The effects of set size on reference resolution in discourse

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In this talk, we present the results from a semantic plausibility study investigating the effects of *set size* on anaphoric reference to quantified expressions (QEs) in Swedish. Determining the referent to anaphoric expressions is at the heart of discourse processing (see e.g. Schumacher, n.d.). It is well-known that focussed entities have a privileged status for being the antecedents of anaphoric pronouns (Gundel, Hedberg & Zacharski, 1993, among others). QEs are interesting in this connection because a sub-group of them, negative QEs (monotone decreasing), consistently allows for a switch in focus when referred back to (see e.g. Moxey & Sanford, 1987).Positive QEs do not allow this switch. In (1), the intersection of the set of fans (set A) and set of people going to the game (set B) is known as the REFERENCE SET (REFSET) while the part of Set A that is not in Set B is the COMPLEMENT SET (COMPSET) (i.e. fans not going to the game) (Moxey & Sanford, 1987). Both of the sentences in (1) talk about fans going to a game, i.e. the REFSET. While (1a) can only be followed by (2a) (still talking about the REFSET), (1b) can be followed by either of the sentences in (2) although many speakers actually prefer (2b), where the anaphoric pronoun has the COMPSET as antecedent. (ex. from Sanford, Moxey & Paterson, 1996, 145):

(1) a. Some of the football fans went to the game. (Positive QE)
b. Few of the football fans went to the game. (Negative QE)

(2) a. They watched it with enthusiasm. (REFSET)
b. They watched it on TV instead. (COMPSET)

(3) Few/not many fans went to the game and they watched it on TV/with enthusiasm. (Neg-Small/Big-Comp/Ref)

Although positive QEs and negative QEs as groups show the reference patterns described above, contextual factors such as explicitly stated expectations can have an effect on the set focus (Moxey, 2006; Moxey, Sanford & Dawydiak, 2001). In addition Filik, Leuthold, Moxey and Sanford (2011) have shown that in online processing, the REFSET seems to interfere in processing of negative QEs.These issues have been extensively studies for English, but hardly at all for other languages. For Spanish, however, it has been proposed that the relative set size matters in the case of negative QEs (Zulaica-Hernández, 2018). In this study, we investigate how polarity and relative set size affect speakers' judgement of sentences with anaphoric reference to QEs in Swedish. In an offline sentence judgement task 80 participants judged 128 sentences on a 7-grade Likert scale (1 = very implausible – 7 = very plausible). The sentences looked as in (3).[1] As seen in Table 1, there are differences in all 8 conditions. In table 2 we show the results from the linear mixed model (using z-scores) and the relevant pairwise comparisons. All differences except the one between big and small negative QEs in the REFSET-condition are significant. Our interpretation of these results is that, just as in English, the polarity of the QE determines what set is focussed. But, in addition, the relative sizes of the COMPSET and the REFSET play a role in the interpretation of the anaphoric reference. However, the relative size is secondary to polarity when it comes to determine the focussed set. Rather, the fact that the size influence the judgements in the condition with a negative QE and COMPSET and a positive QE and REFSET we take as indication that even in an offline study we can see interfering effects of the non-focussed set with both types of QEs. This is an unexpected result (at least for positive QEs) given the discussions in the literature, but under the assumption that a QE, irrespective of polarity, makes both the REFSET *and* the COMPSET cognitively available (Sanford et al., 1996), it is less surprising. For the unfocused sets (COMPSET for positve QEs and REFSET for negative QEs) there is no (neg QEs) or a very small difference (pos QEs). We think that this small/non-existent effect in these conditions might depend on the fact that in these cases it is difficult to establish any antecedent and neither set if preferred. The fact that these conditions get very low ratings in general

[1] 128 items with 8 sentences each, crossing the following factors: Polarity (Pos, Neg) x Size (Big, Small) x Set (Ref, Compl). Sentences were distributed across 8 lists in a Latin square design.

supports such an assumption. In conclusion, we think the results from the study shows that QEs of both polarities make both REFSET and COMPSET cognitively available to the extent that the unfocussed set interferes with anaphoric reference. However, this availablility does not seem to be so strong as to switch set reference. An outstanding question is if the unfocussed set is available to the same extent as any other unfocussed participants in a discourse, or less. We suspect that offline studies of processing cannot answer this question, but it requires online measures of processing.

Table 1: Mean ratings of QEs (Likert scale)

Positive QEs			Negative QEs		
Size	Set	Rating	Size	Set	Rating
Big	Comp	2.16	Big	Comp	3.87
Small	Comp	2.78	Small	Comp	5.13
Big	Ref	5.55	Big	Ref	2.51
Small	Ref	4.80	Small	Ref	2.35

Table 2: Pairwise differences of Polarity, Size, Set (z-scores)

contrast	estimate	SE	df	t.ratio	p.value
Neg,Big,Comp - Neg,Small,Comp	-0.6444005	0.04280131	1008.63	-15.056	<.0001***
Neg,Big,Ref - Neg,Small,Ref	0.0796094	0.04280131	1008.63	1.860	0.5789
Pos,Big,Comp - Pos,Small,Comp	-0.3129144	0.04273838	1019.27	-7.322	<.0001***
Pos,Big,Ref - Pos,Small,Ref	0.3768658	0.04273838	1019.27	8.818	<.0001***
Neg,Big,Comp - Neg,Big,Ref	0.6883639	0.04280131	1008.63	16.083	<.0001***
Neg,Big,Comp - Neg,Small,Ref	0.7679733	0.04280131	1008.63	17.943	<.0001***
Neg,Small,Comp - Neg,Big,Ref	1.3327643	0.04280131	1008.63	31.138	<.0001***
Neg,Small,Comp - Neg,Small,Ref	1.4123737	0.04280131	1008.63	32.998	<.0001***
Pos,Big,Comp - Pos,Big,Ref	-1.7155929	0.04248160	1054.84	-40.384	<.0001***
Pos,Big,Comp - Pos,Small,Ref	-1.3387271	0.04273838	1019.27	-31.324	<.0001***
Pos,Small,Comp - Pos,Small,Ref	-1.0258127	0.04280131	1008.63	-23.967	<.0001***
Pos,Small,Comp - Pos,Big,Ref	-1.4026785	.04273838	1019.27	-32.820	<.0001***

Degrees-of-freedom method: satterthwaite; Confidence level used: 0.95
P value adjustment: tukey method for comparing a family of 8 estimates.
Model: z.scores $\sim$ Polarity * Set * Size + (1 — Subject) + (1 — Item)

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