Strong Implicatures detected in Connectives embedded under Scalar Quantifiers

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Background. One of the most debated questions in research on scalar implicatures concerns the implicatures that are derivable for sentences involving an interaction between a strong scalar item and a weak scalar item such as (1) - (4). Sauerland's (*L&P*, 2004) proposal is that only alternatives that are logically stronger than the original assertion are taken into account

(1) *All* of the dogs had an apple *or* a pear. (UE strong [weak])	**(2) *Some* of the dogs had an apple *and* a pear. (UE weak [strong])**
a. → Not all of the dogs had an apple and a pear. (weak)	a. → Not all of the dogs had an apple and a pear. (weak)
b. → None of the dogs had an apple and a pear. (strong)	b. → Not all of the dogs had an apple or a pear. (strong)
(3) *Not all* of the dogs had an apple *or* a pear. (DE weak [strong])	**(4) *None* of the dogs had an apple *and* a pear. (DE strong [weak])**
a. → Some of the dogs had an apple or a pear. (weak)	a. → Some of the dogs had an apple or a pear. (weak)
b. → Some of the dogs had an apple and a pear. (strong)	b. → All of the dogs had an apple or a pear. (strong)

during implicature calculation. He predicts only the implicatures in (1a), (2a), (3a) and (4a) to arise. We will call these *weak implicatures*. Subsequent proposals additionally predict *strong implicatures* by factoring in logically independent alternatives in some cases (e.g. Chemla, *ms*, 2009), by allowing local exhaustification (e.g. Chierchia, et al., in *Portner, et al. (eds.)*, 2012) or by exhaustifying alternatives that are generated through a step by step replacement of the scalar items in the original assertion (Romoli, *diss.*, 2012). Such proposals differ with respect to in which of the cases in (1) - (4) the strong implicatures could in principle arise. Most of the previous experimental studies (e.g. Geurts & Pouscoulous, *S&P*, 2009; Clifton Jr & Dube, *S&P*, 2010) only examined the strong implicatures associated with sentences like (1); but due to the problems in their paradigms (see Benz & Gotzner, *proceedings*, 2014; van Tiel, *JoS*, 2013), no solid evidence could be found for either confirming or denying the existence of the strong implicatures for sentences like (1).

Predictions on Strong Implicatures

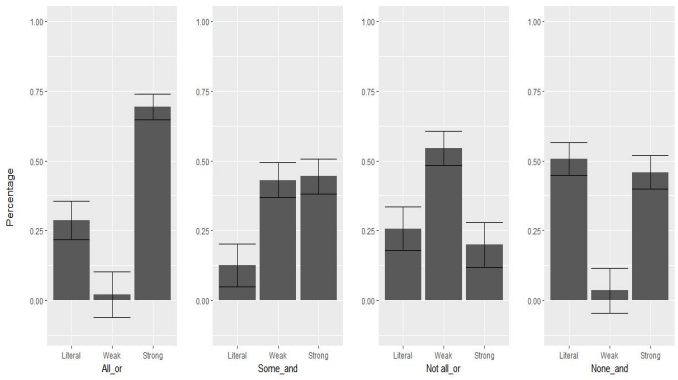
	All...or...	*Some...and...*	*Not all...or...*	*None...and...*
Sauerland	×	×	×	×
Chemla	√	√	√	×
Chierchia, et al.	√	×	×	×
Romoli	√	×	×	√

Experiment. In order to (i) investigate to what extent strong and weak implicatures are generally derivable and (ii) evaluate different theoretical accounts, this study ran an experiment in the form of online questionnaires at the Amazon Mturk, which examined the interpretation of sentences like (1) - (4) under a novel paradigm.

Design. 147 participants self-reported as native English speakers were recruited. A single factorial design was adopted, with the four kinds of utterances in (1) - (4) as the independent variable. Each participant saw 4 target trials and 24 filler trials. A cover story was presented before the trials. The cover story invites participants to imagine that they are in an interactive game, in which they are required to first read and understand a sentence uttered by a speaker who tries to optimally describe the scenario they saw, and then create a scenario that they think is most likely to be what the speaker saw by using a 3x4 matrix, with animals as rows and food options as columns. Exactly one option is required for each row.

Data and Predictions. To simplify the data, we lump together the responses (i.e. the scenarios constructed by participants) as follows: (i) *Literal*: scenarios compatible only with the participant not deriving any implicature; (ii) *Weak*: scenarios compatible with the weak but not strong implicature; (iii) *Strong*: scenarios compatible with the strong implicature (as well as with the weak implicature and literal interpretation). Someone who calculates no implicature could choose a response in any of these three scenario distinctions. If in a certain condition we see significantly more *Strong* responses than *Weak* (and *Literal*) responses, then this is indicative of participants drawing a strong implicature. If in a certain condition we see significantly more *Weak* responses than *Literal* responses, then this is indicative of participants drawing a weak implicature.

Results. In the *All_or* condition, the percentage of *Strong* was significantly higher than that of *Weak* ($t \approx 16$, $p < 0.01$) and *Literal* ($t \approx 5.5$, $p < 0.01$), while the percentage of *Weak* was significantly lower than that of *Literal* ($t \approx -6.6$, $p < 0.01$). This supports the claim that the strong implicature is available for *all...or...*. In the *Some_and* condition, the percentage of *Literal* was significantly lower than that of *Strong* ($t \approx -5.6$, $p < 0.01$) and *Weak* ($t \approx -5.4$, $p < 0.01$); thus, the derivation of the weak implicature for *some...and...* can be confirmed. We find no evidence for the occurrence of strong implicatures in this condition. In the *Not all_or* condition, the percentage of *Weak* was significantly higher than that of *Literal* ($t \approx 3.8$, $p \approx 0.01$) and *Strong* ($t \approx 4.8$, $p < 0.01$). As such, this condition is similar to *Some_and*: we find evidence of a weak implicature, but no evidence for a strong one. In the *None_and* condition, the percentage of *Weak* was significantly lower than that of *Strong* ($t \approx -9.2$, $p < 0.01$). This supports the claim that strong implicatures exist for this condition.



Conclusion and Discussion. (i) Our results suggest that strong implicatures are derivable for the *strong [weak]* configurations, while they provide no evidence for evaluating the assumptions about the availability of the strong implicatures in the *weak [strong]* configurations. The results are in line with Romoli's (2012) account. Chemla (2009) and Chierchia's (2012) accounts are only partly consistent with the results because they falsely predict the non-derivability of the strong implicature for the *DE strong (weak)* configuration. (ii) Weak implicatures were found to be extremely dispreferred for the *strong [weak]* configurations. One possible explanation for this is that the corresponding strong implicatures are strongly preferred in cognition given the fact that they are more informative, as a result, the generation of them greatly suppresses the derivation of the weak implicatures (please notice that there might exists an independent reason for explaining why the corresponding literal interpretations are not suppressed). Notably, this piece of results turns out to be in complete contradiction to the results of Gotzner & Romoli (*JoS*, 2017), which show that the weak implicatures of the *strong [weak]* configurations are preferred over the strong implicatures. Given the sharp contrast between the two results, we suggest that future theoretical work should discuss not only what can be derived, but also what is preferred.