

English definite numerals and nominal conjunctions are different

Nominal conjunctions and definite numerals are observed to show homogeneity and lack non-maximality. This paper shows experimentally that the two are different in that the former shows gappiness, while the latter does not, contradicting to the claim made in Bar-Lev (2021). The finding challenges the views that nominal conjunctions and definite numerals form a natural class. It leaves open two possibilities. The first possibility is that English definite numerals are not homogeneous, unlike definite plurals and nominal conjunctions. The other possibility is that English definite numerals are homogeneous, yet it's different from definite plurals and nominal conjunctions in that gappiness cannot be observed under the same experimental settings.

Background Homogeneity refers to the effect that definite plurals like *the girls* have universal interpretations in affirmatives, and existential interpretations in negatives. (Schwarzschild, 1993; Križ, 2015, etc.)

(1) The girls laughed.

(2) The girls didn't laugh.

In (1), *the girls* interprets as *all the girls*; in (2), it is existential, (2) means no girl laughed. Nominal conjunctions and definite numerals are also homogeneous. Suppose *the girls* refers to Mary and Lucy. Changing *the girls* to *Mary and Lucy* or *the two girls* will not change the interpretations of the sentences. It is proposed that non-maximality and homogeneity are closely related. (Križ, 2015; Bar-Lev, 2021) Non-maximality refers to the effect that sentences with definite plurals tolerate exceptions under certain circumstances (Lasersohn, 1999; Brisson, 2003). Nominal conjunctions and definite numerals lack non-maximality. Gappiness denotes the truth value gap between (1) and (2). Suppose there are ten girls in total, only five laughed, people are hesitant to judge the sentences as true or false.

Experiments We did two web-based experiments using picture-sentence verification. Our experiments are based on Križ and Chemla (2016), but crucially test the interpretation of nominal conjunctions and definite numerals, which have not been tested before. 84 participants were recruited through Prolific.

In the experiments, participants were given a back story about a toy finding game. The result of the toy finding game was presented, with a sentence describing the result provided under the result. Participants then had to decide upon seeing the result how right the sentence had been. Following the method in ternary judgement tasks, we provided participants with three response options, *Completely false*, *Neither completely false nor completely true*, and *Completely true*.

*Elizabeth was assigned to a room with four hidden waving lucky cats. She was encouraged to find as many cats as possible. Here's her result.



Elizabeth found Max, Coco, Luna and Tom.

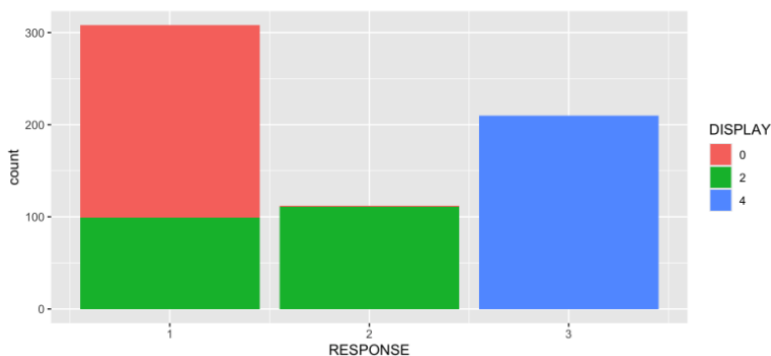
- Completely true
- Completely false
- Neither completely true nor completely false

Both experiments are of 3 by 2 design. The first factor we control is the display. There were four cats in total, the display showed the result of finding 0, 2 or 4 of the four cats, and not finding the

rest. The second factor we control is the form of plurals. In both experiments, we used quantified nouns *all*-DP as control, which has long been observed to be non-homogeneous. (Brisson, 2003) In the first experiment, we compared *all*-DP with nominal conjunctions. In the second experiment, we compared universally quantified DP with definite numerals. The critical sentences are as exemplified below.

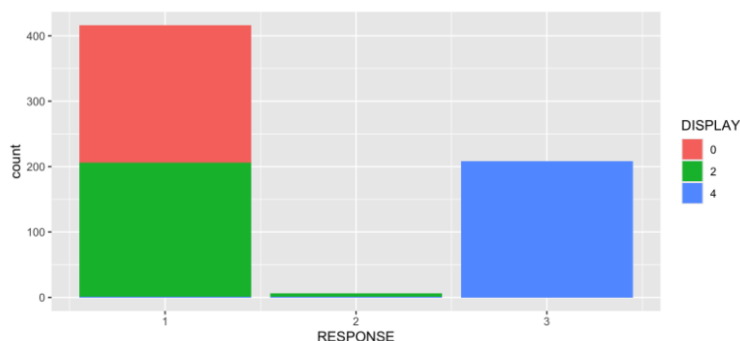
- (3) a. Lucy found Max, Tom, Lala and Luna.
- b. Lucy found each of Max, Tom, Lala and Luna.
- (4) a. Lucy found the four cats.
- b. Lucy found all the cats.

In each experiment, the participants received 2 training items, followed by a semi-randomized sequence of 15 targets (5 under each display), 15 controls (5 under each display), and 30 filler sentences, for a total of 60 experimental trials. The experiment results are as below. In the first experiment where we contrast nominal conjunctions with universally quantified DPs, a great portion of participants chose the neutral option when the display is non-uniform and went for the two polars when the displays are uniform. This duplicates what Križ and Chemla (2016) found for definite plurals.



We fitted a mixed effects cumulative link model to responses to critical items with Form, Display and their interaction as fixed effects, and random by-participant slopes for Display. Model comparison between the maximal model and those without each of the fixed effects revealed a significant effect of Form ($\chi^2= 77, p < .001$).

In the experiment comparing definite numerals and universally quantified DPs, the neutral option was not as prevalent, as shown in the chart below.



Again, we fitted a mixed effects cumulative link model to responses to critical items with Form, Display and their interaction as fixed effects, and random by-participant slopes for Display. Model comparison between the maximal model and those without each of the fixed effects did not reveal a significant effect of Form.

Conclusions Further studies are required on how homogeneity relates to gappiness and non-maximality, and how plural forms contribute to the issue. Currently, we take this as an evidence showing that nominal conjunctions and definite numerals do not form a class in terms of homogeneity and non-maximality, and they cannot be taken as evidence supporting Bar-Lev's (2021) claim that gappiness is a side effect of non-maximality. The additional numerals influence of homogeneity of definite plurals. Besides, Haslinger (2023) mentions that prosody may influence people's interpretation of sentences with definite numerals. The experiment does not involve audios, so such a factor is not controlled yet.

References

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