per (14), (17a) has the meaning in (17b)

* This function makes reference to a scale where the minimum is the gap's measure *on the original* **wide** *scale*, and it will map entities measuring less than 1 inch wide to 1 inch

  – So, (17b) will be true of an event iff the endpoint measure of Gap A (9 inches) is greater than degree denoted by the differential marker (i.e. 8 inches); (17a) is predicted true, but not for the right reason!

* Sharpening the issue:

  (18) CONTEXT: Gap B, also widened by the waves that rocked Gap A, originally measured 13 inches, but now measures 15 inches.
    a. Gap B widened 8 inches.
    b. $[\![(18a)]\!] = \lambda e.\mathbf{wide}^{\uparrow}_{\mathbf{wide}(B)(\textsc{init}(e))}(B)(\textsc{fin}(e)) \succcurlyeq 8$ inches

  – (18a) is obviously false in this context—Gap B only widened 2 inches—but K&L predict (18a) have the meaning in (18b)

  – This is true of events where the measure of Gap B is greater than 8 inchesGap B measures 15 inches, (18b) is true of e_5 even though Gap B's width only increased by 2 inches

* This particular issue is resolved if we DFs and MOCs do not denote on the original scale, but rather on a new scale entirely, where each degree actually represents an amount of change from the initial measure on the original scale

  – I'm actually not sure how to accomplish this technically[7], but grant that this is feasible, and we can map Gap B in (18b) to 2 inches, correctly predicting (18a) to be false

  – Then we'd have an actual measure of change

* H2: However, resolving this technical problem raises another problem, this time when we're dealing with $\textsc{pos}_v$

* Adjectives like *straight* make reference to upper-closed scale, with a maximum standard interpretation in the positive (Kennedy & McNally 2005, Kennedy 2007); this maximum is inherited by DFs and MOCs built on them

[7] In fact I'm doubtful it's feasible at all.

(19) Bar C straightened.

a. $\lambda e.\mathbf{straight}^{\uparrow}_{\mathbf{straight}(\mathrm{bar})(\textsc{init}(e))}(C)(\textsc{fin}(e)) \succcurlyeq \textsc{stnd}(\mathbf{straight}_{\Delta}(C)(e))$

* Assume we've got a function in (19a) which actually measures change on the left-hand side of $\succcurlyeq$; on the right-hand side, the standard function, contributed by $\textsc{pos}_{v}$, will return (in line with INTERPRETIVE ECONOMY) the maximum degree on the scale associated with $\textsc{straight}_{\Delta}$

* The maximum degree on the STRAIGHT scale is the degree corresponding to being completely straight; per K&L, $\textsc{straight}_{\Delta}$ inherits this maximum

  – However, if $\textsc{straight}_{\Delta}$ measures *change*, it's not obvious that there is a maximum degree of change necessary to reach complete straightness

* Furthermore, if STND yields the maximum degree of straightness rather than some degree of change, we have degrees that are from incommensurate scales[8]

  on either side of $\succcurlyeq$!

* In the end, the two horns of the dilemma concern the fact that K&L's semantics doesn't allow independent access to both measures of change and endpoint measures

  – *Gap A widened by 8 inches* needs a measure of difference
  – *Gap A widened to 9 inches* and *Bar C straightened* need endstate measures

* Unfortunately, K&L don't give us a way to have our cake and eat it too; we need to seek out an alternative measure

4 A different take

* Recall the three properties K&L wanted to account for: **(i)** the variable telicity of DAs; **(ii)** the default interpretations of darken (telic) and widen (atelic); and **(iii)** the differential interpretation of measure phrases

* DAs, first and foremost, tell us that the measure of an individual with respect to property some has changed over the course of some event, so before anything else let's tackle this…

* …via a visit to an alternative theory of how degrees are introduced into the semantics

[8]Note that the situation is different than subcomparatives like the following (Kennedy 1999):

(1) The table is wider than the doorway is tall.

(2) ? The table is wider than the doorway is green.

The first is straightforward enough: the scales *tall* and *wide* make reference to degrees on the same scale. The second is different, and the two adjectives can't be said to make reference to degrees on the same scale. However, we don't just have different scales in (19a); we have change scales, which are parasitic on the original scale and measurements of individuals therein.

* As argued by Fults (2006) and Wellwood (2014, 2015) a.m.o.[9], adjectives seem to have davidsonian arguments (in particular, states)
  - For instance, they can be targeted by modifiers that typically target predicates of eventualities

(20) a. Mary is sad in the morning.
b. John ran in the morning.

(21) a. Mary is happy in the park.
b. John ran in the park.

* These data suggest that there is something in the domain of eventualities that the modifiers are targeting; on an analysis of adjectives that has them lexicalize measure functions or degree relations, these facts are difficult to account for[10]
* In light of these facts, I assume adjectives denote $\langle st \rangle$ functions, as well as Wellwood's (2014, 2015) theory of comparatives
* In her theory, measurement is uniformly introduced by *much*; the comparative morpheme *er* takes *much* as input, a degree provided by the *than*-clause, and returns an underspecified function which composes via predicate modification with the matrix adjective[11,12]

(22) a. $[\![\text{er}]\!]^g = \lambda f_{\eta,d} \lambda d \lambda \alpha_\eta .\ f(\alpha) \succ d$ $\langle\langle \eta,d\rangle,\langle d,\eta t\rangle\rangle$
b. $[\![\text{ABS}]\!]^g = \lambda f_{\eta,d} \lambda d \lambda \alpha_\eta .\ f(\alpha) \succcurlyeq d$ $\langle\langle \eta,d\rangle,\langle d,\eta t\rangle\rangle$
c. $[\![\text{much}_\mu]\!]^g = g(\mu)$ $\langle \eta,d\rangle$
d. $[\![\text{tall}]\!]^g = \lambda s.\ \text{TALL}(s)$ $\langle s,t\rangle$

* Instead of measuring individuals, Wellwood's account involves measuring states and events; the measure function that *much* denotes must be a homomorphic (i.e. structure preserving) mapping from the input to degrees
  - More specifically, permissible values for μ must be *monotonic*

(23) MONOTONICITY
A measure function $\mu : D_{\preccurlyeq^{\text{part}}} \rightarrow D_{\leq^{\text{deg}}}$ is MONOTONIC iff:
for all $\alpha, \beta \in D_{\preccurlyeq^{\text{part}}}$, if $\alpha \prec^{\text{part}}$, then $\mu(\alpha) \prec^{\text{deg}} \mu(\beta)$

* To illustrate, we can consider a standard comparative

(24) John is taller than Mary is.

[9] See, e.g., Parsons (1990), Higginbotham (2000), Kawamura (2007), Landman (2000), Moltmann (2009), and Wellwood (2014, 2015) and references therein provide more data and arguments in favor of such a view.

[10] Wellwood provides further arguments against the standard view that adjectives denote (wholly or partly) measure functions; they are indirect, but concern the availability of multiple dimensions of meaning to comparatives with gradable adjectives in a way that standard theories would be hard pressed to predict.

[11] η signifies underspecification; it can either be an individual argument or an eventuality argument.

[12] We also need a rule of *much*-deletion to account for the absence of the morpheme overtly in comparatives with gradable adjectives, as well as DAs; see Wellwood (also Bresnan 1973) for details.

a. $[\![(24)]\!]^g = \lambda s.[\textsc{tall}(s) \ \& \ \textsc{holder}(s) = \text{John} \ \& \ g(\mu)(s) \succcurlyeq \delta_{\textit{than}}]$

* The function in (24a) will yield truth iff there is a tall state of which John is the holder, and the measure of that state is greater than or equal to the measure of Mary's own state of tallness

* Back to DAs: we want two measures of some property, and for them to stand in some relation to an event; with Wellwood's theory, those measures are measures of states

  – We also want to require that the measure of the first state plus a degree corresponding to an amount of change is less than or equal to the measure of the goal state[13]

* Previous literature (e.g. Abusch 1986, HK&L 1999, Križ 2011) has noted the following (near) equivalence:

(25) Gap A widened $\rightsquigarrow$ Gap A became wider.

(26) Bar C straightened $\rightsquigarrow$ Bar C became straighter[14]

* There is more to this (near[15]) equivalence—Bobaljik (2012) showed that, cross-linguistically, it is well attested that DAs are built from comparatives; in fact, it seems that German provides some evidence in favor of this idea

(27) *gut* 'good' (28) *bess-er* 'better' (29) *ver-bess-er-n* 'to better'

* We can, as a first pass, treat DAs as partly comparative structures; DA morphology builds on the contribution of [$much_{\mu}$ + *-er*]

(30) $[\![\text{-en}]\!] = \lambda f_{\eta d} \lambda d \lambda g_{d,\eta t} \lambda h_{st} \lambda e.\ \exists s,s'[h(s) \ \& \ h(s') \ \& \ \mathbb{R}(e)(s)(s') \ \& \ g(f(s) + d)(s')]$

* *-en* takes a measure function, a degree (the differential), a function from degrees to sets of (underspecified) objects, and returns a predicate of events

* What is $\mathbb{R}$, though? Modifiers give us an important clue

(31) Mary ran from the store to the library.

(32) Gap A widened from 1 inch to 9 inches.

[13] We could demand something stronger, namely equality of the measures; I do not make this assumption for now, leaving this open as a possibility.

[14] Note that this is probably too weak across the board—it's the case that *straighten* seems to mean more often *become straight*. This is the reason for the view that verbs like this are default telic. *Becoming straight* is a special case of *becoming straighter*:

(1) # The bar straightened but it didn't become straight.

(2) # The bar straightened but it didn't become straighter.

[15] I'll come back to this hedging in a moment.

* *from*-adverbials specify the SOURCE of some event, and *to*-adverbials specify the GOAL (Dowty 1989, Jackendoff 1985); typically they are taken to relate an entity to an event

(33) $[\![\text{from}]\!] = \lambda x \lambda e.\ \textsc{source}(e) = x$

(34) $[\![\text{to}]\!] = \lambda x \lambda e.\ \textsc{goal}(e) = x$

(35) $[\![\text{Mary ran to the park from the store}]\!] = 1$ iff
$\exists e[\textsc{run}(e)\ \&\ \textsc{agent}(e)(\text{Mary})\ \&\ \textsc{goal}(e)(\text{the park})\ \&\ \textsc{source}(e)(\text{the store})]$

* (32) is important because it tells us (i) how to reconstruct the differential argument (i.e. the difference between these two degrees) and (ii) that those measures *are* the measures of the two relevant states

* In line with Wellwood's theory, then, we can give a more general semantics to *from* and *to*—sources and goals can be of type e, d, or v, which we signify via η[16]

(36) $[\![\text{from}]\!] = \lambda \alpha_{\eta} \lambda e.\ \textsc{source}(e) = \alpha$

(37) $[\![\text{to}]\!] = \lambda \alpha_{\eta} \lambda e.\ \textsc{goal}(e) = \alpha$

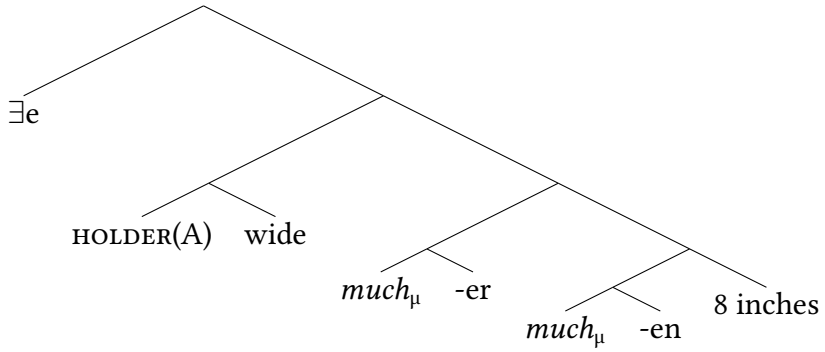
* We can now in a position to specify $\mathbb{R}$: it's actually two relations, SOURCE and GOAL, which can be overtly specified out via adverbials

(38) $[\![\text{en}]\!] = \lambda f_{\eta d} \lambda d \lambda g_{d,\eta t} \lambda h_{st} \lambda e.$
$\exists s,s'[h(s)\ \&\ h(s')\ \&\ \textsc{source}(e) = s\ \&\ \textsc{goal}(e) = s'\ \&\ g(f(s) + d)(s')]$

* With this, we can account for our basic cases

(17a) Gap A widened 8 inches.

a.



(39) $[\![\Theta_{\textsc{holder}}]\!] = \lambda x \lambda s.\ \textsc{holder}(s) = x$ $\langle e,st \rangle$

(40) $[\![\text{wide}]\!] = \lambda s.\ \textsc{wide}(s)$ $\langle s,t \rangle$

(41) $[\![(10a)]\!]^g = 1$ iff $\exists e \exists s \exists s'[\textsc{source}(e) = s\ \&\ \textsc{goal}(e) = s'\ \&\ \textsc{wide}(s)\ \&\ \textsc{holder}(s) = GA\ \&\ \textsc{wide}(s')\ \&\ \textsc{holder}(s') = GA\ \&\ g(\mu)(s') \succcurlyeq g(\mu)(s) + 8\ \text{inches}]$

[16]This is too quick, though; intuitively we want to *measure* those source and goal states, and have the adverbials say that their measure is some degree. I leave spelling this out more clearly for another time.

* The truth conditions in (41) seem right—they tell us that (17a) is true so long as Gap A's wide state measure at the end of an event e is 8 inches greater than its wide state measure at the beginning of that event[17]

* Unlike in K&L's system, there is no need for a morpheme competing with POS to introduce a differential; this comes for free with the semantics in (30)[18]

* We can now say something more concrete about variable telicity

  - In the absence of an overt differential, we can assume that there is existential closure over degrees (Rett 2008), or else a degree pronoun (in contexts where there is a contextually salient differential value, perhaps bindable (Schwarzschild 2010))

  - The former yields atelic interpretations, and the latter telic

* Quite important (and not discussed by K&L) is the role *to*- adverbials play in yielding telic predicates

  - (32), and its more minimal sister below, are both telic

    (42) Gap A widened to 9 inches.

  - These kinds of phrases can be left implicit as well (clearest, I think, in causative structures)

* Importantly, I've not said anything about default (a)telicity; I suspect that characterizing the relevant property of DAs as default *telicity* is not the right way to think of it

* K&L say that *widen* only ever has a telic interpretation as a marked option without overt material (e.g. *to*-adverbials, or differentials; 2008:fn.6), but they are conflating two properties DAs can have: telicity and a 'positive' interpretation

  - It's true that *widen* never has a 'positive' meaning like *become wide*; but this doesn't mean it doesn't have telic interpretations!

  - On the other hand, *straighten* typically seems to mean *become straight*, but it also can mean *become straighter*, which is the only interpretation available in comparatives

    (43) CONTEXT: Bar C was originally 90°, and Mary straightened it to 45°. Bar D was originally 45°, and John straightened it to 15°.

[17] This is misleading; given the meaning of *-er*, the relation between the two measures is $\succ$; I'd have to posit that ABS actually appears in the structure of DAs to get it right. For now, I'll be sloppy, and face the consequences later.

[18] An alternative would have the differential introduced in a neodavidsonian way via a functional head, likely *by*, and would likely necessitate introducing the differential and the second *much* just below existential closure over events. We'd need to guarantee, though, that a monotonic mapping from events to measures of difference, and I'm not sure how this would work, if it would at all. I leave this open for now.

a. Mary straightened Bar C more than John straightened Bar D.

- (43a) is true in this context because Mary's straightening involved more change than John's did; this seems to necessitate a comparative, rather than positive, semantics
- I take it, then, that the task is to show why some DAs, like *straighten*, have the stronger, positive interpretation, and why others only have the comparative interpretation, and I leave this open for now

5 Comparisons and prospects

* As it stands, we've improve on K&L by having a semantics that actually can yield measures of change, and which allows us to access endstate measures when necessary; we can also account for variable telicity
  - I've (fairly tenatively) suggested that **(ii)** needs to be understood in a different way, but I don't as of yet have anything positive to say[19]
* By the time we hit the end, there will lots of important open questions; for one, I'll have left out a proper discussion of comparatives of DAs, but here's a start

  (44) Gap A widened more than Gap B did.

  (45) Gap A widened 6 inches more than Gap B did.
* We can paraphrase (44) as "How much Gap A widened exceeds how much Gap B widened" and (45) as "How much Gap A widened exceeds how much Gap B widened by 6 inches"
  - This suggests a few things: (i) that DAs have a degree argument available, namely that which specifies how much something has changed; (ii) that comparatives of DAs target this degree argument
  - Importantly, it's not the case that we measure endstates with these comparatives—if that were the case, we'd predict (44) and (45) to be false contra to fact, since in the context the endstate wideness of Gap B is (in fact 6 inches, in fact) wider than Gap A
* A little more data, this time negative: the only available interpretations of these comparatives (if there is one) is that of number of events

  (46) # [Gap A widened 8 inches] more than [Gap B widened 2 inches].

  (47) * [Gap A widened 8 inches] [6 inches] more than [Gap B widened 2 inches].

  (48) # [Gap A widened to 9 inches] more than [Gap B widened to 15 inches].

  (49) # [Gap A widened from 1 inch] more than [Gap B widened from 13 inches].

[19] Buh dum chhhhhhhh.

(50) # [Gap A widened from 1 inch to 9 inches] more than [Gap B widened from 13 inches to 15 inches].

* (46) and (47) emphasize that what is being compared are measures of change; the same pattern can be found in comparatives of gradable adjectives

(51) Gap B is (6 inches) wider than Gap A is.

(52) * Gap B is 15 inches wider than Gap A is 9 inches.

* Further comparing DAs and other constructions that appear to be built on comparatives (e.g. superlatives, equatives, *too-* and *enough* constructions) is left for future work

* While I used modifiers as suggesting how the two states that *-en* quantifies over are related to the event it introduces, I've actually left quite open how their semantics works when you have a degree

(53) Gap A widened from 1 inch to 9 inches (in a few minutes).

(17a) Gap A widened 8 inches.

  - These adverbials say that the source is some measure; considering (53), the source is a 1 inch measure, and the goal is a 9 inch measure

* So our semantics for (53) would have [GOAL(e) = 9 inches] and [SOURCE(e) = 1 inch] as two of its conjuncts; but there would also be two states s_2,s_3 such that [GOAL(e) = s_2] and [SOURCE(e) = s_3]

  - This doesn't seem right—states are not degrees

* We'd need a semantics for these adverbials to measure the states

(54) $[\![\text{from 1 inch}]\!]^g = \lambda e.\ g(\mu)(\text{SOURCE}(e)) = 1 \text{ inch}$

(55) $[\![\text{to 9 inches}]\!]^g = \lambda e.\ g(\mu)(\text{GOAL}(e)) = 9 \text{ inches}$

* Where does this measurement come from? Is there more to the internal structure of these adverbials than meets the eye?

* Not all such adverbials (obviously) specify degrees, or at least would require some additional work to get there:

(56) Bar C straightened from completely bent.

* I'll conclude by comparing K&L's predecessor HK&L; recall that their semantics for *widen* looks very similar to ours

(57) λe. ∃d[**wide**(A)(END(e)) = **wide**(A)(INIT(e)) + d] HK&L

(58) λe. ∃s∃s'∃d[SOURCE(e) = s & GOAL(e) = s' & WIDE(s) & HOLDER(s) = A & WIDE(s') & HOLDER(s') = A & [g(μ)(s') ≿ g(μ)(s) + d]] CB

* While the net result is quite similar (both involve dual measurement, and involve a differential argument that is the basis for (part of) the account of variable telicity), the ways in which the semantic ingredients are packaged and composed are radically different

* On our account, DA morphology takes *much + er* as argument; this makes it possible to have a morphosyntax in line with Bobaljik's generalization

* What's not obvious is how HK&L could do the same; their account (and essentially any measure-functional analysis of adjectives and comparatives) would rely on the following pieces

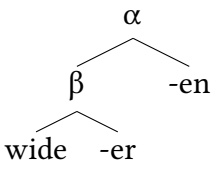
(59) $[\![\text{en}]\!] = \lambda f_{e,id}\lambda d\lambda x\lambda e.\ f(x)(\text{END}(e)) = f(x)(\text{INIT}(e)) + d$

(60) $[\![\text{er}]\!] = \lambda f_{e,id}\lambda d\lambda x\lambda t.\ f(x)(t) \succ d$

* We'd immediately hit a type mismatch if we were to have *en* take [wide +*er*] as input; we'd need to redefine *en* in order for the composition to work out

* Importantly, though, *en* needs to access two measures of the same kind, but this isn't possible with this sort of an analysis

(61)



(62) $[\![\beta]\!] = \lambda d\lambda x\lambda t.\ \textbf{wide}(x)(t) \succ d$

(63) $[\![\alpha]\!] = \lambda d\lambda x\lambda e.\ \textbf{wide}(x)(\text{END}(e)) \succ \textbf{wide}(x)(\text{INIT}(e)) + d$

* The semantics in (63), our target, would require *en* to have a meaning along the lines of the following

(64) $[\![\text{en'}]\!] = \lambda h_{d,eit}\lambda d\lambda x\lambda e.\ h(\textbf{\textit{wide}}\textit{(x)(init(e))} + d)(x)(\text{END}(e))$

* What is italicized is problematic; where does come from? We would need another *wide + er* present in the structure

* Without evidence for such ellipsis[20], and very tentatively, I will take this as a serious problem for HK&L, and note that the proposal developed here doesn't need to make such an unappealing

[20]Or some other mechanism.

6 References

Abusch, Dorit. 1986. Verbs of change, causation and time. Technical Report CSLI-85-59, Center for the Study of Language and Information, Stanford University.

Bobaljik, Jonathan. 2012. *Universals in comparative morphology: Suppletion, superlatives, and the structure of words.* Boston MA: MIT Press.

Bresnan, Joan. 1973. Syntax of the comparative clause construction in English. *Linguistic Inquiry* 4(3). 275-343.

Dowty, David. (1979). *Word meaning and Montague Grammar*, vol. 7. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Dowty, David. (1989). On the semantic content of the notion 'thematic role.' In Chierchia, Partee & Turner (eds.), *Properties, types and meaning: Semantic issues*, 69-129. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Fults, Scott. 2006. *The structure of comparison: An investigation of gradable adjectives.* College Park: University of Maryland dissertation.

Hay, Jennifer, Christopher Kennedy, & Beth Levin. 1999. Scale structure underlies telicity in 'degree achievements.' IN Matthes & Strolovitch (eds.), *Proceedings of Semantics and Linguistic Theory 9*, 127-144. Ithaca, NY: CLC Publications.

Higginbotham, James. 2000. On Events in Linguistic Semantics. In Higginbotham, Pianesi & Varzi (eds.), *Speaking of Events*, 49-79.

Kawamura, Tomoko. 2007. *Some interactions of focus and focus sensitive elements*: Stony Brook University dissertation.

Kearns, Kate. 2007. Telic senses of deadjectival verbs. *Lingua* 117:26-66.

Kennedy, Christopher. 2007. Vagueness and grammar: The semantics of relative and absolute gradable adjectives. *Linguistics & Philosophy* 30(1). 1-45.

Kennedy, Christopher & Beth Levin. 2008. Measure of change: the adjectival core of degree achievements. In McNally & Kennedy (eds.), *Adjectives and adverbs: Syntax, Semantics, and Discourse*, 156-182. Oxford, UK: OUP.

Kennedy, Christopher & Louise McNally. 2005. Scale structure, degree modification, and the sematnics of gradable predicates. *Language* 81(2). 345-381.

Križ, Manuel. 2011. *Issues in the Semantics of Degree Achievements*: Universität Wien diplomarbeit.

Landman, Fred. 2000. *Events and Plurality.* Norwell, MA: Kluwer Academic Publishers.

Martínez Vera, Gabriel. 2018. Superlatives across domains: Evidence from degree achievements in Southern Aymara. In Maspong, Stefánsdóttir, Blake and Davis (eds.), *Proceedings of Semantics and Linguistic Theory 28*, 1-20.

Menon, Mythili & Roumyana Pancheva. to appear. Degree Achievements of Color. In Cabrera & Camacho (eds.), *Exploring Interfaces.* Cambridge: Cambridge University Press.

Moltmann, Friederieke. 2009. Degree structure as trope structure: A trope-based analysis of positive and comparative adjectives. *Linguistics and Philosophy.* 32(1). 51-94.

Parsons, Terence. 1990. Events in the semantics of English: A study in subatomic sentences. In *Current studies in linguistics series no. 19*, 334. Cambridge, MA: MIT Press.

Rett, Jessica. 2008. *Degree modification in natural language.* New Brunswick, NJ: Rutgers dissertation.

Rotstein, Carmen & Yoad Winter. 2004. Total adjectives vs. partial adjectives: scale structure and higher-order modifiers. *Natural Language Semantics* 12(3). 259-288.

Schwarzschild, Roger. 2010. Comparative Markers and Standard Markers. In Erlewine & Sudo (eds.), *Proceedings of the MIT Workshop on Comparatives.* MIT Working Papers in Linguistics 69:87-105.

Svenonious, Peter & Christopher Kennedy. 2006. Northern norwegian degree questions and the syntax of measurement. In Frascarelli (ed.), *Phases of interpretation.* Studies in Generative Grammar 91:133-161. Berlin: Mouton de Gruyter.

Wellwood, Alexis. 2014. *Measuring Predicates.* College Park: University of Maryland dissertation.

Wellwood, Alexis. 2015. On the semantics of comparison across categories. *Linguistics & Philosophy* 38(1). 67-101.