Equatives and two theories of negative concord: experimental evidence from Czech

Mojmír Dočekal
Masaryk univerity, Czech republic, docekal@phil.muni.cz

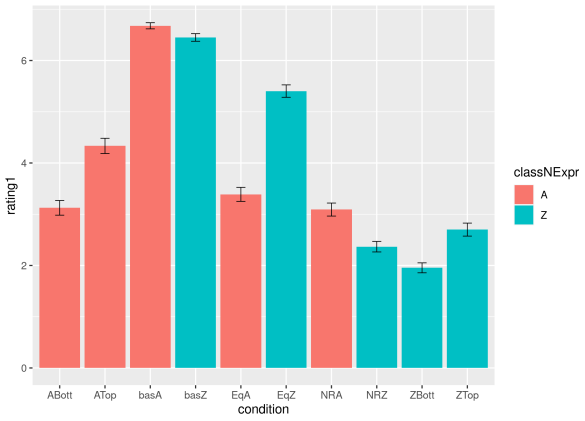
Background. There are two theories of neg-words and negative concord currently: (i) standard, widely addopted syntactic theory ([12, 13] a.o.), (ii) slightly overlooked semantic theory ([7, 6]). Even if the syntactic theory works well in many cases, there are systematic data patterns which are problematic for it. We constructed an experiment testing acceptability of Czech neg-words (*žádný* 'any') and strong NPIs (SNPIs), *ani jeden* 'not even one', to gather solid data allowing us to test predictions of both theories, focussing on equatives, Neg-Raising and scalar contexts.

Experiment. The experiment was the acceptability judgment task in two parts: in the first part subjects judged acceptability of sentences, in the second part we provided a context against which the target sentence was judged. In both parts subjects rated sentences on Likert scale 1 to 7 (1 the worst, 7 the best). The experiment was run online on L-Rex platform and filled by 105 subjects; 82 of them passed the fillers and their answers were included into the analysis. Each subjects rated 32 items and 32 fillers. In the first part of the experiment there were three conditions: baseline (BAS), equatives (EQ) and NegRaising (NR), each condition was crossed with two conditions: SNPIs (ANI) and neg-words (ŽÁDNÝ), 3x2 design. In the second part there were two conditions: bottom of the scale (BOTT) and top of the scale (TOP), again crossed with ANI and ŽÁDNÝ, 2x2 design. The example items from both parts are in (1) and (2). The standard-error bar graph is in Figure 1a. We analyzed the data in mixed-effects linear models (R package LME4, [10, 1]). The dependent variable was the subject's rating. The independent variables of the models were the three conditions (part1) and the two conditions (part2) and their interaction with ANI and ŽÁDNÝ (plus the item and subject intercept+slope random effects). The baseline was BAS. All the main effects were negative (t-values and p-values: $-21.84, p < 0.001$; $-23.92, p < 0.001$; $-23.20, p < 0.001$ for EQ, NR and BOTT respectively). More telling are the interaction effects: we found (i) a strong positive effect of EQ by ŽÁDNÝ; (ii) a significant negative interaction of NR by ŽÁDNÝ; (iii) a significantly strong negative interaction of BOTT by ŽÁDNÝ (t- and p-values respectively: $10.35, p < 0.001$; $-2.48, p < 0.001$; $-4.561, p < 0.001$). Another model constructed for BAS, EQ, NR and TOP yielded effects of the same magnitudes, just the t-value of the main effect TOP was $t = -14.81, p < 0.001$. Summary: neg-words in the standard of equatives were much more better accepted than SNPIs (their acceptability was the third best after the two crossed BAS); (ii) SNPIs were judged better than neg-words in NR; (iii) in probability/scalarity manipulated environments SNPIs were judged better than neg-words. Given that the positive evidence to distinguish neg-words from SNPIs is very limited in strict negative concord languages, we hypothesized that some speakers can treat *ani* as neg-word; therefore we checked correlations of (by speaker) z-transformed ratings of EQ and NR. And indeed, we found that there are speakers who seem to treat *ani* as SNPI, accepting it in NR and rejecting it with EQ (left part of Figure 1b) but there are also speakers who reject it in NR and accept it with EQ (right part of Figure 1b); notice that there no reject-all speakers (empty bottom left quarter), neither accept-all speakers (empty top right quarter). Crucially no such correlation was found against the baseline. And the correlation between EQ-NR acceptability was strong (t = $-5.97, p < 0.001$, also the slope of the correlation line in Figure 1b.)

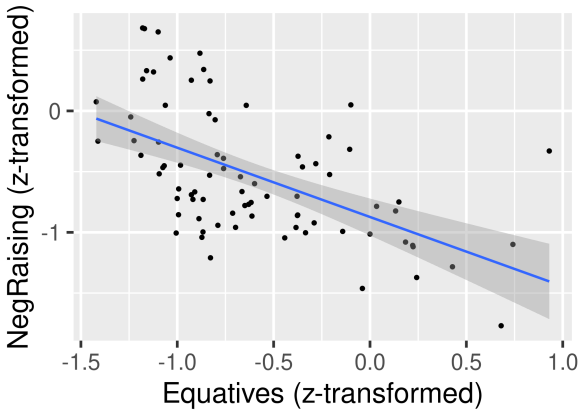
(1) a. V království nezůstal {žádný/ani jeden} zloděj.
in kingdom neg-ramained neg-word/NPI thief
'No thief remained in the kingdom.' BAS

b. Král nechce, aby v království zůstal {žádný/ani jeden} zloděj.
King neg-wants that in kingdom remained neg-word/NPI thief
'The king doesn't want any thief to remain in the kingdom.' NR

c. Zloděj ze souostroví Qwghlm je tak šikovný jako {žádný/ani jeden} zloděj.
thief from archipelago Qwghlm is so clever how neg-word/NPI thief
'The thief from the Qwghlm archipelago is as clever as no other thief.' EQ



(a) Standard-error barplot of responses



(b) Correlation graph (SNPI: *ani*)

Figure 1: The SE-barplot and the correlation graph

(2) Kontext: Šikovný trpaslík ze vsi najde v těchhle dolech za den 1, 2 někdy i 3 diamanty.
C.: A clever dwarf from the village will find 1, 2 or 3 diamonds in these mines per day.

a. Jeden šikovný trpaslík ze vsi nenašel včera v dolech {žádné/ani 3/1} diamant(y).
one clever dwarf from village neg-found yesterday in mines neg-word/NPI 3/1 diamond(s)
'One clever dwarf from the village didn't find even 3/1 diamond(s) in the mines yesterday.' TOP/BOTT

Discussion. The high acceptability of neg-words in EQ nicely follows from semantic theory of neg-words: following [7], we treat neg-words as existential ($\lambda P.\exists x[\mathbf{thief}(x) \wedge P(x)]$) with non-at-issue meaning component (postsupposition in the dynamic version of the semantic theory: [6] which requires emptiness of the extension of the discourse referent; after Kuhn we label this non-at-issue part as $\mathbf{0}_x$). SNPIs we treat in the standard way following [5], [3] and [8] for scalar SNPIs and [2] for the general framework. But as for truth-conditions (TCs), we assume that Czech SNPIs are existential as neg-words: the difference between neg-words and SNPIs is only in non-at-issue component ($\mathbf{0}_x$ for neg-words; scalar for SNPIs *ani*: the crucial scalar presupposition of *ani* we, following [8], take as a presupposition – covert or overt *even* ϕ requires ϕ to be relatively unlikely to be true among alternatives of ϕ). The high acceptance of neg-words in EQ we explain as follows: (i) following [9] (for German), we assume that Slavic equatives are syntactically built from the correlatives and therefore are bad licensors of NPIs generally (unlike English equatives); (ii) the correlative nature of non-English equatives can be (in core) formalized as involving maximally informative operator (max_{inf} instead of the English-type equative max); (iii) max_{inf} is compatible $\mathbf{0}_x$ but still would crash with classical negation (verbal negation cannot appear in the standard of non-English equatives). The decreased acceptability of neg-words (against SNPIs) in TOP and BOTT follows from the positive inference: (2a) implies that some diamonds were found contradicting $\mathbf{0}_x$ (analogical inferences for other items). The high acceptance of SNPIs follows the standard theories of NPI licensing. As for NR, again standard theory of Neg-Raising ([11]) explains this; for neg-words in NR, we propose that Slavic languages require $\mathbf{0}_x$ both in the intensional and extensional contexts (unlike Spanish, e.g., see [6]). Finally, as for speaker variation: we propose that some speakers switch from the scalar presupposition of SNPIs to the $\mathbf{0}_x$ with *ani* (such behavior was observed before: [4]). **Consequences.** Decreased acceptability of neg-words in TOP/BOTT and its high acceptance in EQ are empirical arguments in favor of the semantic theory; syntactic theory would have to assume $\text{OP}_{\neg[\text{iNEG}]}$ in the standard of EQ which goes against all current theories of equatives. Also, the by-speaker variance is very problematic for syntactic theory. Despite that, many open questions remain (precise formulation of the locality constraints for neg-words in semantic theory, a.o.).

[1] Bates, D., M. Mächler, B. Bolker, and S. Walker (2015). Fitting linear mixed-effects models using lme4.*Journal of Stat. Soft. 67*(1), 1–48. [2] Chierchia, G. (2013). *Logic in grammar*. OUP Oxford. [3] Crnič, L. (2011). *Getting even*. Ph. D. thesis, MIT. [4] M. Dočekal and J. Dotlačil (2017). Strong NPIs vs. n-words. In *SuB, Berlin*. [5] Gajewski, J. R. (2011). Licensing strong NPIs. *NLS 19*(2), 109–148. [6] Kuhn, J. (2022). The dynamics of negative concord. *L&P 45*(1), 153–198. [7] Ovalle, L. A. and E. Guerzoni (2004). Double negatives, negative concord and metalinguistic negation.*Proceedings of CLS 38*(1), 15–31. [8] Panizza, D. and Y. Sudo (2020). Minimal sufficiency with covert even.*Glossa 5*(1). [9] Penka, D. (2016). Degree equatives-the same as comparatives. In *Workshop on Eq. Constr. University of Cologne*. [10] R Core Team (2022). *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation. [11] Romoli, J. (2013). A scalar implicature-based approach to Neg-Raising. *L&P 36*(4), 291–353. [12] Zeijlstra, H. (2004). *Sentential negation and negative concord*. LOT/ACLC. [13] Zeijlstra, H. (2008). Negative concord is syntactic agreement. *Ms., Uni. of Amsterdam 5*, 113.