Swarms are High Degree Predicates: Experimental Evidence

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Background. *swarm* constructions exist in many natural languages; they appear at least in two sub-types (A-construction: *Termites are swarming in my kitchen* with agent in the subject and L-construction: *My kitchen is swarming with termites* – location in the subject) and attracted some linguistic attention (Dowty 2000, Hoeksema 2009, 2018 a.o.). Formal linguistic approaches to swarms offer two basic lines of analysis: (i) Dowty's (2000) dynamic texture analysis treats L-construction as in essence transfer from the domain of events to the domain of locations, the multiplicity of events resulting in the parcellation of the location into many subregions; (ii) Hoeksema's (2009) high degree analysis identifies the L-construction as a causative one, where the object of *with* (in English) affects the subject to exhibit a high degree of some property. Both analyses agree on default/semantically unmarked status of A-construction. Hoeksema (2018) further classifies *swarms* as PPIs (analogically to the other high degree constructions).

Experiment. *swarms* haven't been extensively empirically investigated so far (the main reason of our Experiment on Czech *swarms*; the other reason: to eventually decide between the two theories). Another goal of the experiment was to verify/falsify the PPI status of *swarms*, con- cretely whether L-construction exhibit: i) high degree properties and whether it behaves as PPI: ii) avoiding PPI contexts, iii) rescuing in iterated DE contexts. In the experiment we used all three tests, see an example item in (1) for L-construction. Next to the three conditions Deg, Neg and Resc, there was a baseline condition Ref; each condition was varied for L-construction (Lcon) and A-construction (Acon). In total there were 4x2 conditions, 32 stimuli were created with 32 fillers. 50 subjects filled the experiment, and all of them passed the fillers.

(1)   **REF:**   Ta louka bzučela včelami.
           'The meadow swarmed with bees.'
     DEG: Ta louka trochu bzučela včelami.
           'The meadow swarmed slightly with bees.'
     NEG: Ta louka nebzučela včelami.
           'The meadow didn't swarm with bees.'
     RECS: Jestli to dnes na louce nebzučí včelami, tak zítra bude.
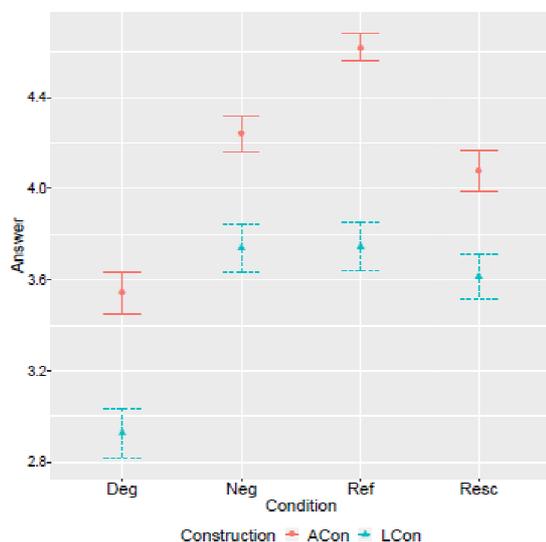   'If the meadow doesn't swarm with bees today, it will swarm tomorrow.'

Fig. 1: Responses (mean and SE)

Results & discussion. We analyzed the data in a mixed-effects linear model with sub- ject and item random effects (R package ordi- nal). The independent variables were: Condi- tions (DEG, NEG, RESC and ref-level REF), Construction (Acon, Lcon) and their in- teraction. The dependent variable was sub- ject's response. We found a negative main effects of DEG ($z = −6.333$, $p = 2.41e − 10$) and the negative interaction of Lcon by DEG, NEG, RESC and even REF ($z = −13.916$, $p < 2e − 16$; $z = −8.373$, $p < 2e − 16$; $z = −9.424$, $p < 2e − 16$; $z = −8.406$, $p < 2e − 16$): graphical summary (means and standard er- rors are in Figure 1). The overall worse ac- ceptability of Lcon results from the relative morpho-syntactic markedness (against Acon) of (Czech) swarms probably; moreover, the main negative effect of DEG proves the high degree status of swarms. We found no nega- tive interaction of NEG by Lcon ($z = −0.066$; $p = 0.9774$) and no positive interaction of Lcon by RESC ($z = −1.115$, $p = 0.26484$). The results taken together strongly support the high degree analysis of *swarms* and falsify the PPI status of them.

References: Dowty, D. 2000. " The garden swarms with bees' and the fallacy of 'argument alternation'." In Ravin, Y. & Leacock, C. (eds.). Polysemy.111-128.New York: Oxford University Press · Hoeksema, J. 2009. "The Swarm Alternation Revisited." Theory and Evidence in Semantics, no. 189: 53. 2018. · Hoeksema, J. "Positive Polarity Predicates." Linguistics 56 (2): 361–400. · Morzycki, M. 2012. "Adjectival Extremeness: Degree Modiffication and Contextually Restricted Scales." Natural Language & Linguistic Theory 30 (2): 567–609. 40.