Comparative numerals revisited: scalar implicatures, granularity and blindness to context

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Comparative modified numerals, such as "more than five", are known to not trigger the scalar implicatures that bare numerals do. Instead, unembedded modified numerals give rise to so-called ignorance inferences (the speaker doesn't know the number) or to irrelevance inferences (the question under discussion makes the precise number irrelevant).

Cummins et al. (2012) note that comparative modified numerals may in fact receive enriched readings when they combine with "round" numerals, as in (1).

(1) There are more than 80 people in this room. $\rightsquigarrow$ There aren't more than 90.

We extend this observation to non-round numbers. Specifically, enriched readings of non-round comparative numerals are sometimes available when they refer to continuous quantities, as in (2).

(2) a. John walked more than 7 kilometers to get home.
$\rightsquigarrow$ He didn't walk 8 kilometers.
b. John has been working there for more than 22 years.
$\rightsquigarrow$ He hasn't been there for 23 years.

Fox and Hackl (2006) give an account for the lack of scalar implicatures for comparative modified numerals where they introduce the *Universal Density of Measurement* (UDM) hypothesis, according to which the alternatives of modified numerals are based on all real (or rational, or decimal) numbers. Together with the assumption that the mechanism giving rise to scalar implicatures (exhaustification) is blind to contextual information, they predict that comparative numerals cannot receive enriched meanings.

The UDM hypothesis doesn't seem compatible with (2): it's precisely when the dimension in question is intuitively continuous that enriched meanings become possible for non-round numerals. Instead, our proposal builds upon Fox and Hackl (2006)'s blind exhaustification and Cummins et al. (2012)'s notion of *granularity scales*: first, we propose that the comparative numeral "more than m" competes with all bare numerals "n" (meaning "n or more") of the same granularity; we could also add the corresponding comparative numerals to the scale, but they won't play any role in the predictions. Granularity scales are based on "roundness" and include $< 0, 1, 2, 3, \cdots >$, $< 0, 10, 20, 30, \cdots >$, etc. Numerals are interpreted within the coarsest scale available, so that "20" will only be competing with the tens but "23" competes with all integers.

Second, we postulate a standard treatment of implicatures where utterances have alternatives obtained by replacing any scalar items with other members of the scale. The listener infers that for any logically stronger alternative, either the speaker doesn't believe that it is true, or they do not deem it relevant. In the first case, the listener may further conclude that the speaker believes any innocently excludable alternative is false, in the sense of Fox (2007) (in all our examples, alternatives are totally ordered so that all those that entail the prejacent are innocently excludable; negating them all amounts to negating the weakest one). Crucially, our notions of logical entailment and consistency used for both types of inferences ('Speaker does not believe p' and 'Speaker believes $\neg p$') are purely logical and blind to the context.

Under our theory, the alternatives for (2a) are:

(3) John walked (more than) 0/1/2/.../8/9/... kilometers to get home.

Those stronger than (2a) are those involving the numerals starting at 8. Then, the listener may infer either that those alternatives are irrelevant (most obviously, if the question under discussion is "did John walk more than 7kms?"), or that the speaker doesn't consider them true. If the latter, they may further conclude that (1) means the following:

(4) John walked more than 7 kms, but he didn't walk 8 or more, i.e. he walked $7{+}x$ where $x \in (0, 1)$.

The case of (1) would be similar, except the scale is tens and not units. Consider now (5) where sub-unit granularity doesn't make sense. The alternatives to (5) are similar to those of (2a); because logical entailment is blind to the context, we count "John has 8 cars" among the stronger alternatives. Then we predict the enriched meaning to be similar to (4), but that is a (contextual) contradiction as John may not have more than 7 and less than 8 cars. Hence our prediction is that the irrelevance inference is obligatory for (5).

(5) John has more than 7 cars. $\not\rightsquigarrow$ He doesn't have more than 8.

Thus, our theory predicts two possible readings for unembedded comparative numerals. The strong reading is only accessible when the scale is coarse enough that possible worlds exist between items. The literal reading presupposes that the numeral being used has some special relevance. In both cases, we never predict ignorance inferences, which has been argued to be a desirable result (Buccola and Haida 2017). Both readings are *compatible* with speaker ignorance, though; in particular, the enriched reading for round numbers such as "more than 20" is compatible with speaker ignorance as to the precise number.

Under negation, we predict an "exact" reading for comparative numerals. This is because the minimal alternative to "not more than m" is "not m" (or "fewer than m"); denying it, we end up with "not more than m" meaning "exactly m". Such a reading is indeed available, as shown by the validity of (6):

(6) A: John's no reader, he hasn't read more than 7 books in his life.
B: Well, I doubt he has even read 7!

Nouwen (2008) already explores such exact readings in the case of the variant comparative numeral "no more than n", which tends to make them more salient. Furthermore, our theory predicts the possibility of a non-enriched reading when the listener concludes alternatives are irrelevant.

Finally, in the case of embedding under necessity modals, readings with a scalar implicature are accessible. For instance, (7) can be interpreted as meaning that the minimal number of questions John must answer is 8.

(7) John must answer more than 7 questions.

We may derive this under our theory only with specific assumptions about the interpretation of modals. (7) has a minimal stronger alternative involving "8", resulting in the implicature that answering fewer than 8 questions is allowed. If we assume that deontic modality can be partly blind to world knowledge, in the sense that the fact you may only answer integer numbers of questions may not be part of the deontic modal base, the enriched meaning of (7) is not contradictory even in context; it asserts that answering between 7 and 8 questions is compatible *with the rules*, regardless of whether it is feasible or not. The listener eventually infers that answering 8 questions is possible too, from their knowledge of the general form of such rules.

The case of “fewer than” numerals, not mentioned here, is entirely symmetric if we assume they compete with “not more than” numerals.

References

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