

## The cost of *embedded* Scalar Implicatures

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**The theoretical and empirical question.** Two main points constitute a matter of debate concerning the phenomenon of Scalar Implicatures (SIs): the existence of *embedded* implicatures, which opposes a “recursive”/grammatically driven approach such as Chierchia’s (Chierchia, 2006; Fox, 2003; Landman, 1998; Levinson, 2000) to traditional approaches that view SIs as genuinely post-grammatical/pragmatic processes that are added “globally”, independently of compositional semantics (Russell, 2006; Sauerland, 2005; Spector, 2003); and the question of the “cost” of SI computation, which most of the experimental works on SIs has recently been focused on, which opposes “default” (Chierchia, 2004, Levinson, 2000) to “context-driven”/relevance theoretic approaches (Sperber and Wilson, 1986, Bott & Noveck, 2004; Breheny et al., 2005; Noveck & Posada, 2003). Following Chierchia (2006), our contribution to this debate is based on the assumption that SIs can occur in *embedded* position and tests the effect of logical abstract properties of the context (e.g. monotonicity) on the computation of implicatures and their “cost”. Our main finding is that a “cost” is found only when implicatures are added despite the fact that they lead to a weakening of the overall assertion (namely, in Downward Entailing contexts): this loss in informativity, and not implicature computation *per se*, is interpreted as the source of this “cost”.

**A reaction-time study.** Two factors were manipulated in our experiment: the type of environment in which the scalar term *or* appears, (DE vs. NON-DE contexts, as in (1) and (2) – please note that fantasy names were used to limit extra-linguistic influences); the type of situation in which the sentences were to be evaluated (representing *exclusive* vs. *inclusive* interpretation of *or*, cf. (S1) and (S2)). Subjects were asked to say whether each sentence was “true” or “false” in the situation. With respect to the question of the *place* of SI computation, “globalist” approaches would predict that we never derive implicatures in contexts like (1), in which SIs (added via post grammatical processes) are not appropriate, while “localist” accounts would expect the SI (whenever computed) to occur *embedded*, as in (1’). About their “cost”, the following crucial prediction is made: (1’), where the implicature is *embedded* in a DE context (where informativity is reversed), is systematically harder to get and less frequent than (2’) where the implicature is *embedded* in a NON-DE context instead.

**Results.** Results are summarized in Table 1. First of all, a large majority of subjects (90%) accepted sentence (1) in Condition S2, compatible with the *inclusive* interpretation of *or*, while only half of them (57%) accepted it in S1, where *exclusive* interpretation of *or* is represented ( $p < .01$ ). In the second place, the rate of acceptance of sentence (1) in S1 is also significantly lower than the rate of acceptance of sentence (2) in the same condition, which was 87% ( $p < .01$ ). Thus, subjects showed sensitivity to abstract logical properties, such as monotonicity, treating the sentences differently. Moreover, one intriguing result emerges from the analysis on reaction times (RTs), namely: only one comparison revealed statistically significant among RTs. Precisely, this was the time to answer “true” in situation S1 in case of sentence (1) compared to the mean time to answer “false” when evaluating the same sentence in the same condition ( $p < .001$ ). This reflects the fact that subjects that derived the implicature in case of DE context did it at a “cost”. Crucially, no other “cost” was otherwise revealed, contrary to, e.g., Relevance Theory predictions.

**Conclusion.** All in all, our findings seem compatible with Chierchia’s “logicality” approach, which assumes that SI are computed “locally”, as part of the recursive computational process and not via post grammatical operations. With respect to the theoretical issues mentioned above, we believe that our results are important at least in two respects: not only they provide experimental support to the existence of *embedded* implicatures; they also cast some doubts

on the hypotheses that their derivation is costly *per se*. Most importantly, they confirm the value of integrating theoretical claims in semantics with experimental work.

- (1) If a Glimp has a curp or a dorf, he also has a pencil [DE]  
 (2) If a Glimp has a pencil, he also has a curp or a dorf [NON-DE]



S1 exclusive "or" (A and B but not C)

S2 inclusive interpretation of "or" (A and B and C)

- (1') [if **O** (a Gimp has a curp *or* a dorf), he also has a pencil]  
 =[if a Glimp has a curp *or* a dorf, but not both, he also has a pencil]  
 (2') [if a Glimp has a pencil, he also has **O** (a curp *or* a dorf)]  
 =[if a Glimp has a pencil, then he also ha a curp *or* a dorf, but not both]

Sentence	S1 ( <i>or<sub>exc</sub></i> )	S2 ( <i>or<sub>inc</sub></i> )	S1			S2		
			RTs for True	RTs for False	Mean RTs	RTs for True	RTs for False	Mean RTs
(1) DE	57%	90%	11320	7167	9628	8937	12362	9291
(2) NON-DE	87%	77%	9734	8341	9549	10183	11754	10562

Table 1: rate of acceptance of critical statements and RTs (ms.)

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