Testing the nature of free choice effects with modified numerals

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Introduction The list of free choice (fc) effects with disjunction and epistemic indefinites has been enriched by those that are found to arise with modified numerals (MN's) under the scope of modal and nominal quantifiers, plurals or generics (Nouwen, to appear). Building on Kratzer and Shimoyama (2002), Coppock and Brochhagen (2013) (henceforth C&B) show how such effects with MN's are generated via an implicature mechanism. In this paper I will test the predictions that follow from their analysis, contributing new experimental data that shed light on the semantic/pragmatic nature of the fc effects with MN's and more importantly on the mechanism that gives rise to them. I present evidence supporting C&B's implicature proposal, but going against the nature of the implicature-generating mechanism they suggest.

Background Imagine the following conference submission requirement:

(1) The abstract must be at least two pages long.

When *must* takes wide scope with respect to *at least*, (1) states that the minimal page requirement is 2, and also conveys the fc-reading component that there is no specific n such that you need to write exactly that many pages. In their inquisitive semantic analysis, C&B represent the assertion in (1) with the modal taking wide scope by (3), where the set of possibilities in (2) is gathered into a single possibility via Existential Closure (cf. Kratzer and Shimoyama, 2002).

(2) {The abstract is 2 pages long, The abstract is 3 pages long, ...}

(3) $\{\Box(\cup\{$The abstract is 2 pages long, The abstract is 3 pages long, ...$\})\}$

In order to derive the fc component, they execute Kratzer and Shimoyama's (2002) Gricean recipe for the implication:

(4) $\Box(a \vee b) \rightarrow \Diamond\, a \wedge \Diamond\, b$.

Its rationale goes as follows: **Q:** Why did the speaker not pick the more specific and stronger alternative $\Box$(The abstract is 3 pages long)? **A:** Because it is either the case that it is false or that its exhaustivity inference is false. Applying the same reasoning to the rest of the alternatives from (2) together with (1)'s assertion in (3) gives us *free choice* among the page lengths exceeding 1 for the abstract. This mechanism is assumed to hold for MN's under universal quantification in general (cf. Nouwen, to appear).

The idea of an inference of conjoined permissible choices (fc inference) with MN's can also be found in Büring (2008). He claims that *at least n* has a disjunctive status, i.e. n or >n, and suggests that an fc-reading is generated via the implicature mechanism responsible for fc readings with disjunction, which additionally shares the idea in (4).

Experiment I conducted an offline study to answer the questions: What is the nature of fc effects with MN's? Can we find evidence that they are indeed generated as an implicature? Do fc effects with MN's and with disjunction involve the same mechanism?

Method 27 native speakers of Dutch participated in an offline judgement task. They were presented with short dialogues in Dutch between person A and person B. A makes a statement and B reacts with a question. A's statement includes a universal nominal quantifier and a numeral modified either by *at least* or by *more than* (*at least* and *more than* conditions, respectively), as illustrated in (5) below.

(5) **A:** According to a random sample every bag contains *at least*/*more than* 22 licorice candies.
B: Do they all contain the same number of candies?

The fc component of A's statement says that there is no specific n such that all bags contain exactly that many licorice candies. Thus, B's question in (5) is incompatible with such a reading. Participants were asked to judge how reasonable they found B's reactions to A's statements on a scale from -5 (*completely unreasonable*) to +5 (*completely*

reasonable), inspired by a similar scale introduced by Cummins and Katsos (2010). In addition to the test items, the experiment included control items in which A's statement contained a disjunction, again interacting with *every*, and B's question either contradicted the semantics of disjunction (*semantic controls*) or its fc inference (*pragmatic controls*):

(6) **A:** For lunch everybody at work ordered a salad or a soup.
B_{sem}: Did anyone order neither of those?
B_{pragm}: Did anyone order a soup?

Semantically and pragmatically non-contradictory controls were also included.

Predictions According to C&B's pragmatic account, which embraces the idea in (4), also applied to fc inferences with disjunction, the predictions are: If an fc implicature is generated, B's question will be judged as incompatible with the fc component of A's statement, and these judgements will not pattern with those of the *semantic controls* with disjunction, *but* with the *pragmatic* ones. If an implicature is not generated, B's questions will be judged similarly to the non-contradictory controls, because there is nothing to be contradicted by B's questions.

Results Scores were analyzed with a Cumulative Link Mixed Model fitted with the Laplace approximation, with Condition as fixed factor, and Subject and Item as random factors. The *more than* condition was rated significantly higher than both the *semantic* (z=-5.881, p<.001) and the *pragmatic controls* (z=-.-5.121, p<.001). Moreover, *more than* and *at least* conditions did not differ significantly (z=-0.666, p=.506), and the former scored significantly lower than the non-contradictory controls (z=7.358, p<.001). Post-hoc pairwise comparisons showed further that the *at least* condition, similarly to *more than*, scored significantly different from all types of control conditions (*sem.*: z=-5.480, p<.001, *pragm.*: z=-4.556, p<.001, and *non-contr.*: z= 7.742, p<.001). Finally, the *semantic controls* scored significantly lower than the *pragmatic controls* (z=2.076, p<.05).

Discussion As the results above reveal, both types of MN's give rise to an fc effect (cf. their difference from the non-contradictory controls). Moreover, the fc effect for both MN's is *not* generated via an entailment, as their significant difference from the *semantic controls* indicates. The fc effects in question were also found to differ from the *pragmatic controls*, which together with their difference from the non-contradictory controls points to an implicature-generating mechanism; one though that produces weaker fc inferences compared to those involved in disjunction (in *pragmatic controls*). However, the status of the (6)B_{pragm} items as pragmatic controls needs to be looked into further. Chemla and Bott's (2014) findings suggest that there is no implicature-generating mechanism involved in fc effects with disjunction, since in their experiment they did not induce any additional processing cost, unlike the well-established scalar implicatures with *some*. These findings could question the pragmatic status of the fc effect with disjunction. Still, no matter what the status of the *pragmatic controls* is, the significant difference between them and both types of MN conditions indicates that the mechanism deriving the fc effect with MN's is different from that with disjunction. This disproves C&B's relevant prediction.

Conclusions In this paper I offer robust evidence that the fc mechanism for both *at least* and *more than* is not semantic in nature and, crucially, that it differs from the fc mechanism for disjunction.

References

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