How to properly order your times

Before and *after* as plain degree comparatives

0 Introduction

Two potential representations for time:

(1) long time ago < some time ago < recently

(2) recently < some time ago < long time ago

(1) is by far the most intuitive, and is usually taken for granted. In what follows, I present two types of evidence where it seems that natural language (English) makes reference to the much less intuitive mirror order in (2).

1 The anatomy of a comparative

- Any comparison of height can be broken down as follows:

$$\text{Comparandum} + \left\{ \begin{array}{l} \text{more} \\ \text{less} \end{array} \right\} + \left\{ \begin{array}{l} \text{tall} \\ \text{short} \end{array} \right\} + \text{comparatum}$$

- Some of these combinations are synonymous: 'more tall' = 'less short', and 'more short' = 'less tall'.
- Using this strategy, we can generate potential meanings to try to reduce *before* and *after* to:
  Candidate pool: {more, less} (relations) × {late, early} (scales)[1]
- How do we go about choosing the right entries? A priori guess: either the scale is going to be invariant, or the relation will be.
- Truth tables!:
  Model: With times the natural numbers, A = {1,2,3}, B = {2,3,4}.

  (3) A x B iff $\exists t \in A$ [$\text{rel}_{\text{scale}}(t, \text{MAX}_{\text{rel}_{\text{scale}}}(\text{B}))$]

(4)

	late	**early**	conn.	
A	more F	**less** **T**	after T	B
A	less T	**more** **T**	before T	B
B	more T	**less** **T**	after T	A
B	less T	**more** **F**	before F	A

(5)

	less	more	conn.	
A	early T	late F	after T	B
A	late T	early T	before T	B
B	early T	late T	after T	A
B	late T	early F	before F	A

- *Early* patterns with the temporal connectives.

[1] I group dimension and order together as 'scale'.

- We cannot arrive to the same result with an "A-not-A" analysis, because it's the *relation* on which the two temporal connectives differ, and not the scale.

This is a good reason to adopt a scale as in (2).

- (3) departs from a usual analysis of comparatives: MAX only applies to the comparatum B, and not to A. This is required to capture the truth conditions. The intuitions:

- (5) a. Pam was a vegan after Pat was. (T)
  b. Pam was a vegan before Pat was. (T)
  c. Pat was a vegan after Pam was. (T)
  d. Pat was a vegan before Pam was. (F)

(6)
$$\frac{\text{Pam a vegan}}{\text{Pat a vegan}}$$

- Everyone working on *before* and *after* assumes truth conditions as in (5).
- Under the present analysis, applying MAX to the first argument as well as the second has the effect of making (5a) false—making (5a)/(5b) and (5c)/(5d) genuine sentential converses.
- To the extent that (5a) can be judged as true, something needs to be said; why can't (7a)/(7b) be both simultaneously true the same way (5a)/(5b) can?

- (7) a. Pam is less tall than Pat is.
  b. Pam is taller than Pat is.
  c. Pam is as tall as Pat is.

- The lower bound of Pam, Pat, or anyone on the scale of tallness is always the same!—It is the lower bound of the scale itself. In other words (7b) entails (7a), regardless of who Pam or Pat is. So (7a) is forever uninformative in a context where (7b) is true.
- MAX(A) in (7a) is an implicature. It is all the more a strong implicature because (7c) separates (7a) from (7b).
- Turning to times, the picture is different because *before* does not entail *after* when the compared times don't overlap. So (5a) can still be informative in a context where (5b) is true.
- This is so because Pam and Pat can have different lower bounds on the scale of time, as they do in (6).

2 MAX is EARLIEST

- Beaver & Condoravdi (2003) propose the following meanings for the temporal connectives:

(8) $\llbracket \text{before B} \rrbracket = \lambda t\ [t < \text{EARLIEST}(\llbracket B \rrbracket)]$
$\llbracket \text{after B} \rrbracket = \lambda t\ [t > \text{EARLIEST}(\llbracket B \rrbracket)]$
$\text{EARLIEST}(\phi) = \iota t\ [\forall t' \in \phi, t \leq t']$

- They suggest that EARLIEST is pragmatically selected, for unknown reasons. As far as I know, no one has been able to motivate this operator independently.
- Once we adopt a scale of time as in (2), EARLIEST becomes indistinguishable from MAX, a well-motivated operator.

> It is the inherent direction of the scale of time that biases us to consider earlier times.

- But is this scale only used for *before* and *after*, or do we see reflexes of it elsewhere?

3 Degree-sensitive *only*

- The usual (Horn 1969) analysis of *only* treats it as associating with focus to generate alternatives at the propositional level.
- The scope of *only* is presupposed, and the propositional alternatives generated are asserted to be false.

(9) I had only three danishes.
Presupposed: I had three danishes.
Asserted: ¬ (I had {4, 5, 6...} danishes.)
Implied: Three danishes is not a lot of danishes.

- The weaker propositional alternatives are not denied for obvious reasons: they are entailed by the presupposition.
- We can say that the added implication arises as a direct consequence of the assertion and presupposition: 'once you consider those alternative (stronger) propositions, my danish eating claim is modest'.
- The implication cannot always be explained this way:

(10) He had only at most three danishes.
⇝ Three danishes is not a lot of danishes.
(11) He promised to eat as few danishes as possible, and said he'll have only three.
⇝ Three danishes is not a lot of danishes.

- Here the alternative (stronger) propositions 'He had at most {1, 2} danishes' are not entailed by the presupposition, yet they fail to be ruled out by *only*.
- *Only* then fails to weaken its prejacent as it did in (3). But it succeeds in triggering the 'modest danish eating' implication.

> *Only* must be sensitive to something more local than propositional strength to trigger its modesty implication. It must be sensitive to the scale of its focus.

- If we take *only* to express that its focus fails to meet a contextual degree, we predict the behavior of (10) and (11). All we need to say is that part of the meaning of these sentences is 3 < *contextual standard*.

4 *Only* and times

- (12) He showed up only at 6 o'clock.
  ⇝ 6pm was a late time to show up at.
  (12′) He wants to show up as late as possible, and said he'll show up only at 6 o'clock.
  ⇝ 6pm is a late time to show up at.
  ⇝̸ 6pm is an early time to show up at.
- The fact that *only* rigidly gives rise to a "lateness" implication is evidence that it feeds on a scale as in (2).
- A potential derivation for (12), where t is a variable for a (simplex or complex) time, T is a variable for a set of times (the type of saturated VPs and temporal adjuncts), Std is a contextual simplex time acting as the standard of comparison for *only*. As is argued in this paper, < counterintuitively reads "is less early than".

(13)
$$\begin{aligned}
[\![\text{only}]\!] &= \lambda T\ [T]\ \langle \forall t \in T, \text{MAX}(t) < \text{Std}\rangle^2 \\
[\![\text{he showed up}]\!] &= \lambda t\ [\textit{showup'}(\textit{he'})(t)] \\
[\![\text{at 6 o'clock}]\!] &= \lambda t\ [6 = \text{MAX}(t)] \\
[\![\text{only at 6 o'clock}]\!] &= \lambda t\ [6 = \text{MAX}(t)]\ \langle 6 < \text{Std}\rangle \\
[\![\text{he showed up only at 6 o'clock}]\!] &= [\![\text{he showed up}]\!] \cap [\![\text{only at 6 o'clock}]\!] \\
&= \lambda t\ [6 = \text{MAX}(t) \wedge \textit{showup'}(\textit{he'})(t)] \quad \langle 6 < \text{Std}\rangle \\
\text{(existential closure)} &= [\exists t, \text{now} < t \wedge 6 = \text{MAX}(t) \wedge \textit{showup'}(\textit{he'})(t)] \\
&\qquad \langle 6 < \text{Std}\rangle
\end{aligned}$$

5 *Only* and comparatives

- Additional puzzle when we consider comparatives. The observation is that 'only {less, after}' is acceptable, but 'only {more, before}' is always out.
- (14) { I beat you, / You beat me, } because I have only { less / #more } flour than you.

[2] It's unclear what kind of content *only*'s contribution is. It seems to project, in any case. I explicitly leave it out of the asserted content here, by placing it in angled brackets ⟨.⟩.

(15) $\left\{ \begin{array}{l} \text{I beat you,} \\ \text{You beat me,} \end{array} \right\}$ because I had no flour left only $\left\{ \begin{array}{l} \text{after} \\ \text{\#before} \end{array} \right\}$ you.

- A derivation like (13) handles this observation, by preventing 'only {more, before}' sentences from being true under any circumstances.
- *Only more than X:* any more than X is less than the contextual standard.
  Only before X: any time before X is later than the contextual standard.
- Compare to legitimate:
  Only less than X: any less than X is less than the contextual standard.
  Only before X: any time after X is later than the contextual standard.
- It's crucial that *only* feed locally on the denotation of the temporal adjunct, so that it can make a comment about *every* time holding of this adjunct and not just times that also hold of the main predicate. That is:

(14b) # I have only more flour than you.
$\neq$ I have more flour than you, but less than the contextual standard.

- The otherwise unmotivated entry for *only* I propose does just that.
- For the sake of completeness, here's a derivation for (15b). In the extensional representations, plain numerals are atomic times, and underlined ones are complex times. Generalized summation, $\oplus$, acts as a type shift to make a set of times amenable to MAX.

(16) # I had no marbles left only before you.

$$
\begin{aligned}
[\![\text{only}]\!] &= \lambda T\ [T]\ \langle \forall t \in T, \text{MAX}(t) < \text{Std} \rangle \\
[\![\text{you}]\!] &= \lambda t\ [[\![\text{you had no marbles left}]\!](t)] \\
&= \{4, 5, \underline{45}\} \\
[\![\text{before}]\!] &= \lambda t.\lambda t'\ [\text{MAX}(t) < \text{MAX}(t')] \\
\oplus([\![\text{you}]\!]) &= \underline{45} \\
[\![\text{before you}]\!] &= \lambda t\ [\text{MAX}(\underline{45}) < \text{MAX}(t)] \\
&= \lambda t\ [4 < \text{MAX}(t)] \\
&= \left\{ \begin{array}{l} 3, \underline{34}, \underline{345}, \ldots \\ 2, \underline{23}, \underline{234}, \ldots \\ 1, \underline{12}, \underline{123}, \ldots \\ \vdots \qquad\qquad \ddots \end{array} \right\} \\
[\![\text{only before you}]\!] &= [\![\text{before you}]\!] \qquad\qquad \langle \forall t \in [\![\text{before you}]\!], \text{MAX}(t) < \text{Std} \rangle \\
[\![\text{I had no marbles left}]\!] &= \lambda t\ [P(t)] \\
[\![\text{S}]\!] &= [\![\text{I had no marbles left}]\!] \cap [\![\text{only before you}]\!] \\
&= \lambda t\ [4 < \text{MAX}(t) \wedge P(t)]\ \ \langle \forall t \in [\![\text{before you}]\!], \text{MAX}(t) < \text{Std} \rangle \\
\text{(existential closure)} &= [\exists t, \text{now} < t \wedge 4 < \text{MAX}(t) \wedge P(t)] \\
&\quad \text{The weirdness is here} \Rightarrow \langle \forall t \in [\![\text{before you}]\!], \text{MAX}(t) < \text{Std} \rangle
\end{aligned}
$$

6 Conclusions drawn

- *Before* and *after* can be paraphrased with '{more, less} early than', but not by '{less, more} late than'.
- Maybe they borrow the scale of earliness, then.
- But this scale is available to degree-sensitive *only* as well.
- I argue that it is simply the inherent natural scale of time.
- Degree-sensitive *only* cannot be reduced to propositional alternative-sensitive *only*.
- Degree-sensitive *only* associates locally with sets of degrees, so that its behavior with comparative PPs is predicted, i.e. *only {more, before}.