Understanding metaphors in object positions: A test of competing processing theories and an investigation of the interaction between contextual and verb-generated expectations

Camilo Rodríguez Ronderos, Ernesto Guerra & Pia Knoeferle

How are novel metaphors understood? Extant theories on metaphor processing can be broadly categorized according to how they view the relationship between the elements of a metaphor: The `Implicit Comparison View' (ICV), claims that in a metaphor such as *my cat is a princess* (where 'cat' is the topic and 'princess' the vehicle'), the topic and vehicle are understood through a process of analogical reasoning, being both initially scanned equally for relational similarities (Coulson & Oakley, 2005; Wolff & Gentner, 2011). A second view, the `class inclusion model' (CIM), sees metaphor comprehension as a shift in meaning of the metaphoric vehicle, with the metaphoric topic providing the relevant dimensions for lexical modulation (Glucksberg, 2001; Mcglone & Manfredi, 2002; Sperber & Wilson, 2008).

The views therefore make opposing predictions on the issue of symmetry: ICV claims that both elements are initially processed symmetrically, meaning the order of presentation of the elements should not play a role during early stages of processing, while CIM claims that the elements are processed asymmetrically and the order of presentation is crucial for meaning construction. Wolff & Gentner (2011) addressed this issue experimentally by showing that when given only 500 ms to respond, participants give similar comprehensibility ratings to metaphors (*some lies are boomerangs*) and their reversed counterparts (*some boomerangs are lies*), supporting the existence of an initial alignment stage in which both topic and vehicle are evaluated equally, regardless of their position in the sequence. However, this evidence rests on the assumption that the processing of metaphors and their reversed, non-comprehensible counterparts can be compared. It is thus necessary to examine the issue of symmetry in an environment in which the elements of the metaphor can be naturally reversed without rendering the expression infelicitous.

The current experiment aims to do this by making use of the properties of German syntax, which can alternate from an SVO to an SOV surface sentence structure in the presence of an auxiliary verb. This allows us to construct metaphoric expressions in which the vehicle is in the object position and the topic-related verb either appears before (early-verb condition) or after it (late-verb condition), such as in the target sentence in (1):

(1a) Sebastian füttert TOPIC-RELATED eine Prinzessin VEHICLE und wird unablässig der Adligen/der Katze beistehen.
(1b) Sebastian wird eine Prinzessin VEHICLE füttern TOPIC-RELATED und wird unablässig der Adligen/der Katze beistehen.
'Sebastian feeds/will feed a princess and will continuously support the noble woman/the cat.'

A pilot study was conducted with 12 participants (7 female) who first read 4 sentences that either biased towards a literal or a metaphoric interpretation of the target sentence (literal and metaphoric conditions) (literal interpretation: Sebastian is feeding a noble woman; figurative interpretation: he is feeding a very spoiled cat). They then heard the target utterance (1-a or b) while looking at a grid of four pictures, two of which represent the literal and the metaphoric interpretation of the sentence respectively. Participants' eye movements to these pictures were recorded. As a dependent measure, we used the mean log-gaze ratios of the probability of looking at the target picture (the cat in the metaphorical condition and the princess in the literal conditions for sentence 1 above) over the probability of looking at the competitor (the princess in the metaphorical conditions and the cat in the literal conditions for sentence 1 above) in two critical regions: From the onset of the first to the onset of the second element in the metaphor (*füttert to prinzessin* in the early conditions, *prinzessin* to *füttern* in the late verb conditions)(region 1) and from the onset of the second element (*prinzessin* in the early conditions and *füttern* in the late verb conditions), to the onset of the following word (*und* in all conditions) (region 2).

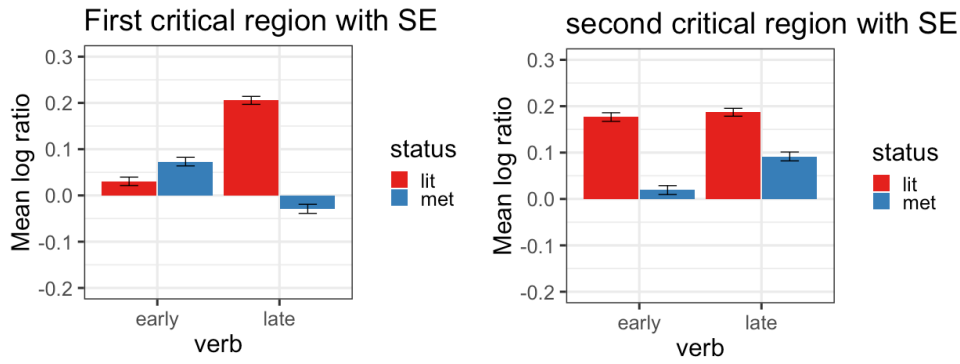
To the extent that the ICV holds, i.e. if both elements of the metaphor contribute equally to the construction of the metaphoric meaning, we should expect the pattern of activation of literal and figurative meaning to be similar regardless of whether the sentence is verb-second or verb-final. This should translate to a similar log-ratios in region 1 and region 2 for the metaphoric conditions.

To the extent that the CIM is correct, i.e. if each element of the metaphor has a role-specific contribution, we should see different activation patterns contingent upon verb order. This should translate to a higher log-gaze probability ratio in the metaphoric early-verb condition in region 1 compared to the log-gaze

probability ratio of the metaphoric late condition in region 2, which should result in an interaction of both factors in region 1 and no interaction in region 2.

The current experiment also allows us to address a different question: What conceptual information drives our expectations of possible objects to a given verb? Is it mostly the information provided by context, or is it knowledge stored together with the verb itself? Altmann & Kamide (1999) showed that participants rapidly generate expectations about upcoming referents based on verb-specific information: Hearing 'the boy will eat' resulted in more looks to a picture of a cake (which has the feature [+ edible]) compared to pictures of a ball or a train. But would this pattern still hold if contextual information leads participants to believe that the kid is actually about to eat a ball instead? The German verb *füttern*, for example, prototypically requires an animal or a baby as its direct object. Thus, in the early-verb conditions (1a above), the expectations associated with the verb coincide with the interpretation 'Sebastian feeds a cat' but are at odds with the interpretation 'Sebastian feeds a princess'. If expectations about possible objects of a verb are driven by context, we should see more looks towards a contextually-appropriate fit in the early-verb conditions in region 1, resulting in positive and similarly high log-gaze probability ratios for both metaphoric and literal early-verb conditions. If, on the other hand, initial expectations are driven by verb semantics alone, more looks should go to the metaphoric-interpretation picture (i.e. the one most prototypically associated with the verb) than to the literal picture regardless of contextual bias. This should result in a negative log-gaze probability ratio in the literal-early-verb condition and in a positive log-gaze probability ratio in the metaphoric-early-verb condition in region1.

Results of the pilot study suggest that participants settled on a metaphoric interpretation of the sentence more easily in the early-verb compared to late-verb metaphoric conditions: In region 1 the mean log-ratio of the late-verb metaphoric condition was negative, whereas in region 2 the mean log-ratio of the early metaphoric condition was positive, in line with the predictions of the CIM. On the other hand, the log-ratio for both early conditions was positive in region 1, suggesting that contextual expectations are overall stronger than verb expectations. However, this preference was more pronounced in the metaphoric condition, which might indicate that verb-driven expectations do interfere to a certain degree with contextually-driven expectations. The full version of the experiment is currently underway.



Graph 1: mean log-ratios of proportion of looks to target picture (the cat in the metaphorical conditions, the princess in the literal conditions) over proportion of looks to competitor picture (the princess in the metaphorical conditions, the cat in the literal conditions). Positive values indicate a preference for the target picture, negative values a preference for the competitor.

References

Altmann, G. T., & Kamide, Y. (1999). Incremental interpretation at verbs: Restricting the domain of subsequent reference. *Cognition*, *73*(3), 247-264.

Coulson, S., & Oakley, T. (2005). Blending and coded meaning: Literal and figurative meaning in cognitive semantics. *Journal of Pragmatics*, 37(10), 1510-1536.

Glucksberg, S. (2001). *Understanding figurative language: From metaphor to idioms* (No. 36). Oxford University Press on Demand.

McGlone, M. S., & Manfredi, D. A. (2001). Topic—vehicle interaction in metaphor comprehension. *Memory & Cognition,* 29(8), 1209-1219.

Sperber, D., & Wilson, D. (2008). A deflationary account of metaphors. *The Cambridge handbook of metaphor and thought*, 84-105.

Wolff, P., & Gentner, D. (2011). Structure-mapping in metaphor comprehension. *Cognitive Science*, *35*(8), 1456-1488.