Does semantic composition rely on predicate decomposition? Contrasting resultatives and depictives

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Abstract. The representation of verb meaning has long been central to the investigation of compositionality. This is so because verbs specify the nature of their arguments, but also, by hypothesis, decompose into complex predicate-argument structures at the semantic or conceptual level of representation. We report on a self-paced reading study investigating the verb-decomposition hypothesis contrasting resultative (*John cooked the fish dry… / The waiter wiped the plate clean…*) and depictive (*John cooked the fished naked… / The waiter carried the plate clean…*) sentences. By hypothesis, resultatives are more complex because they are represented by more predicates. Participants took significantly longer to read depictive sentences than resultative sentences, thus, failing to capture the hypothesized internal complexity of the secondary predicate associated with resultative sentences. Taken together, our results suggest that verbs may not be represented by complex semantic templates with multiple internal predicates. We suggest that a theory which accounts for the representation of verb meaning without predicate-decomposition should be favored.

Keywords: Compositionality, Resultatives, Depictives, Verb semantic complexity, Lexical-conceptual structures, Self-paced reading, Psycholinguistics.

1   Introduction

It is now more than an article of faith in cognitive science that compositionality is a key characteristic of human cognitive architecture [1]. But what is the nature of semantic composition? And how do verbs contribute their content to the sentences/propositions they partake?

One way to approach the nature of lexical-conceptual representations and their role in semantic composition is to investigate verb meaning and how a verb combines with other sentential elements, at the semantic/conceptual level, to yield the meaning of a sentence. While there are different theories on the representation of verb meaning, it is widely assumed that verbs are represented as complex mental entities that can be further decomposed into rich sets of semantic primitives (see, e.g., [2] and [3], for reviews). For instance, on the surface, a lexical item such as *kill*, may be linguistically expressed as *x kill y*, with *x* and *y* specifying its syntactic arguments. But for theories that assume

predicate decomposition at the conceptual level, *kill* is said to be represented by a complex lexical-conceptual structure (LCS) such as [*x* ACT [CAUSE [*y* BECOME <*dead*>]]]] ([4], [5]). The idea is that verbs such as *kill* denote causation, whereby the action produced by an agent causes a change of state in another entity. The key claim of these theories is that causatives are said to be semantically complex because their templates carry many internal predicates, in comparison to simpler classes of verbs, such as those denoting body movement (e.g., *run*), which is hypothesized to involve no change of state and include less internal predicates within its template (e.g., [$_{Event}$ GO [$_{Thing}$ *x* [$_{Path}$ TO ([$_{Place}$ IN ([$_{Thing}$ *y*])])])]); [4]). Crucially, although causatives may be morphologically unmarked at the linguistic level, the conceptual content they contribute is taken to be complex.

2 Resultatives and Depictives

We investigated the role of LCSs in sentence comprehension using a self-paced reading task. In this task, participants (N = 50) read resultative (see (1) and (3)) and depictive ((2) and (4)) sentences, with words presented one at a time. We hypothesized that if resultatives require the semantic composition of LCSs with complex internal predicates [6][7], this should be reflected in longer reading times at the position of the secondary predicate, in comparison to depictives. This difference should be independent of the position between the predicate and its host. To that end, we employed sentence pairs containing different verbs but holding the secondary predicate and its host constant (3, 4); and sentences with similar verbs but manipulating the position between the predicate and its host (1, 2).

(1) a. John cooked the fish dry…
    b. [CAUSE ([*JOHN*], [GO ([*FISH*], [TO [*DRY*]])]) [BY [CAUSE ([*JOHN*], [GO ([*FISH*], [TO [*COOK*]]]]

(2) a. John cooked the fish naked…
    b. [COOKED ([*JOHN*], [*FISH*]) [WITH [BE ([*JOHN*], [AT [*NAKED*]])]

(3) a. The waiter wiped the plates clean…
    b. [*WAITER* ACT <*WIPE*>] CAUSE [*PLATE* [BECOME <*CLEAN*>]]]

(4) a. The waiter carried the plates clean…
    b.[[*WAITER* ACT <*CARRY*>] [*PLATE* [STATE <*CLEAN*>]]]

3 Results and Discussion

We conducted separate linear mixed effects (LME) analyses for sentences with ((1), (2)) and without ((3), (4)) surface distance between the secondary predicate and its host. The LME models analyzed the effects of sentence type (resultative, depictive) and sentence position (NP, V, VP, AP, PP), on participants' RTs (see Fig. 1). For the first set (with surface distance), we found that participants took significantly longer to read depictive sentences than resultative sentences, in particular in the "spill over" region, after

the secondary predicate (*dry* / *naked*). This effect was not supported in the comparison between sentences without long-distance dependency (*wipe* / *carry*).

These results are at odds with predicate decomposition insofar as LCS complexity affects reading time. Contrary to the predicted greater processing time for resultatives, our results show longer reading times for depictives. It should be highlighted that our analyses took into account collocation frequency as a factor and that our sentence manipulations involved two loci for the noun phrase host of the secondary predications. Our results are more in line with a view of compositionality that relies, not on the decomposition of predicates, but on the denotations of lexical constituents and their structural relations in the propositions that concepts partake, consistent with a more classical notion of compositionality.
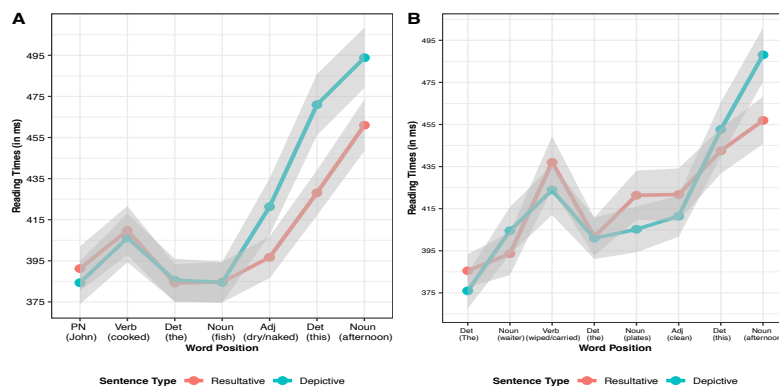

Fig. 1. Mean RTs for each constituents for resultatives and depictives; A: with surface distance between the secondary predicate (*dry / naked*) and its host (*fish / John*); B: without surface distance between host (*plates*) and secondary predicate (*clean*).

References

1. Fodor, J. A., & Pylyshyn, Z. (1988). Connectionism and cognitive architecture: A critical analysis. *Cognition*, *28*, 3–71.
2. Engelberg, S. (2011). Frameworks of lexical decomposition of verbs. In C. Maienborn, K. von Heusinger, & P. Portner (Eds.), *Semantics: An international handbook of natural language meaning* (Vol. 1, pp. 358–399). Gruyter Mouton.
3. de Almeida, R. G. & Manouilidou, C. (2015). The study of verbs in cognitive science. In R. G. de Almeida & C. Manouilidou (Eds.), *Cognitive Science Perspectives on Verb Representation and Processing*. New York: Springer.
4. Jackendoff, R. (1990). *Semantic structures*. MIT Press.
5. Levin, B., & Rappaport Hovav, M. (2005). *Argument realization*. Cambridge U. Press.
6. Goldberg, A. E. & Jackendoff, R. (2004). The English resultative as a family of constructions. *Language*, *80*, 532-568.
7. Levin, B. (2019) *Resultatives and constraints on concealed causatives*. Unpublished manuscript. Stanford University, Stanford, CA.