Deriving evaluativity in *even*-comparatives via presupposition accommodation

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I. Puzzle

- This project investigates the inferences scalar focus particles such as *even* trigger in comparative sentences
- There are two parts to this puzzle
  - ▷ Standard sensitivity / Evaluativity: relative to a contextually determined standard
  - ▷ Association with focus: inferences vary depending on the positioning of focal accent in the sentence

I.1. Evaluativity

- Positive inference first observed in Greenberg 2015

(1) Alex is *even* taller than Blake. [⇝ Both Alex and Blake are **tall**]

- Note that positive adjectives such as *tall* by themselves do not produce evaluative inferences in the comparatives. We cannot infer how Alex's or Blake's height is compared to the standard from (2) alone:

(2) Alex is taller than Blake.

- The evaluative inference must have been triggered by the addition of *even*
- Prior work has always assumed default pitch accent sentence-finally

I.2. Association with focus

- The empirical landscape is actually more complicated

(3) a. Alex is even taller than $[\text{Blake}]_F$. [⇝ Both Alex and Blake are **tall**]
b. $[\text{Alex}]_F$ is even taller than Blake. [⇝ Both Alex and Blake are **short**]

- We observe an unexpected scale-reversal in inferences when pitch accent is shifted to the target of the comparative
  - ▷ $\boxed{\text{Terminology side-note}}$ in the Degree literature, the subject of a comparative is referred to as the TARGET, and the object of *than*-clause in a phrasal comparative as the STANDARD (not to confuse with the standard on a scale, which is conventionally understood as a small range around the median, see Solt 2011 for more details)

II. Existing semantic approach

- Positive inference (1) is taken as one of the main arguments to enrich the meaning of *even* from its classic formulation (Karttunen and Peters 1979; Rooth 1992; Chierchia 2013; a.o.)

(4) **Classic (un)-likelihood analysis of *even***
$[\![even]\!]^{g,c} = \lambda C.\lambda p : \forall q \in C\,[q \neq p \rightarrow p <_{\text{likely}} q].p$
i.e., the prejacent p is the least likely among its alternatives in the context C

to a more involved one by explicitly encoding some version of a positive condition in its semantics

II.1. Greenberg 2015: Gradability-based account

- A more radical revision by dispensing with the likelihood scale all together
- The presupposition of *even* is instead imposed on a contextually determined scale G
- In addition to the comparison between the prejacent p and its alternative q, both p and q also need to have degrees that are at least as high as the standard on G

(5) **Gradability-based analysis of *even*** (Greenberg 2015, 2018)

$$
\begin{aligned}
[\![even]\!]^{g,c} = &\lambda C.\lambda p.\lambda w : \forall q \in C\big[q \neq p \rightarrow \\
&\forall w_1, w_2[w_1 R w \wedge w_2 R w \wedge w_2 \in p \wedge w_1 \in [q \wedge \neg p]] \rightarrow \\
&[max(\lambda d_2.G(d_2)(x)(w_2))) > max(\lambda d_1.G(d_1)(x)(w_1)) \quad \text{Superlative Condition (a)} \\
&\wedge \\
&max(\lambda d_1.G(d_1)(x)(w_1)) \geqslant \mathbf{Stand}_G\,]\big]. \quad \text{Positive Condition (b)} \\
&p(w) = 1 \quad \text{Assertion}
\end{aligned}
$$

where x is a non-focused entity within the prejacent p, C is the set of alternatives, and G is a contextually supplied gradable property

- Applying this analysis to the puzzle
- For (3-a) where focus is on the object *Blake*, following Greenberg 2018, assume *even* associates with the Degree Phrase *-er than Blake*[1]. The set of alternatives C is then

[1] I assume a phrasal comparison structure here for the ease of illustration. This is not crucial for Greenberg's analysis; phrasal comparison structure goes through in the same fashion.

(6) $C_{\text{(3-a)}} = \{$ Alex is as tall as Blake, Alex is taller than Blake $\}$
$= \{ \max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})) \geq \max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake})),$
$\max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})) > \max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake})) \}$

- Suppose the gradable predicate G measures degrees to which x is tall

(7) **Presupposition of (3-a) per Greenberg 2018**
$\forall w_1, w_2[w_1 Rw \wedge w_2 Rw \wedge w_2 \in [\max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})) > \max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake}))] \wedge$
$w_1 \in [\max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})) = \max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake}))]] \rightarrow$
$[max(\lambda d_3.\textsc{tall}(d_3)(\text{Alex})(w_2))) > max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})(w_1))$ Superlative Condition
$\wedge\, max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})(w_1)) \geqslant \text{Stand}_{\textsc{tall}}]]$ Positive Condition

- When and only when Blake's height is known or fixed in the context, the superlative condition is guaranteed to be trivially satisfied – Alex's degree of tallness in all accessible worlds where she is taller than Blake (p worlds) is higher than in all worlds where she is exactly Blake's height (*q-and-not-p* worlds)
- The positive condition requires that Alex's degree of tallness in the worlds where she is the exactly same height as Blake to be at least as high as the standard for tallness $\rightarrow$ Blake is tall, and since Alex is taller than Blake, Alex is also tall
- The reasoning goes through roughly as expected, but the additional assumption of the height of Blake being fixed seems too restrictive
- Sentences such as (3-b) where the focus is on the subject, on the other hand, pose a bigger issue
- Assume *even* associates with the subject *Alex*. The set of alternatives C is then

(8) $C_{\text{(3-b)}} = \{$ ALT(ALEX) is taller than Blake, Alex is taller than Blake $\}$

- Considering the simplest case where $\{x | x \in \text{ALT}(\textsc{alex})\}$ in this context is a singleton set containing only the individual *Dominique*
- Suppose the gradable predicate G again measures degrees of tallness. The scalar presupposition of the sentence (3-b) is thus

(9) **Presupposition of (3-b) per Greenberg 2018 (attempt 1)**
$\forall w_1, w_2[w_1 Rw \wedge w_2 Rw \wedge w_2 \in [\max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})) > \max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake}))] \wedge$
$w_1 \in [\max(\lambda d_3.\textsc{tall}(d_3)(\text{Dominique})) > \max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake})) \wedge$
$\max(\lambda d_1.\textsc{tall}(d_1)(\text{Alex})) \leq \max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake}))]] \rightarrow$
$[max(\lambda d_2.\textsc{tall}(d_2)(\text{Blake})(w_2))) > max(\lambda d_1.\textsc{tall}(d_1)(\text{Blake})(w_1))$
$\wedge\, max(\lambda d_1.\textsc{tall}(d_1)(\text{Blake})(w_1)) \geqslant \text{Stand}_{\textsc{tall}}]]$

- The first conjunct requires that Blake's degree of tallness in all accessible worlds where she is shorter than Alex (p worlds) is higher than in all worlds where she is shorter than Dominique but taller than Alex (*q-and-not-p* worlds). Assuming Alex's height is known and fixed, it is always false, which wrongly predicates the sentence to be infelicitous

- Attempting to resolve this issue, let's try reversing the scale, accommodating a $\textsc{g}'$ measuring degrees of **shortness**

(10) **Presupposition of (3-b) per Greenberg 2018 (attempt 2)**

$$\forall w_1, w_2[w_1 Rw \wedge w_2 Rw \wedge w_2 \in [\max(\lambda d_1.\textsc{short}(d_1)(\text{Alex})) > \max(\lambda d_2.\textsc{short}(d_2)(\text{Blake}))] \wedge$$
$$w_1 \in [\max(\lambda d_3.\textsc{short}(d_3)(\text{Dominique})) > \max(\lambda d_2.\textsc{short}(d_2)(\text{Blake})) \wedge$$
$$\max(\lambda d_1.\textsc{short}(d_1)(\text{Alex})) \leq \max(\lambda d_2.\textsc{short}(d_2)(\text{Blake}))]] \rightarrow$$
$$[max(\lambda d_2.\textsc{short}(d_2)(\text{Blake})(w_2))) > max(\lambda d_1.\textsc{short}(d_1)(\text{Blake})(w_1))$$
$$\wedge\ max(\lambda d_1.\textsc{short}(d_1)(\text{Blake})(w_1)) \geqslant \text{Stand}_{\textsc{short}}]]$$

- The first conjunct now requires that Blake's degree of **shortness** in all accessible worlds where she is shorter than Alex (p worlds) is higher than in all worlds where she is shorter than Dominique but taller than Alex (*q-and-not-p* worlds), which, assuming Alex's height is constant across all possible worlds, is trivially met
- The second conjunct requires that Blake's degree of shortness in the worlds where Alex is taller than her to surpass the standard for shortness, i.e., Blake is short
- It is important to note that the presupposition in (10) does not impose any condition on Alex's height relative to the standard
- We can only infer that Blake is short, but not that Alex is also short
- Unclear why this ad-hoc rescue strategy can be employed, and whether it is always available systematically
- In conclusion, the gradability-based account of *even*
  - ▷ is unsuccessful in capturing the complete inferences of comparative sentences with subject focus
  - ▷ imposes arbitrary restrictions on what needs to be known in the conversation background: the precise height of the focused element, Blake in (3-a) and Alex in (3-b), needs to be known for the derivation to go through
  - ▷ leaves open how the relevant $\textsc{g}$ is determined, it remains a mystery why the scale is reversed for the minimal pair (3)

II.2. Daniels and Greenberg 2020: Adding positive condition to the classic analysis

- Minimally revises the classic analysis (4), hard-wiring a positive condition to the meaning of *even*

(11) **Revised Comparative (un)Likelihood (Daniels and Greenberg 2020)**
A proposition *even* p is felicitous only if the following conditions hold:

a. **Superlative Condition**: p is $<_{\text{likely}} q$, for all q in C, where C is the set of contextually restricted focus alternatives;

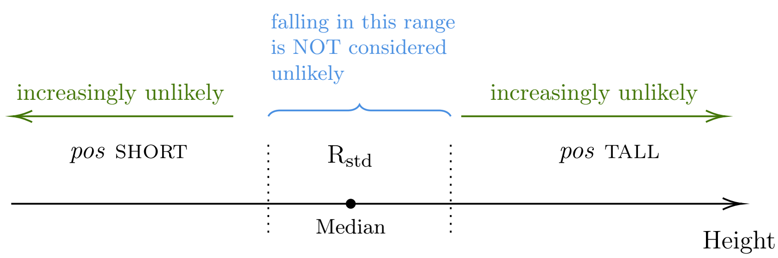
b. **Positive Condition**: p and q are $> \text{R}_{\text{Std}}$ for (un)likelihood, where R_{Std} is the standard range, i.e., both p and its alternatives q are unlikely.

- Since the original wording left it unclear, let's assume the weakest, existential version of the Positive Condition, i.e., there exists a salient alternative q such that both the prejacent p and q are unlikely

- To translate (un)likelihood to other scales, the following assumptions are made:

(12) **Daniels and Greenberg 2020's assumptions regarding scales of gradable predicates**

a. the standard range R_{Std} is an interval on the scale;
b. antonyms sit on the same scale, occupy the opposite sides outside of R_{Std};
c. having degrees within $R_{Std} >_{likely}$ having degrees outside R_{Std};
d. having degrees within R_{Std} cannot be unlikely;
e. variations within R_{Std} are allowed, i.e., it is possible to have a total ordering of the individuals fall within R_{Std}, but these differences are negligible, and thus not considered unlikely.



- For (3-a), the alternative set $C = \{$Alex is taller than Blake, Alex is taller than Cassie ...$\}$. The authors assume that the Superlative Condition inherited from the classic comparative (un)likelihood analysis guarantees the ordering Alex $>_{tall}$ Blake $>_{tall}$ Cassie ⚠
- The additional Positive Condition requires both p = *Alex is taller than Blake* and q = *Alex is taller than Cassie* be unlikely. Since an individual can be tall, short, or neither, we have $3 \times 3 = 9$ possible cases regarding Alex's and Blake's height status

Alex	Blake	
tall	*tall*	?
tall	*average*	?
~~*tall*~~	~~*short*~~	since it's not unlikely to be taller than a short individual, p is not unlikely
~~*average*~~	~~*tall*~~	contradicts Alex $>_{tall}$ Blake
~~*average*~~	~~*average*~~	following assumption (12-e), p is not unlikely
~~*average*~~	~~*short*~~	since it's not unlikely to be taller than a short individual, p is not unlikely
~~*short*~~	~~*tall*~~	contradicts Alex $>_{tall}$ Blake
~~*short*~~	~~*average*~~	contradicts Alex $>_{tall}$ Blake
~~*short*~~	~~*short*~~	since it's not unlikely to be taller than a short individual, p is not unlikely

- As the authors point out, the two cases with ? need further examination:
  - ▷ If Alex is tall and Blake is neither tall or short, one could argue p is not unlikely if we assume that, within a default distribution, the existence of individuals having degrees outside the standard range is expected. This is another, albeit sensible, assumption that needs independent support
  - ▷ If both Alex and Blake are tall, since variations are expected among the tall individuals, p is

not necessarily unlikely. Their proposal would then wrongly predicate a presupposition failure

- Daniels and Greenberg's proposal is a reasonable and straightforward attempt to address the puzzle of standard sensitivity in *even*-comparatives. However, it suffers from two major issues
  - ▷ The analysis takes for granted the likelihood ranking of the propositions p and q derives where the individuals sit relative to one another on the relevant scale
    - Nothing in our current system guarantees this mapping; in theory, there can be many reasons as to why p is less likely than q
    - Consider (3-a) in a more specific context

(13) *Context: The speaker is talking about the three kids in the Smith family. So far, it has been established that Alex is taller than her twin Aaron and that Blake is their older sibling.*
Alex is even taller than [Blake]$_F$. cf. (3-a)

    - p = *Alex is taller than Blake* is less likely than q = *Alex is taller than Aaron* simply because that it's more likely for a kid to be taller than someone of their own age than to be taller than someone older
    - Importantly, it doesn't have to the case that Blake is strictly taller than Aaron in actuality
    - A separate, well-defined machinery is needed to explain why and how likelihoods of propositions are translated to degrees on a scale
  - ▷ The derivation relies on the assumptions in (11), which are satisfied by relative adjectives but not absolute adjectives (Kennedy 2007, Toledo and Sassoon 2011, Lassiter and Goodman 2013)
    - As a result, the same reasoning cannot apply to comparable sentences containing absolute adjectives
    - But empirically speaking, absolute adjectives behave the same way as relative adjectives with respect to their inference patterns

(14) *Maximum standard absolute adjective*
a. District A is even safer than [District B]$_F$. [$\rightsquigarrow$ Both districts are **safe**]
b. [District A]$_F$ is even safer than District B. [$\rightsquigarrow$ Both districts are **dangerous**]

(15) *Minimum standard absolute adjective*
a. The study is even dirtier than [the kitchen]$_F$. [$\rightsquigarrow$ Both rooms are **dirty**]
b. [The study]$_F$ is even dirtier than the kitchen. [$\rightsquigarrow$ Both rooms are **clean**]

    - This would have to be explained either by proposing a separate mechanism or by revising the assumptions for Daniels and Greenberg 2020

Interim summary

The existing semantic analyses

- fail to capture the complete inference patterns observed in *even*-comparatives;
- are unsatisfactory conceptually considering the stipulative assumptions;
- cannot easily explain the systematic scale reversal effect triggered by the change in focus placement;
- contingent on the mechanism assumed for setting the standard of a gradable predicate, they seem to predict that, since the positive condition is hardwired, evaluative inferences always arise in comparative sentences with *even*, which is not borne out empirically.
  - ▹ In the sibling scenario (13), the Smith kids can be tall, short or average height; we don't necessarily infer anything about their absolute height status from the sentence

It is also interesting to note that similar evaluative inferences are seen in other scalar particles such as *at least* and *still*, and it would be ideal to have an uniform analysis, instead of enriching their semantics individually

(16) a. The study is at least cleaner than [the kitchen]$_{\text{F}}$. [$\rightsquigarrow$ Both rooms are **dirty**]
b. Simon is taller still than Paige. [$\rightsquigarrow$ Both Simon and Paige are **tall**]

III. My proposal: a pragmatic approach

- Main idea: supplementing the classic (un)-likelihood analysis of *even* with two general pragmatic principles can derive these inferences systematically

(17) **Presupposition Accommodation Condition (PAC)**
In cases where a presupposition is not entailed by the common ground, listeners can accommodate it only if its best explanation is already entailed or can be accommodated at the same time.

(18) **Alternative-sampling Hypothesis (ASH)**
When the alternative set is not explicitly specified, assume that individuals included in the computation of alternatives form a representative sample of the contextually determined relevant population with respect to G.

- Assumptions:
  - ▹ Alternative semantics approach (Rooth 1985) to focus-sensitivity
    - the general function of focus is to evoke alternatives, which are sets of propositions
  - ▹ *even* always takes scope over matrix TP and associates with focus
- For (3), according to the classic (un)likelihood analysis of *even* (4), both sentences assert that *Alex is taller than Blake*, but different alternative sets are invoked:

(19) Alternatives of (3-a) = $\{$Alex is taller than $\pi \mid \pi \in \text{ALT}(\textsc{Blake})\}$
Alternatives of (3-b) = $\{\pi$ is taller than Blake $\mid \pi \in \text{ALT}(\textsc{Alex})\}$

- The presupposition of *even* mandates that the proposition *Alex is taller than Blake* is the least likely among its alternatives
- Either this presupposition is already entailed by the common ground, in which case no accommodation is needed and evaluative inference do not necessarily arise, as in (13); or, the addressee learns that this likelihood ranking is entailed by the speaker's intended common ground
- In the later case, somewhat unexpectedly, the addressee simultaneously commences an abductive reasoning trying to find the most likely justification for this ranking
  - ▷ Discourse participants are not satisfied with simply accommodating the likelihood presupposition on its own; they need to understand why the speaker would presuppose such differences in likelihood exist in the first place
- I claim that in the absence of further context, absolute height status is the best and most salient explanation

(20) **Abduction** (Douven 2017)
Given evidence E and candidate explanations $H_1, ..., H_n$ of E, infer the truth of *that* H_i which best explains E.

▷ For (3-a), the evidence E is the fact the speaker's intended common ground entails that *Alex is taller than Blake* is the least likely proposition among its alternatives {Alex is taller than π}

▷ There can be many reasons as to why that would be the case. To name a few candidate explanations

- H_1 = Blake is the oldest in the group of teenagers
- H_2 = Blake is a mythical giant
- H_3 = Blake is the only modern human compared to a group of mid-19th century people
- etc.

▷ Among these explanations, H_i Blake is the tallest within the contextually determined group is the one that presumes the least from context, which, I hypothesize, makes it the "best" explanation of E

- The link between degrees and likelihoods is a natural one, considering the *transitive* and *antisymmetric* properties of ordering relations

(21) For a gradable predicate G with responding scale $>_{\text{G}}$
a. Given $x >_{\text{G}} y$. If $z >_{\text{G}} x$, then $z >_{\text{G}} y$;
b. Given $y >_{\text{G}} x$. If $x >_{\text{G}} z$, then $y >_{\text{G}} z$.

- For example, if Ben is taller than Carl, and Ali is taller than Ben, than Ali is taller than Carl
- Given that if ϕ entails ψ, ϕ is at most as likely as ψ

(22) For a gradable predicate G with responding scale $>_{\text{G}}$,
$$\begin{cases} x >_{\text{G}} y \rightarrow \mathcal{L}\big(z >_{\text{G}} x\big) \leq \mathcal{L}\big(z >_{\text{G}} y\big) & \text{(a)} \\ y >_{\text{G}} x \rightarrow \mathcal{L}\big(x >_{\text{G}} z\big) \leq \mathcal{L}\big(y >_{\text{G}} z\big) & \text{(b)} \end{cases}$$

- Via abduction, listeners infers H_i to be true, i.e., Blake is the tallest within the set of the individuals considered in the computation of alternatives
  - ▷ We will refer to this set as the set of individuals under consideration, and it forms the comparison class for the interpretation of the gradable predicate
- Still not quite there yet! Blake being the tallest within the comparison class does not necessarily mean Blake is tall. Perhaps everyone else in the comparison class is exceptionally short, in which case we still do not know Blake's height status relative to the standard
- To bridge the gap, we need the additional assumption that when an *even*-comparative is uttered more or less out of blue, i.e., when the individuals under consideration are not specified in the discourse, the comparison class is representative of the contextually determined population (formalized as Alternative-sampling Hypothesis)
- At its core, all ASH claims is for interlocutors to assume normality unless there is evidence indicating otherwise
- Now we have all the necessary pieces to give a complete derivation of the positive inference in (3-a) when uttered in a context that does not already support the presupposition of *even*

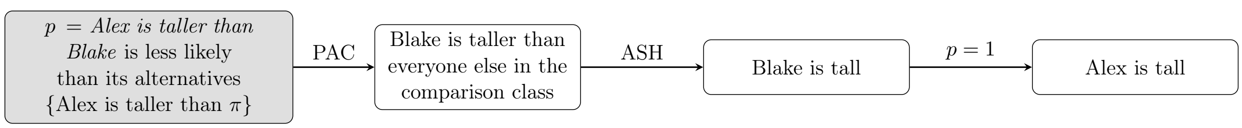


Figure 1: Pragmatic reasoning process for (3-a)

- The reversed, negative, inference of (3-b) falls out straightforwardly from the same reasoning process

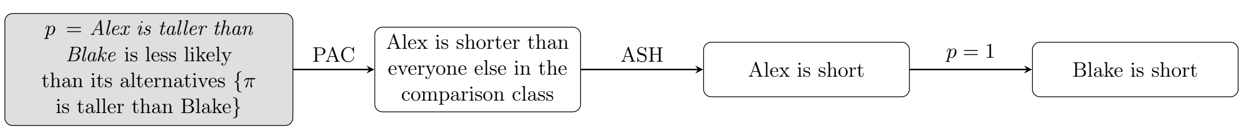


Figure 2: Pragmatic reasoning process for (3-b)

Summary

A pragmatic approach

- ☑ captures the complete inference patterns observed in *even*-comparatives
- ☑ requires few specific, stipulative assumptions
- ☑ easily explains the systematic scale reversal effect
- ☑ accounts for optionality of the evaluative inferences

Future research

- ☐ extending to other scalar particles, both in English and crosslinguistically

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