Differential Degrees and Cross-Categorial Measure-Phrase Modification

Marcin Morzycki
Michigan State University

1 Introduction

The starting point:

(1) a. Clyde is six feet taller.
   b. Clyde is taller by six feet.

(2) a. Clyde is six feet tall.
   b. *Clyde is tall by six feet.

What accounts for this contrast? How do by measure phrases work?

A larger issue, to which the contrast in (1-2) is related:

(3) a. six feet tall
   b. 40 years old
   c. 20 minutes long

(4) a. six feet taller
   b. 40 years older
   c. 20 minutes longer

Examples such as those in (3), in which a measure phrase occurs with a positive (i.e., non-comparative) adjective, have often been taken to be prototypical of measure-phrase modification.

But there are reasons to think they may actually be misleading, and that differential measure phrases such as those in (4) are more basic.

The goal: Develop an account of the grammar of by measure phrases, and use this to approach broader questions about measure-phrase modification more generally.

2 Some Data

2.1 By Measure Phrases

By MPs occur in a number of syntactic categories:

(5) a. Floyd was late by 15 minutes.
   b. That book is overdue by six days.
   c. Floyd is taller than Clyde by six inches.

(6) a. The soup cooled by several degrees.
   b. The meeting was delayed by an hour.

(7) a. The flight is behind schedule by two hours.
   b. The gas station is past the intersection by about a mile.
   c. The arrow is above the target by a few inches.

(Caveat: the PP judgments sometimes seem a little more brittle than the others.)

These are categories that generally accommodate ordinary (bare) measure phrases—in one form or another—as well:

(8) a. Floyd was 15 minutes late.
   b. That book is six days overdue.
   c. Floyd is six inches taller than Clyde.

1 Schwarzschild (2005) most directly; also Kennedy & Levin (to appear) on ‘measure of change’ in degree achievements and Svenonius & Kennedy (2006) on a corresponding adjectival syntax.)
(9)  a. The soup cooled several degrees.
    b. The meeting was delayed an hour.

(10) a. The flight is two hours behind schedule.
    b. The gas station is about a mile past the intersection.
    c. The arrow is a few inches above the target.

But it’s not the case that by MPs and bare MPs occur with exactly the same predicates.

AP contrasts:

(11) a. Floyd is six feet tall.
    b. *Floyd is tall by six feet.

(12) a. The meeting is an hour long.
    b. *The meeting is long by an hour.

(13) a. Clyde is 40 years old.
    b. *Clyde is old by 40 years.

VP contrasts:

(14) a. Floyd slept six hours.
    b. *Floyd slept by six hours.

(15) a. Norma talked an hour.
    b. *Norma talked by an hour.

In PP, by MPs and bare MPs seem to generally have the same distribution. Possible exceptions:

(16) a. The meeting was half an hour ago.
    b. *The meeting was ago by half an hour.

(17) a. The monkey was two meters from the tree.
    b. *The monkey was from the tree by two meters.

So: by MPs group together comparatives, some PPs, and some VPs, excluding positive APs. Common thread: by MPs do ‘differential measurement’.

3 In the right contexts this may have a ‘too long’ interpretation on which it’s grammatical—more on that below.

2.2 Slightly and Somewhat (and Lexicalized MPs)

Slightly and somewhat also have a cross-categorial distribution—one that mirrors that of by MPs rather than bare MPs:

Adjectives:

(18) a. Floyd is \{slightly somewhat\} taller than Clyde.
    b. Floyd is taller than Clyde by several feet.

(19) a. This box is \{slightly somewhat\} too wide.
    b. This box is too wide by a few centimeters.

(20) a. *Floyd is \{slightly somewhat\} tall.
    b. *Floyd is tall by several feet.

(21) a. *This box is \{slightly somewhat\} wide.
    b. *This box is wide by a few centimeters.

Verbs:

(22) a. The soup cooled \{slightly somewhat\}.
    b. The soup cooled by several degrees.

(23) a. The meeting was delayed \{slightly somewhat\}.
    b. The meeting was delayed by an hour.

(24) a. *Floyd slept \{slightly somewhat\}.
    b. *Floyd slept by six hours.

(25) a. *Norma talked \{slightly somewhat\}.
    b. *Norma talked by an hour.
Prepositions:

(26) a. The flight is \{slightly, somewhat\} behind schedule.
   b. The flight is behind schedule by two hours.

(27) a. The gas station is \{slightly, somewhat\} past the intersection.
   b. The gas station is past the intersection by about a mile.

(28) a. The arrow is \{slightly, somewhat\} above the target.
   b. The arrow is above the target by a few inches.

(29) a. *The meeting was \{slightly, somewhat\} ago.
   b. *The meeting was ago by half an hour.

(30) a. *The monkey was \{slightly, somewhat\} from the tree.
   b. *The monkey was from the tree by two meters.

To some extent, fixed lexicalized MPs such as a little and a bit have a distribution similar to that of by MPs:

(31) a. Floyd is \{a little, a bit\} taller than Clyde.
   b. This box is \{a little, a bit\} too wide.

(32) a. *Floyd is \{a little, a bit\} tall.
   b. *This box is \{a little, a bit\} wide.

These lexical MPs differ from slightly and by MPs in their behavior in the verbal domain:

(33) a. The flight is \{a little, a bit\} behind schedule.
   b. The gas station is \{a little, a bit\} past the intersection.
   c. The arrow is \{a little, a bit\} above the target.

(34) a. *The meeting was \{a little, a bit\} ago.
   b. *The monkey was \{a little, a bit\} from the tree.

I don't know why there should be this difference between the behavior of lexicalized MPs and slight/somewhat. More generally, lexicalized MPs give rise to various idiosyncrasies that deserve separate consideration.5

5For example, a great deal and a lot are somewhat odd with some PPs (a great deal behind schedule vs a great deal past the intersection), and much seems largely restricted to AP (Floyd slept much, much past the intersection). Schwarzschild & Wilkinson (2002) suggest that degree much is essentially a kind of mass quantifier, like determiner much, and Schwarzschild (2006) discusses mass quantifiers in the adjectival domain more broadly. Kennedy & McNally (2005) suggest that much is sensitive to whether a standard normally defaults to the bottom of a scale.

4These impossible on the relevant interpretation, but more or less perfect on the too tall/wide interpretation.
So: *slightly* and *somewhat* group together comparatives, some PPs, and some VPs, excluding positive APs. Common thread: these modifiers too do ‘differential measurement’.  

2.3 Schwarzschild’s Bare MP Observations

Schwarzschild (2005): Adjectives in general permit MPs with the comparative, but there are many that do not permit MPs with the positive:

(37)  
a. *6 lbs heavy/light
b. *30 degrees hot/cold/warm
c. *80 mph fast/slow
d. *$5 cheap/expensive
e. *2 inches big/small
f. *3 shades dark/light
g. *50 decibels loud/soft
h. *$106 rich/poor
i. *20 IQ points intelligent/stupid
j. *2 percentage points likely
k. *2 degrees acute
l. *200 pounds fat/thin
m. *The winds are 25 mph strong.
n. *30 miles close/far/near
o. *600 watts powerful
p. *20 points popular

These are all good in the comparative.

So: MPs are possible with comparative adjectives in general, but not necessarily with corresponding positive forms. Again, they seem to do differential measurement.

2.4 Beyond English

A number of languages do not allow MPs with positive adjectives, but do allow them with comparatives and with PPs.

Positive APs:

(38) **Polish**:  
*dwa metry duży* two meters big

(39) **Japanese**:  
*kono nekutai-wa 65-inch nagai* this necktie-TOP 65-inch long

(40) **Russian**: *(na) dva metra vysokij* (on) two meters tall

(41) **French**: *(Schwarzschild 2005)*  
*grand de 1.27m* 1.27m ‘1.27 meters tall’

Comparatives:

(42) **Polish**:  
dwa metry *większy* two meters bigger

(43) **Japanese**:  
*kono nekutai- wa ano nekutai- yori 5-inch nagai* this tie- TOP that tie- than 5-inch long  
‘This tie is 5 inches longer than that tie.’

(44) **Russian**:  
*na 20 samtimetrov vyshie* on 20 centimeters taller

*20 centimeters taller*

---

6The correspondence isn’t perfect, though, if we take *ago* and *from* to be differential.

(45) French:  
plus grand que Marie de 2 centimetres  
morebigthanMarieof2centimeters  
‘2 centimeters bigger than Marie’

PPs:

(46) Polish:  
(a) kilka metrów przed szczytem  
severalmetersfromsummit  
‘Wells Hall is 500 feet away from here’  
(b) dwa metry ode mnie  
twometersfromme

(47) Japanese:  
(a) Wells Hall- wa koko hanarete- iru  
Wells Hall- top here-frombe  
‘Wells Hall is 500 feet away from here’  
(b) kaigi- no 10-ppun mae  
meeting-gen10minutesbefore

(48) Russian:  
(a) (v) 10 metrov za perekrestkom  
10metersbehindintersection  
(b) v metrax ot perekrestka  
inmetersfromintersection  
‘some distance from the intersection’

(49) French:  
à 10 mètres de l'intersection  
at10metersfromtheintersection

So: cross-linguistic data groups comparatives with some PPs, and some VPs, excluding positive APs. Same common thread: MPs are systematically possible where there is differential measurement.

2.5 Generalizations and Conclusions So Far

- by MPs and various related degree modifiers are possible with comparative APs, PPs, and some VPs, but not with positive APs
- bare MPs are possible with comparative APs, but not with many positive APs that one might have expected to permit them
- in various languages, MPs are possible with comparative APs, PPs, and some VPs, but not with positive APs
- more generally, then MPs in comparative APs and PPs and some VPs form a natural class that excludes those that modify positive APs
- MPs in positive APs are the marked case, not only relative to MPs in comparatives (as Schwarzschild [2005] suggests), but relative to MPs in other syntactic categories as well
- MPs tend to do differential measurement (in some languages and for by MPs, this is the only option)

3 Theoretical Tools: Points, Intervals, and Degree Morphemes

3.1 Schwarzschild (2005): Points vs Intervals

Schwarzschild [2005] proposes an understanding of the unmarked character of MPs in comparatives, which I will build on below.

The core intuition:

(50) ‘If the purpose of a measure phrase is to describe a gap, and comparatives necessarily entail the presence of a gap, it is no surprise that they fit together so snugly.’

To implement this, he treats measure phrases as predicates of intervals on a scale (extents).8

(51) a. John is two inches taller than Mary.

b. two-inches′(\[\max\{d : \text{tall}'(m, d)\}, \max\{d : \text{tall}'(j, d)\}\])

c. ‘the size of the interval from Mary’s height to John’s height is two-inches’

8I’ve changed his logical representation here by replacing some operators with their definitions. I’ve also changed his UpLim upper-limit predicate to MAX, which I think will do the same thing, given that he assumes in this paper that tall is a predicate of points on a scale rather than intervals.
He treats adjectives themselves as predicates of points on a scale. Thus (52) is correctly predicted to be ill-formed:

(52) a. *Mary is 50 pounds heavy.
    b. ∃d[heavy′(m, d) ∧ 50-pounds′(d)]

If d is a point, 50-pounds′(d) will be undefined (because 50-pounds′ is a predicate of intervals); if d is an interval, heavy′(d) will be undefined (because heavy′ is a predicate of points).

What to do for (53), which for the same reasons is also predicted to be bad?:

(53) a. *Mary is 5 feet tall.
    b. ∃d[tall′(m, d) ∧ 5-pounds′(d)]

He proposes a lexical rule:

(54) Homonym Rule, from degrees to intervals:
    If A has meaning A′ that relates individuals to degrees
    then A has a secondary meaning relating individuals to sets
    of degrees (intervals). The secondary meaning is given by:
    λIλx . I = {d : A′(x, d)}

(55) Homonym Rule applies to tall, wide, deep, thick, old, long, high

This correctly predicts that MPs in comparatives should be basic, and that MPs in positive forms are marked and require special machinery.

Also, gives substance to the tendency to talk about 'differential(degree)s' as though they were an ontologically distinct object from ordinary degrees.

3.2 Degree Morphemes


(56) DegP
    six feet
    Deg
    Meas
    AP
    tall

A null degree head Meas specifically for introducing MPs.

Makes possible explanations in terms of syntactic terms of MP distribution:

- Why not *six pounds heavy? Meas doesn't select heavy.
- Why no MPs with positive adjectives in some languages? Meas doesn't select comparative morphology in some languages.
- Why by MPs possible where bare MPs aren't? By MPs aren't introduced by Meas.

A related idea: Kennedy & Levin (to appear) observe that in degree achievements, measurement is inherently differential:

(57) The gap boats widened six inches.

This doesn't mean that the gap came to be six inches.

Both comparatives and degree achievements involve 'a difference function with a scale whose minimal element—the 'derived zero'—corresponds to the degree introduced by' the standard of comparison.

‘One of the general properties of this morpheme, however, is that it can always combine with difference functions.’

3.3 Worries

On the points vs. intervals approach: How to reconcile the point-based degree semantics of adjectives with arguments that degrees are always intervals (Kennedy [2001] Schwarzchild & Wilkinson [2002] among others)?


In particular: If positive *tall* and *short* are predicates of points on a scale, we lose [Kennedy (2001)]'s explanation of *five feet short* (and of polar anomaly as well).

The [Kennedy (2001)] account: Degrees of tallness can be measured because they are finite intervals on a scale, as in (58); degrees of shortness are degrees of not-tallness and hence not finite, as in (59), so can’t be measured by e.g. *five feet*:

(58)

![HEIGHT SCALE]

On the degree-morpheme approach:

- The notion of a ‘difference function’ is pretty intuitive, but why would measure phrases (or their associated degree head) tend to *insist* on this? Why would the default/unmarked case be to measure on a derived scale, and the special/marked case to measure on a basic scale? Shouldn’t it be the reverse?
- Secondary concern: it is not MPs themselves that require differential measurement, so it’s not clear that this reflects that this is more basic than the alternative (if both require additional degree morphology).

4 Differential Degrees as Discontinuous Extents

4.1 Sorts of Degrees

Desiderata:

- ontological (sortal) distinction between differential and ‘ordinary’ degrees, as in [Schwarzschild (2005)]
- preserving [Kennedy (2001)] satisfying account of *tall* vs. *short*
- preserving [Schwarzschild (2005)]’s satisfying account of why MPs by default do differential measurement

One way of thinking about the problem: We’d like for both ordinary and differential degrees to be intervals, as in (59):

(59)

![HEIGHT SCALE]

We’d like to do this in a way that allows making a sortal distinction between differential and ordinary degrees.

The representation in (59) does allow making such a distinction: differential degrees are those that start measuring in the middle of a scale.

But why would MPs *prefer* to measure from the middle, rather than from an endpoint? Why would they be so perverse?

An answer: Take the intuition that measure phrases are ‘predicates of gaps’ [McConnell-Ginet (1973), Schwarzschild (2005)] very seriously. A differential degree is not an interval in the middle of a scale, as in (59), but rather a *gap* in a scale, as in (60):

(60)

![HEIGHT SCALE]

So why do MPs insist on measuring from somewhere other than the bottom of a scale (or else, on measuring on a derived scale)? They don’t. They just require two (nonzero) intervals to measure the distance between.
This is compatible with—and in fact naturally complements—the Kennedy (2001) conception.

Sortal typology of degrees:

- finite degree: finite interval on a scale
- non-finite degree: non-finite interval on a scale
- differential degree: two intervals on a scale separated by a gap; the union of a finite and negative degree

Measure phrases can thus be predicates of a particular sort of degree, as Schwarzschild (2005) would have it—crucially, differential degrees.

4.2 Differential Comparatives

(61) Clyde is ten centimeters taller than Floyd.

(62) ten-centimeters(tall(Floyd) ∪ −tall(Clyde))

Assuming a syntax in which there are no additional degree heads beyond the comparative morpheme and a Kennedy (1997)-style adjective semantics:

(63) [more tall than Floyd]  
    = λm_{d, t} λx . m(tall(Floyd) ∪ −tall(x))

[ six feet more tall than Floyd ]  
    = λx . six-feet(tall(Floyd) ∪ −tall(x))

Aside: early and late, flat and sharp, fast and slow when predicated of timepieces are in a sense inherently comparative Kennedy (2001), Schwarzschild (2006). Both members of each pair allow measure phrases, in a number of languages, and both allow by MPs. These could be understood as inherently providing differential degrees.

4.3 By Phrases

By MPs can have exactly the same denotation as the corresponding bare MPs:

(65) Clyde is taller than Floyd by ten centimeters.

(66)

4.4 Positive Adjectives

What to make of positive adjectives?

11To spell this out in this sort of system, adopting single MP-licensing head, as Svenonius & Kennedy (2006) do, would be helpful.
In cases where the measure phrase is not possible—as is the case for many measure phrases and in many languages—nothing special needs to be said, beyond some form of standard assumptions (for this kind of syntax)\(^\text{12}\):

\[
\begin{align*}
&DegP(e, t) \rightarrow \\text{Deg'} \\
&Deg(e_d, e_t) \rightarrow \text{AP}(e_d, e_t) \\
&\text{POS} \quad \text{heavy}
\end{align*}
\]

\[
\begin{align*}
&DegP(e, t) \rightarrow \\text{Deg'} \\
&Deg(e_d, e_t, dt) \rightarrow \text{AP}(e_d, e_t) \\
&tall(e_d, e_t)
\end{align*}
\]

MPs are impossible here for straightforward type-theoretic reasons. Even apart from that, \textit{heavy}(x) could not be measured, since it isn’t a differential degree.

How to account for the marked cases where an MP is possible with a positive adjective? Something like the MP-licensing head of Svenonius & Kennedy (2006):

\[
\begin{align*}
&DegP(e, t) \rightarrow \\text{Deg'} \\
&Deg(e_d, e_t, dt) \rightarrow \text{AP}(e_d, e_t) \\
&tall(e_d, e_t)
\end{align*}
\]

A syntactic assumption: \textit{MEAS} requires that its specified be filled (for case reasons, say).

\[
\begin{align*}
&\text{MEAS} = \lambda a(e, d) \lambda x. a(x) \geq d_s
\end{align*}
\]

This is a weird denotation. (Why the extrinsic reference to the bottom of the scale? What independent reason for manipulating \textit{tall}(x) at all?) Good.

This ‘builds’ a differential degree roughly as in (72):

\[
\begin{align*}
&\text{HEIGHT SCALE} \\
&tall(Floyd) \\
&tall(Floyd) \cup \sim -tall(Clyde)
\end{align*}
\]

Why \textit{six feet tall} but not \textit{*tall by six feet}?

- \textit{POS tall by six feet} is uninterpretable for both type-theoretic and sortal reasons
- \textit{MEAS tall by six feet} is syntactically ill-formed (because \textit{MEAS} requires an MP in its specifier)

5 \textbf{Brief Speculation About Prepositions}

These are all good with bare MPs, as (72) reflects, and with \textit{by} MPs as well:

\[
\begin{align*}
\text{(73) a. } & \text{The gas station is (two blocks) \{} \begin{array}{l} \text{past} \\ \text{beyond} \end{array} \text{ the intersection.} \\
\text{b. } & \text{The coffee table is (two feet) \{} \begin{array}{l} \text{in front of} \\ \text{behind} \end{array} \text{ the sofa.} \\
\text{c. } & \text{The meeting is (15 minutes) \{} \begin{array}{l} \text{after} \\ \text{before} \end{array} \text{ class.} \\
\text{d. } & \text{The bird is (15 feet) \{} \begin{array}{l} \text{above} \\ \text{below} \end{array} \text{ the farm.}
\end{align*}
\]

All in a particular sense sense inherently comparative, much as \textit{early} and \textit{late}, \textit{flat} and \textit{sharp} are. They all involve measurement that can be construed as involving the middle of a scale (rather than an

\textsuperscript{12}The standard is represented here for simplicity as just \(d_s\). See e.g. Kennedy (2007) for a more serious implementation.
interval that includes an endpoint)—that is, as involving a differential degree.

In the case of past, beyond, in front of, behind, above, and below, the scale seems to start at the speaker (point-of-view ‘pivot’). The scale for after and before seems to either be open on both ends.

PPs that don’t have this property tend not to allow MPs.

(74) a. *The gas station is two blocks around the intersection.
b. *The coffee table is two feet on the sofa.
c. *The meeting is 15 minutes at six.
d. *The bird is 15 feet near the farm.

In these cases, the scale seems to start at the reference point provided by the object.

Working in terms of Vector Space Semantics, Zwarts & Winter (2000) and Winter (2005) propose an understanding of such restrictions in terms of a ‘Modification Condition’ which permits only PPs which do not impose a minimal or maximal distance between the located object and reference point to be modified.

The distinction between differential and ordinary degrees may provide another way of looking at this restriction.

6 Final Remarks

Summary:

- MPs tend to occur in differential structures, not only across language, but also across categories
- even in English, as by MPs reflect, positive adjectives that take bare MPs are unusual
- to model this, a sortal distinction should be made between ordinary and differential degrees
- MPs should be understood as inherently predicates of differential degrees
- differential degrees should be construed as gaps on a scale
- construing differential degrees this way allows degrees in general to be intervals
- it also explains why MPs should prefer to measure from non-zero points on a scale, an otherwise mysterious requirement

Among the remaining issues: PP? VP? Connection to e.g. telicity?

References


morzycki@msu.edu
http://www.msu.edu/~morzycki
Dept. of Linguistics and Languages
Michigan State University
East Lansing, MI 48824
USA