Many expectations about *few* balls

Abstract. Work in psychology suggests that the use of context-dependent expressions like *few* and *many* is dependent on speakers' prior expectations. In real-world contexts, however, it is not possible to manipulate expectations in a controlled manner. This is why we move to more abstract contexts and present urns of varying content. We show that prior expectations can be manipulated in this way and that they are a significant predictor of the acceptability of *few* and *many*.

Landscape. One key property of vague quantifiers like *few* and *many* is that their denotation can vary extremely across contexts. The number of spectators described by *many* in (1a) will be much larger in a conversation about the final of the European Championship than for a match of the local football club. The same variability can be found in *few* in (1b) as well.

(1) a. Many people watched the football match on Sunday.
 b. Few of the guests at the party drank beer.

Literature in psychology informally suggests that world knowledge influences the use of vague quantifiers or gradable adjectives (Clark, 1991; Moxey and Sanford, 1993). These insights have not been incorporated in formal semantics yet. Especially theories based on a degree semantics like Hackl (2000), Kennedy (2007), and Solt (2009) and also Partee (1989) formulate truth conditions in terms of whether a cardinality or degree exceeds a contextually given threshold. How exactly this threshold is influenced by the context is not spelled out. We set out to identify one aspect of the context to which we ascribe a major role in the production and interpretation of these vague expressions.

Hypothesis. Following Clark (1991), Fernando and Kamp (1996), and Frank and Goodman (2012) we assume that the context is integrated into the reasoning about language use in the form of prior expectations. The way we use vague quantifiers like *few* and *many* is influenced by the quantities we have expected and consider to be normal in the respective situation.

Experimental investigation. Since each speaker has individual experiences of a real-world context, it is very hard if not impossible to manipulate expectations in a controlled manner. This is why we move to using a clearly manipulable fixed contextual prior setting. A sample of the visual material can be found in Figure 1. A character draws 10 red and blue balls from an urn. The draw's outcome is displayed visually. The character describes the NUMBER of blue balls drawn [1-10] with a statement including the QUANTIFIER *few* or *many* as in (2). We explicitly mention the content of the urn in a *for*-phrase to make the prior salient.

(2) For a draw from an urn with that content, [few|many] of the balls I drew are blue.

To manipulate PRIOR EXPECTATIONS, we present a picture of the urn from which the balls were drawn. The urn's content varies. From a total of a 100 balls either 25, 50, 75 or 90 balls are blue, the rest red. We recruited 90 participants via Mechanical Turk and asked them to rate on a 7 point scale whether the quantified sentence is a good description of the situation.

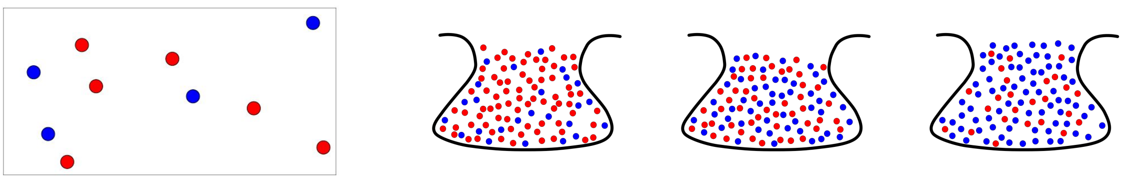

Figure 1: Sample pictures of the drawn balls and an urn with 25, 50 and 75 blue balls

Predictions. We expect that NUMBER is a significant predictor of participants' behaviour. *Few* is applicable to low numbers whereas *many* will be rated highest for numbers in the upper range.

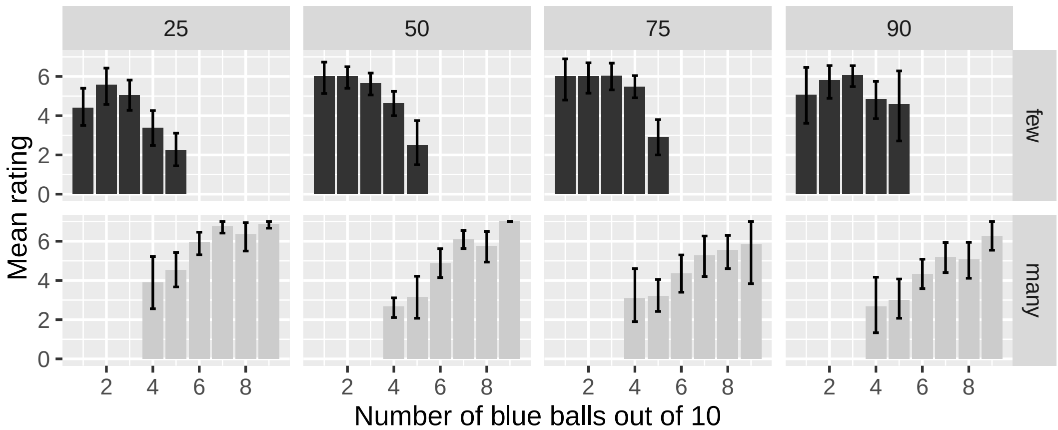

Figure 2: Results of the rating study: mean ratings of each PRIOR-QUANTIFIER pair.

We expect that PRIOR EXPECTATIONS have a significant effect since both quantifiers express, or can express, that a cardinality is lower or higher than expected. When prior expectations are low [25 blue balls in urn], both quantifiers are applicable to lower numbers than when prior expectations are high [75 or 90 blue balls].

Results. Mean ratings of each PRIOR-QUANTIFIER pair can be found in Figure 2. For each of the quantifiers *few* and *many* we specified a mixed linear effects regression model predicting ratings which included the main effects NUMBER OF BLUE BALLS (1-5 for *few*, 4-9 for *many*) and PRIOR EXPECTATIONS (25,50,75 or 90 blue balls out of 100).

***few*.** For *few*, the model included the fixed effect NUMBER. Participants gave significantly lower ratings for a rising number of balls ($\beta = -0.52, SE = 0.08540, p < 0.001$). The factor PRIOR EXPECTATIONS was significant, too. Higher prior expectations led to higher ratings ($\beta = 0.33, SE = 0.089, p < 0.002$). This effect was modulated by a significant interaction between NUMBER and PRIOR EXPECTATION ($\beta = 0.18, SE = 0.077, p < 0.02$). A higher expected cardinality seems to have the effect that *few* is applicable to higher numbers.

***many*.** Ratings are significantly higher for an increasing NUMBER of balls ($\beta = 0.72, SE = 0.063, p < 0.001$). We found a significant effect of the factor PRIOR EXPECTATIONS as well. Higher prior expectations lead to higher ratings ($\beta = .0.46, SE = 0.087, p < 0.001$). However, there is no significant interaction between NUMBER and PRIOR EXPECTATION.

Discussion. We successfully manipulated expectations in an abstract context and found that they influence the ratings of sentences including *few* and *many*. For both *few* and *many* the factor PRIOR EXPECTATIONS has a significant effect which confirms that both express that a cardinality is lower or higher than expected. However, only for *few* we find a significant interaction of NUMBER and PRIOR EXPECTATIONS. When a low cardinality is expected, the ratings decrease more for a rising number of blue balls than when a higher cardinality is expected. We conclude that the range *few* applies to is more restricted than *many*'s. *Few*'s range can be slightly shifted, but in general *few* only applies to small cardinalities, whereas *many*'s range is more flexible. Overall, we successfully applied a new experimental paradigm and confirmed that contextual information can be integrated in the form of prior expectations. However, this insight is only a first step and more work is necessary. To substantiate our claim we plan to extend the investigation to further constructions like *few* and *many* in combination with *compared to* frame setters. Other open questions are how to integrate prior expectations into the formal semantics and how they interact with the threshold proposed by degree semantic theories.

Selected references. Fernando & Kamp: *Expecting Many* (1996). Moxey & Sanford: *Prior Expectations and the Interpretation* (1993). Newstead & Coventry: *The Role of Context* (2000). Partee: *Many Quantifiers* (1989).