Overspecification of number

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It has been acknowledged that color is more often overspecified in reference production than other attributes (such as size, shape, material and pattern), cf. the recent papers by Tarenskeen et al. (2015) and Rubio-Fernández (2016) among others. However, the question of to which extent number is likely to be overspecified has not been studied yet.

The paper reports on a production experiment in Russian and proposes two of its follow-ups.

The experiment studies the interaction of number and color overspecification and involves numerals and color adjectives. It is aimed at testing the following **hypothesis**: overspecification of numerals is enabled by overspecification of color adjectives. In other words, the idea is that numerals are overspecified only if color adjectives are overspecified. This leads to **Prediction A**: the overspecification of number in a polychrome condition will be higher than the overspecification of number in a bichrome condition but lower than its overspecification in a monochrome condition.

Although Russian has a relatively free word order, a neutral linear word order of a NumP is as follows: numeral + adjective + noun. There were 4 possible ways to make a reference to a cell: a plural noun (e.g. 'squares'), a numeral + a noun (e.g. 'two squares'), an adjective + a noun (e.g. 'red squares') or a numeral + an adjective + a noun (e.g. 'two red squares').

Our hypothesis implies **Prediction B**: the combination "a numeral + an adjective + a noun" will be more often produced than the combination "a numeral + a noun" in all the three conditions. Moreover, according to the Prediction A, the combination "a numeral + an adjective + a noun" will get higher rates in the bichrome condition, lower rates in the polychrome condition, and even lower rates in the monochrome condition.

We verified the hypothesis and the predictions using 4 pictures/cells, each of which contains geometric figures (squares, circles, triangles, or diamonds) of 4 colors (red, green, yellow, or blue) and of 4 quantities (1, 2, 3, or 4). The geometric figures were identical within each cell but are different among the cells, whereas color was either identical or different among all cells depending on a condition. There were 3 conditions. The first was a *bichrome* condition and involved color contrast between one cell vs. the other 3 cells (Picture 1, left). The second was a *polychrome* condition; it involved cells of different colors (Picture 1, center). The third was a *monochrome* condition; it involved cells of the same color (Picture 1, right). In all the three conditions, there was a number contrast between 1 cell (which was outlined) vs. the other 3 cells. In other words, in all the three conditions, number is presented in a contrastive way, welcoming **Prediction C**: number contrast effect might yield higher rates for the combinations with a numeral than without a numeral (a numeral + a noun ≫ a plural noun).
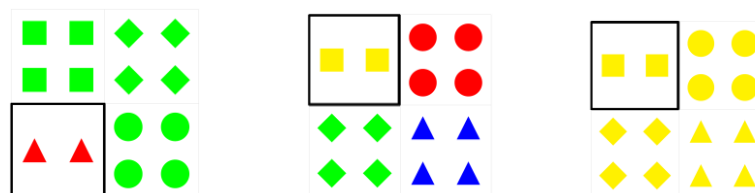
Picture 1. Example of a stimulus in the bichrome, polychrome, and monochrome condition (reported exp.)

Each condition consisted of 24 stimuli and 24 fillers which were counterbalanced. The fillers were human faces. Each condition was allocated to 10 participants, all in all 30 people participated in the experiment (age 18-27, 24 females). The participants had to explain which cell is outlined to the imaginary person who had the same set of pictures but without any outlines. The experiment took approximately 10 minutes.

The results of the experiment are available at LINK. Firstly, the results confirmed **Prediction A**: the combination "a numeral + an adjective + a noun" received the highest rates among all

the answers and all the participants in the bichrome condition (199), less high in the polychrome condition (172) and substantially lower in the monochrome condition (54). Secondly, **Prediction B** was confirmed in the bichrome and polychrome conditions (199 vs. 35, 172 vs. 18 respectively), but it was not corroborated in the monochrome condition: the combination "a numeral + an adjective + a noun" received much lower rates than the combination "a numeral + a noun" (54 vs. 144). Thirdly, **Prediction C** was confirmed: in none of the conditions, there were produced the combination "a plural noun" (0).

A possible explanation for the number overspecification in the monochrome condition could be that number, like color, is salient (at least, the first positive integers: 1, 2, 3, 4). Their salience might be explained by the fact that they are fast calculable. Importantly, when we calculate, we use numerals in exact meanings 'exactly n' instead of at-least meanings 'at least n and possibly $n + 1$' (for exact vs. at-least meanings of numerals cf. Papafragou and Musolino 2003, Musolino 2004 as well as more recent studies). The salience of number leads to the following **hypotheses**: (i) number overspecification appears in an uncolored condition; (ii) number overspecification enables size overspecification (as has been claimed in Tarenskeen et al. (2015), size has to appear in special circumstances to yield overspecification). The two follow-up experiments study these two hypotheses. Both of them are at the stage of design or procedure.

The **first follow-up study** involves the same stimuli and fillers, except for two distinctions. The geometric figures are uncolored and there is no number contrast (each cell contains a unique number of figures), see Picture 2.
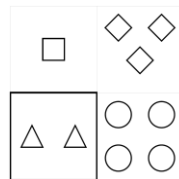
Picture 2. Example of a stimulus in the first follow-up experiment

At the moment, we are asking 30 participants assigned to one of the two lists. The procedure of the study is identical to the procedure of the reported experiment.

As for the **second follow-up study**, it is at the stage of design. We use 4 pictures/cells, each of which contains geometric figures (triangles, squares, circles, or diamonds) of 2 size (big and small, the ration between big and small pictures is 3:1) and of 4 quantities (1, 2, 3, or 4). In order to avoid a possible influence of color, all the pictures are uncolored. The geometric figures are identical within each cell but are different among all cells, whereas number is different among all cells depending on a condition. The cells contain different figures, which are of different quantities. All the cells are uncolored. The prediction is as follows: the combination "a numeral + a size adjective + a noun" will be more often produced than the combination "a size adjective + noun" or "a plural noun".

References

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LINK –
https://drive.google.com/file/d/0B4wD3u5mhPY1cEp6NnZ5dXFhQ3VmVXU3Z1ByaURRZUZFUDh3/view