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A sisterhood of constructions? A structural priming approach to modelling links in the network of Objoid Constructions

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Abstract: A central aim of Construction Grammar is to model links within the construct-i-con. This paper investigates three constructions that share one property: an atypical element in the object slot. The constructions are therefore not prototypically transitive. Structural priming (implemented with an automatic maze variant of self-paced reading) is used to test hypotheses on the relation among the Reaction Objoid (*She smiled her thanks*), the Cognate Objoid (*She smiled a sweet smile* or *He told a sly tale*), and the Superlative Objoid (*She smiled her sweetest*) Construction, and between two variants of the latter (*They worked (at) their hardest*). Results support transitivity as gradient: intransitive COCs prime the ROC and the SOC, whereas COCs with transitives only prime the ROC. For variants of the SOC, we find evidence of asymmetric priming with the bare SOC priming the *at*-SOC. Within-construction priming effects in the SOC are of greater magnitude than those with the *at*-SOC and the latter are weaker than those of the COC and of a rather different nature than those from the ROC. This suggests that speakers, rather than creating a constructeme between the bare and the *at*-SOC, store distinct but closely related constructions on a cline of transitivity.

Keywords: modelling network relations; Reaction Objoid Construction; Cognate Objoid Construction; Superlative Objoid Construction; structural priming

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1 Introduction

As a theory of linguistic knowledge, Construction Grammar is concerned with what speakers know when they know a language and how this linguistic knowledge is represented in speakers' minds. One major tenet of the theory is that the totality of our linguistic knowledge consists of a large network of constructions, the construct-i-con. Constructions as form-meaning pairings at varying degrees of abstraction and complexity (from words to larger phrasal and clausal units) form the nodes of the network, which are connected via different types of associative links between constructions at different levels of abstraction as well as between constructions on the same or a similar level of abstraction. The metaphor of a 'network' stems from work in cognitive psychology, which also treats other types of knowledge as being organised in such a way (e.g., Reisberg 1997). One key concept here is that of 'spreading activation' (Collins and Loftus 1975), a mechanism that in the area of Construction Grammar refers to "the (near-)simultaneous activation of *closely* related nodes in particular usage events" (Traugott and Trousdale 2013: 54; our emphasis). It is assumed that evidence of such relations may come from priming, "a recency effect of language use that facilitates (or inhibits) the activation of semantically or formally similar items" (Diessel 2019: 201). Corpus-based studies by Gries (2005), Szmrecsanyi (2005, 2006), and De Smet (2016) are supportive of such a view. Ungerer (2021) is the first to take an experimental approach to testing the priming hypothesis as evidence of constructional relations in his study on the resultative and the caused-motion constructions.

The aim of this paper is to contribute to this novel avenue of research in Construction Grammar with a case study on three constructions: the Superlative Objoid Construction (SOC), the Reaction Objoid Construction (ROC), and the Cognate Objoid Construction (COC). These Objoid Constructions (OCs) are structurally and semantically related; they are also low-frequency phenomena and restricted to particular text types. Structural priming, being sensitive to both form and meaning (see Ungerer 2021), particularly in low-frequency constructions, presents itself as the best method to test the relations among structurally and semantically related patterns, as is the case with the three members of the family of objoid constructions we analyse here. What we suggest might be a sisterhood of constructions (see Section 2.1) are patterns which are superficially similar to regular transitives but all differ from them in that the elements in the object slot are only object-like, albeit to differing degrees. Bouso and Hundt (2024) adopt the term *objoid* from Allerton (1982) for the structurally particular element in the SOC. We argue that it is also applicable to the two sister constructions. In addition to their unusual transitivity properties, the three OCs at the core of this paper are related in being akin to manner adverb constructions.

The NP in the ROC in (1) is not a prototypical object in that it only passivizes if the possessive is omitted (**Her thanks were smiled*); at the same time, the construction means 'She expressed her thanks in a smiling way'. While the COC in (2) arguably passivizes from a purely structural perspective, the passive variant appears odd on semantic grounds as the NP in object position does not add any content to the event expressed in the VP (?*A sweet smile was smiled*). The COC, furthermore, is very closely attracted to the manner construction *She smiled sweetly* in meaning. In the SOC illustrated in (3), finally, the object slot is filled with a possessive pronoun that is correlative with the subject NP and a superlative adjective, but this objoid lacks the nominal head typical of regular object NPs. The SOC is thus even further removed from the transitive prototype in that it does not passivize at all. Instead, the objoid itself is akin to a degree manner adverb construction (*We worked very hard to raise them that way*).

(1) *She <u>smiled her thanks</u> and opened the inner door*. (COCA, FIC, 1991)

(2) *She <u>smiled a sweet smile</u>*. (COCA, FIC, 2015)

(3) *Kate and I have <u>worked our hardest</u> to raise them that way*. (COCA, MAG, 2009)

Previous research by Bouso (2021, 2022, 2024), and Bouso and Hundt (2024) shows that such OCs are relatively low-frequency phenomena that find their niche in particular text types, which greatly reduces the viability of a corpus-based approach to testing potential priming effects. More importantly, taking an experimental approach offers a substantial advantage over observational data in allowing researchers to tap into potential cause-and-effect relations (see Grieve 2021).

Section 2 offers some background on the properties of OCs as well as the priming approach for testing constructional relations. The assumptions underlying the connections between priming and constructional relations allow us to formulate more fine-grained research questions and predictions that we aim to test empirically. Sections 3 and 4 provide details on the experimental design and the results obtained. We discuss the relevance of the results for the theoretical modelling of constructional relations in Section 5. The concluding section summarises the most relevant findings and pinpoints aspects that need to be further explored in future investigations.

2 Previous research and methodological considerations

2.1 Locating OCs in the construct-i-con

At the outset, Construction Grammar focused on vertical inheritance relations in the construct-i-con (e.g., Goldberg 1995). Vertical links also hold between constructions at different levels of abstraction, as in Traugott and Trousdale's (2013) hierarchy of macro-, meso-, and micro-level constructions. Horizontal links, while already implicit in the metaphor of a family of constructions (Goldberg and Jackendoff 2004), started receiving systematic attention much later, from around the 2010s (Booij 2010; Hilpert 2019 [2014]; Lorenz 2014; Van de Velde 2014) and are the focus of Sommerer and Smirnova (2020).[1]

Horizontal relations hold between constructions on the same level of abstraction, which may be part of a family, or a neighbourhood, depending on whether they have a connection to a parent construction, or not (see also Audring 2019). Diessel (2019, 2023) distinguishes between horizontal relations of similarity and contrast. English resultatives, in this view, are a family of constructions (Goldberg and Jackendoff 2004) that are connected by overlapping similarities in form and meaning (see Wittgenstein 1955). Though it is true that the resultative meaning is implicit in most examples of the construction, the siblings show varying degrees of similarity with each other with respect to their structural properties, to the extent that some members of the family may actually be quite different, for instance, in terms of their transitivity (compare transitive *The prism breaks the light into different colours* with intransitive *His trousers froze stiff*). Horizontal links that contrast related constructions are postulated to exist between allo-structions, as in the English particle placement construction (Cappelle 2006): the two variants (*He turned the radio on* vs. *He turned on the radio*) describe the same scene but differ both in their word order and with respect to their contexts of use (Diessel 2023: 34).

We build on Bouso and Hundt (2024), who argue that the ROC, the COC, and the SOC are related to higher level schemas, namely the prototypical transitive, on the one hand, and the manner adverb construction, on the other hand. For the SOC, the study postulates two variants, the bare SOC in (4) and the *at*-SOC in (5).

(4) … *we <u>work our hardest and best</u> to fix it.* (COCA, WEB, 2012)

(5) … *Windows 8 will <u>work at its best</u>.* (COCA, WEB, 2012)

The ROC, COC, and SOC occur roughly on the same level of abstraction and are thus assumed to be 'horizontally' related to each other and 'vertically' related to two parent constructions, the transitive, and the manner adverb schema, with 'vertical' and 'horizontal' being used here as a shorthand for level of abstraction rather than a

1 Diessel's (2019, 2023) overview of different types of links also includes those between form and meaning, i.e., the symbolic link that constitutes a construction, sequential links (akin to the syntagmatic relations in structural linguistics) and filler-slot relations (similar to paradigmatic relations). Horizontal links have sometimes also been referred to as paradigmatic relations (Diewald 2020; Diewald and Politt 2020), a terminological choice that is conceptually confusing considering its origins in structuralist terminology. Our focus here is on links between nodes.

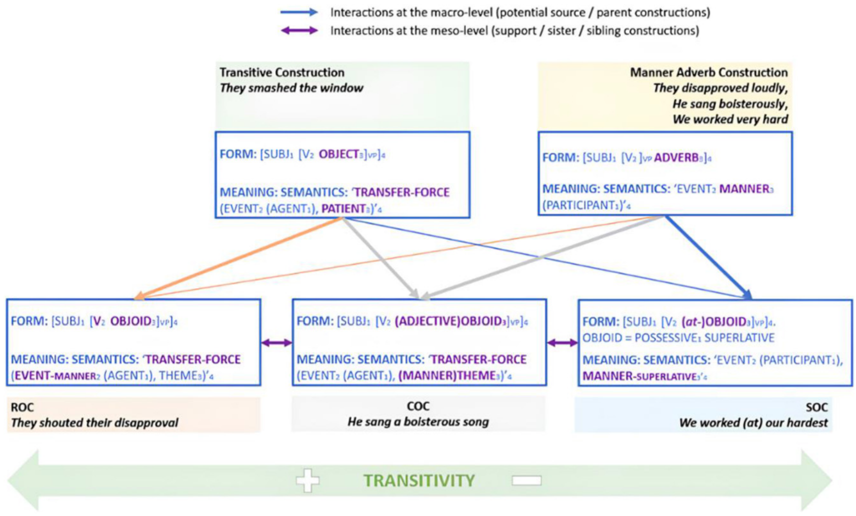


Figure 1: Constructional properties and relations of OCs; based on, but adapted in detail following Hoffmann (2022), from Figure 13 in Bouso and Hundt (2024: 116).

strictly spatial notion. As pointed out in the introduction, the ROC, COC, and SOC are all 'defective' with respect to the prototypical transitive construction schema, and the different degrees of inheritance from the transitive schema are indicated by differences in line thickness in Figure 1. All three constructions are also related to the manner adverb construction schema, again to different degrees, represented by thicker and thinner lines. Starting with the one closer to the manner adverb construction, we observe that the objoid of the SOC (POSS + superlative) is akin to a degree adverb manner construction: *she worked her hardest* ~ *she worked extremely hard.* The most felicitous COCs typically contain an adjective that premodifies the cognate deverbal noun. Prototypical COCs thus express manner in a nouny construction: *he sang a boisterous song* ~ *he sang boisterously*. The ROC, finally, has a manner verb that combines with a deverbal noun: *They shouted their disapproval* ~ *They disapproved loudly*. In other words, the SOC and the COC recruit the object slot to express manner whereas the ROC recruits the verb slot for this function (see chapter 14 in Croft 2022 for a cross-linguistic survey supportive of 'verby' and 'nouny' manner constructions).[2]

2 Figure 1 is only one possible way of presenting the relations among a subset of constructions. Importantly, it presents something on a two-dimensional plane that would benefit from a three-dimensional representation. Moreover, presenting constructional relations on a two-dimensional plane has given rise to the somewhat problematic dichotomies of (a) horizontal versus vertical

The detailed descriptions in Figure 1 of the constructional schemata and the OCs reveal differences between parent and offspring in the semantic roles that fill argument slots. Prototypical transitive events express the "transmission of force … by an initiator with mental capacities exercising her/his control acting on a physical endpoint" (Croft 2012: 282); in other words, in canonical transitive constructions, a volitional (human) subject acts on a patient, which in turn is affected by the action denoted by the verb (e.g., *They smashed the window*). In the non-prototypical COC and ROC there are also two arguments. However, the second argument is not a patient or a physical endpoint, but rather involves a resultative meaning where a participant (a theme) is brought to existence by the action denoted by the verb ('X CAUSES Y TO EXIST'). Finally, in the SOC there is only one participant; the energy in this pattern therefore "stays" in the process, bringing it closer to a prototypical intransitive construction (which could be added to Figure 1 and linked by an attraction rather than a differentiation link, as suggested in Bouso and Hundt 2024: 116).

2.2 Priming horizontal and vertical links

Most studies dealing with structural priming (priming above the word level) have focused on alternating constructions such as the dative alternation (Bock 1986; Bock and Loebell 1990; Goldwater et al. 2011) or the active-passive alternation (Vasilyeva and Waterfall 2011).[3] Bock's (1989) seminal study shows that participants tend to produce prepositional datives (*The girl is handing a paintbrush to the man*) instead of the alternative double object constructions (*The girl is handing the man a paintbrush*) even if the prime does not include *to* (*The secretary baked the cake for her boss*). Hare and Goldberg (1999) is an early example of a study on cross-constructional priming. They show that the order of the semantic roles (agent, recipient, theme) in the *provide-with* construction (*The officer provided the soldier with guns*) is primed by the double object construction (*His editor offered Bob the hot story*) despite the fact that the former is syntactically closer to the prepositional dative (NP V NP PP). Both Bock (1989) and Hare and Goldberg (1999) are examples of experiments that primed participants' production.

Ungerer (2021, 2022, 2023a, 2023b) extends the structural priming paradigm to the investigation of clause-level constructions that, while differing in their form and

relations amongst constructions and (b) nodes versus links (for details see Hilpert 2018; Ibbotson et al. 2019). Figure 1 is not meant to imply that nodes are more important than links.

3 For a more comprehensive overview, see Mahowald et al. (2016).

meaning, have nevertheless been claimed to be constructionally related. Specifically, his experiments tap into putative cross-constructional links between two sets of patterns: the caused-motion (CM) construction (6) and the resultative (RES) construction (7), and the RES and the object-oriented depictive (DEP) construction (8).

(6) *James rolled the ball down the hill.* ('X CAUSES Y TO GO Z')

(7) *Susan hammered the metal flat.* ('X CAUSES Y TO BECOME Z')

(8) *John cut the grass wet.* ('X ACTS ON Y WHILE Y IS Z')

As Ungerer's research is pivotal to our own study design, we provide a somewhat more detailed discussion of his work. He observes differences in priming effects between instances of the same construction and the target construction with respect to a (structurally unrelated) baseline pattern. He interprets these as a sign that the constructions in his experiments are distinct but related. He also argues that the directionality of the priming effect for the CM and the RES construction can be taken as indication of the type of link that connects them: if the priming effect is bidirectional then the constructions are horizontally related; by contrast, if the effect is asymmetrical the two constructions are vertically (metaphorically) connected. The results from Ungerer's (2021) experiment, for instance, reveal priming effects of a similar magnitude in both directions, thus providing support of a horizontal link between the CM and the RES construction.

According to previous research, priming effects tend to be small for frequent patterns but more pronounced for marked (low-frequency) constructions (Bernolet and Hartsuiker 2010; Jaeger and Snider 2013). This suggests that the low-frequency niche constructions at the core of this paper should be amenable to experimental testing via a comprehension priming approach.

As pointed out in the introduction, priming can have a facilitatory or an inhibitory effect. Previous research has yielded different (and occasionally contradictory) results on the type of priming effect. Lexical priming has been shown to be amenable to both facilitatory and inhibitory priming, with semantically related words yielding both types of effect in different studies, which Ungerer (2023b: 99) attributes to the methodological approaches rather than underlying cognitive processes. While previous experiments on structural priming (e.g., Branigan and Pickering 2017) have mostly revealed facilitatory effects, Ungerer (2021, 2023b) observes inhibitory effects between the CM and the RES construction and facilitatory effects between the RES and the DEP construction. He (2023b: 100, 184) points out that inhibitory effects are more likely to emerge from comprehension studies.

2.3 Research questions and predictions

The research questions we aim to answer serve as a continuation of Ungerer's (2021, 2022, 2023b) line of research. They concern the manifestation of cross-constructional priming effects between constructions at roughly the same level of abstraction. More specifically, the present study aims to test the hypothesis that the ROC, COC, and SOC are closely related constructions forming a sisterhood that shares horizontal links of varying strengths. As pointed out in Section 2.1 and shown in Figure 1, the ROC, COC, and SOC differ in their relation to the transitive schema. On the basis of this, we postulate that adjacent constructions on the cline of transitivity are more likely to prime each other than constructions that are more distantly related (see Figure 1).

- RQ 1: Do speakers show signs of *cross-constructional priming* between instances of the COC and the SOC, the COC and the ROC, but not (or to a lesser degree) between the ROC and the SOC?

As for the bare SOC and its prepositional variant, the questions to be addressed are the following,

- RQ 2a: Do speakers show signs of *cross-constructional priming* between instances of the bare SOC, and the *at*-SOC, which are distinct from *within-construction priming* between instances of the same construction?
- RQ 2b: Does cross-constructional priming only occur from bare SOC primes to *at*-SOC targets (providing evidence of a vertical, *asymmetric relation*), or do the effects emerge in both directions (suggesting the existence of a bidirectional horizontal link)?

As for the directionality of the links, preliminary corpus evidence (Bouso and Hundt 2024) suggests that the bare SOC primes the *at*-SOC but that the *at*-SOC is unlikely to prime the bare SOC. More specifically, in example (9), the bare SOC with *do* primes the bare SOC with *be* despite the fact that *be* is a prototypical verb in the prepositional variant of the SOC. Example (10), on the other hand, provides direct evidence of the lack of priming from the *at*- to the bare SOC, as the *at*-SOC is never attested with *do* (examples taken from Bouso and Hundt 2024: 111).

(9) … *you've got to <u>do your best</u> – and – and <u>be your best</u>*. (COHA, 1920)

(10) …*our American armies <u>were **at** their best</u> and <u>did their best</u>*. (COHA, 1890)

Finally, with respect to degrees of relatedness, the study aims to answer a RQ that cuts across all four constructions:

– RQ 3: Are the effects of priming of greater magnitude for what we assume to be more closely related constructions (the variants of the SOC) than those among the postulated sisterhood of OCs?

RQ3 is of theoretical relevance because previous papers have postulated a meta-construction (Leino and Östmann 2005) or 'constructeme' (Perek 2012, 2015), i.e., an abstract level uniting varying constructions. Experimental evidence of a tighter connection between variants of the SOC than between the SOC and its sisters could be taken to support the existence of an underlying, more abstract representation.

3 Experiment

3.1 Participants

We recruited 300 participants from Prolific (https://www.prolific.co), 150 each for the variant of the experiment with or without the possessive in the ROC. We decided to sample speakers of US English, only, for three reasons. First, previous research into the ROC, COC, and SOC mostly used corpus data representing US English. Second, our stimuli feature AmE spelling and lexis. Third, in the initial run to create the distractors, we noticed that the language model underlying the creation of a-maze appears to be slightly biased towards this variety. The filter for pre-screening on Prolific was therefore set so that informants had US English as their first language (with a maximum of one additional language) and had not spent an extended period living outside of the US. Participant's age ranged from 30 to 60 years. We also included a qualifications cutoff (high school diploma) following the recommendation of Boyce and Levy (2023: 14) who found that this decreased the number of random answers. We did not preselect for handedness but control for this factor in our analyses. We piloted the experiment with 10 participants to make sure that there were no technical problems. Afterwards, participants were recruited incrementally on Prolific, which allowed us to reject data from individuals who had, for instance, spent significantly less time on the experiment than we deemed necessary (based on the timings obtained from our pre-tests); we also rejected participants with an error rate >50 % for sentence completion. Table 1 provides an overview of participant background information for the two variants of the experiment.

Table 1: Participant background information.

		Version 1	Version 2
Age	Average	44.2 (SD: 9.1)	42.6 (SD: 9.2)
	Median	43	40
	Mode	41	35
Gender	Female	75 (50 %)	77 (51.3 %)
	Male	73 (48.7 %)	72 (48 %)
	Trans	1 (0.7 %)	1 (0.7 %)
	Non-binary	1 (0.7 %)	0
Qualification (highest)	Highschool	54 (36 %)	54 (36 %)
	College/University	92 (61.3 %)	97 (64 %)
	PhD	4 (2.7 %)	0
Handedness	Left	18 (12 %)	26 (17.3 %)
	Right	130 (86.7 %)	123 (82 %)
	Ambidextrous	2 (1.3 %)	1 (0.7 %)
SET	1	73 (48.7 %)	78 (52 %)
	2	77 (51.3 %)	72 (48 %)

3.2 Task type and materials

Following Ungerer (2021, 2023b), we employ a variant of a self-paced reading experiment (G-maze). In a G-maze task, participants build a sentence incrementally from two alternatives they are provided with for each syntactic slot. The technique forces participants' deep processing of the stimuli. It also provides "highly localised indications of processing time differences" (Witzel et al. 2012: 109), reducing the risk of "spillover" effects.

The aim of our experiment is to test how speakers' processing of the OCs is affected by previous exposure to instances of an adjacent construction (ROC and COC, COC and SOC) and a more distant construction (ROC and SOC). As baselines, we use reaction times (RT) from pairs of the same construction and completely unrelated constructions paired with one of our OCs. For the variant forms of the SOC, we also test cross-constructional priming. With three related constructions and two variants of the SOC as well as the aim to test potential priming effects in each direction, our experimental set-up is already very complex. We therefore deliberately design our stimuli such that any lexical boosting effect will be ruled out. This approach seems justified by the fact that Ungerer (2021) found only a very marginal effect of the lexical boost in his experiment.

There is one exception to a potential lexical boost, however. The objoid in the ROC can be either a bare noun or an NP with an indefinite article, an adjective or a possessive pronoun:

(11) *He grunted assent*. (COCA, 2019, FIC)

(12) *He grunted a response*. (COCA, 1990, FIC)

(13) … *I grunted exaggerated puffs*. (COCA, 2009, FIC)

(14) *Occasionally the big man grunted his disapproval* … (COCA, 1995, FIC)

Instances with a possessive pronoun are actually more prototypical than those with a bare noun (see Bouso 2021). In order to be able to test the potential impact of lexical boosting from the possessive on priming effects between the ROC and the SOC, we collected data for this aspect, using exactly the same stimuli as previously but adding the possessive to the instances of the ROC. Seeing that the remaining stimuli remain exactly the same, we can use the dataset with the extended ROC stimuli, overall, as a replication study for the non-ROC contexts/comparisons.

The verbs selected for the construction of the stimuli are prototypical for each construction (based on the results from Höche 2009; Bouso 2021, 2024; Bouso and Hundt 2024). For the COC we also controlled for transitivity, including both transitive (e.g., *drink, give, smell, tell*) and intransitive verbs (e.g., *dance*, *live*, *sing*, *sleep*) as primes for the SOC and the ROC.[4] All verbs attested in the ROC are intransitive (manner of action) verbs (e.g., *grin, growl, murmur*, *mutter*, *sigh*, *snort*, *smile*, and *whisper*). Finally, for the bare and the *at*-SOC, in addition to prototypical *do*, *try*, and *be*, we used verbs across the sentence pairs that are related in meaning (*perform*/*play*, *seem*/*look*).

All in all, the present study investigates three constructions, each of them having two subtypes, thus a total of six specific patterns: the ROC (with/without possessive), the COC (intransitive/transitive), and the two putative allo-structions of the SOC (the bare and the *at*-SOC). To verify the naturalness of the critical stimuli, we informally asked nine native speakers for feedback on their acceptability. Predictably, the overall ratings for the ROC (instances without the possessive) and the *at*-SOC were lower than for the bare SOC, and the COC, in that order. Importantly, our informants commented on the markedness rather than grammaticality of the items, one of them noting that “I feel like speakers might often avoid some of these, although there’s nothing wrong with them”.

The region of interest (ROI) in our study is not necessarily in the same syntactic position (cf. Ungerer 2021). For RQ1, the critical sentence region is the slot

4 This classification is based on Liu’s (2008) well-known taxonomy of intransitive verbs (see Bouso 2024: foonote 11).

immediately following the VP for the ROC and the SOC as we can assume that at the onset of the objoid speakers become aware of the difference in constructional meaning (see Figure 2). We test whether the inclusion of the possessive has a lexical boosting effect, that is, whether this lexical overlap enhances priming effects (Ungerer 2023b). This will be done by comparing RTs from the first version of the experiment with trials from the second version of the experiment where participants saw stimuli with a possessive; to control for this effect we changed the ROI in a couple of prime-target pairings from both sets (e.g., *Luis murmured his agreement* – prime => *Arnold fought his fiercest* – target; *Mat shouted his loudest* – prime => *Leo sighed his relief* – target) and placed the ROI on the objoid instead of in the immediate region following the verb (see Figure 2; for details, see Supplementary Materials; STIMULI folder).

For the COC, the ROI is the onset of the objoid with prototypical intransitives (e.g., *live* and *sleep*) but the cognate noun with transitive (*paint*) or intransitive/ ambivalent verbs like *dance* and *sing*. As transitive verbs can also take regular NP complements, the element of surprisal that is likely to affect RTs only comes at the cognate noun in COCs with a transitive verb (see Figure 3).

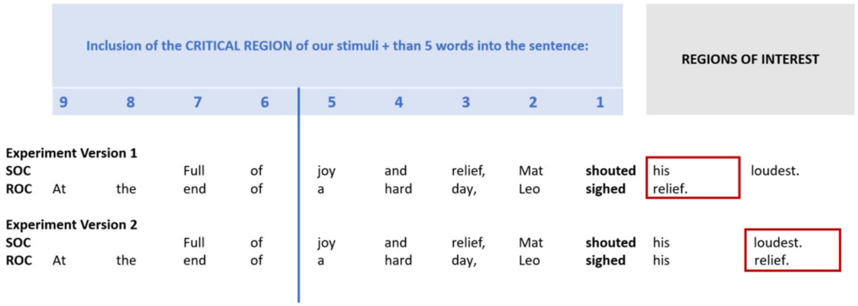


Figure 2: Region of interest for the SOC and the ROC (with potential lexical boost).

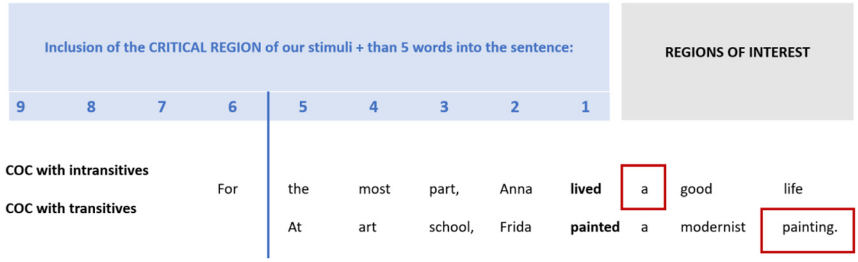


Figure 3: Regions of interest for the COC with intransitive and transitive verbs.

For RQ2, the ROI is the first word following the verb – the correlative possessive for the bare SOC and the preposition for the *at*-SOC (see Figure 4).

All our sentences contain material in the left periphery of the main clause (see Figures 2–4 for examples). There are two reasons for this. First, Boyce et al. (2020: 6) advise to place the critical word in the maze after five words into the sentence as error rates stemming from poor distractors or distracted participants are less likely to affect RT at this point. Second, the added left periphery provides some contextual motivation for the OCs, thus improving the naturalness of the critical items. To be able to address the issue of directionality (symmetrical vs. asymmetrical priming), our research design ensures that the OCs and the variants of the SOC function as prime and target.

All stimuli have human subject NPs. To avoid any potential noise from a change in the gender of the proper names, all paired critical items have either male or female names. Gender of personal names in sets of filler items was not controlled for (with some same-gender and some mixed sets). In addition to the critical items, we adapted half of our total number of fillers from Ungerer's (2021) study, including some with correlative possessives but avoiding passives. Since Ungerer's test items have a transitivity bias, the remaining unrelated patterns are comprised of mono-transitives and intransitives. Filler items were inserted between the critical items in randomised order.

To avoid fatigue, we opted for a between-subjects design. To this end, we created two sets of stimuli involving eight blocks of 14 sentences each, asking participants to continue after each block, which contained two critical sets (prime and target) with one within- and one cross-constructional priming context as well as one baseline. Participants thus saw a total of 112 sentences, with 80 fillers and 32 priming contexts (two of each type, evenly distributed across the two participant groups, i.e., SET1 and SET2). The ordering of the blocks was randomised when these were distributed among the participants to control for ordering effects in the data.

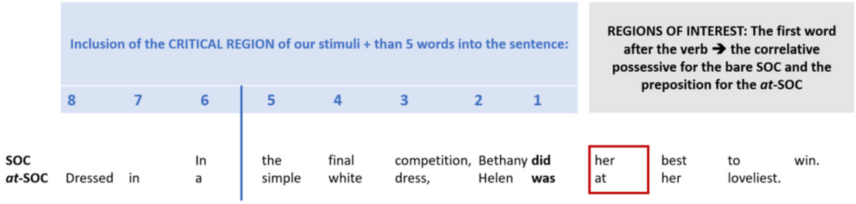


Figure 4: Regions of interest for the bare and *at*-SOC.

3.3 Implementation

The experiment was implemented in Gorilla (https://www.gorilla.sc). At the beginning of the experiment, we collected background information on the participants in order to verify whether pre-filtering of participants via the Prolific interface had been successful (see 3.1). This was followed by information on the task and two training items to familiarise participants with the task and allow them some time to practice the use of keys (participants pressed “e” and “i” for the left and right word respectively).

For the creation of the maze task, we used the scripts for the automatic generation of distractors provided by Boyce et al. (2020). Seeing that the algorithm generates choices that are potentially ambiguous, we generated several sets of distractors. In manually adjusting the distractors, we replaced any problematic items with alternatives from a parallel set of distractors, changed upper case *Happier* to *happier*, and replaced words that are only used as part of chunks or abbreviations (e.g., *al, vs*), making sure they matched the corresponding words in the stimuli in length. For the replacement of potentially ambiguous items we also relied on the results from a pre-testing run.

Participants were presented with a series of frames, each containing a distractor and a word with a possible continuation of the sentence. The position (left-right) of the correct word was randomised across participants. They were instructed to respond as quickly and accurately as possible. Following the model of Boyce et al. (2020: 6), we included a gamification element in the form of a counter that provided participants with the number of correct choices they had made. Additionally, after each correctly completed sentences, the feedback ‘Well done!’ was shown; if a participant chose the wrong continuation, the trial aborted.

3.4 Analysis

Pre-processing of our data included the following steps. First, we applied log transformation (Baayen and Milin 2010) to the RT of the relevant data, that is, all words defined as region of interest (3,788 datapoints for version one and 3,814 for version two). Second, we removed absolute outliers (i.e., 2.2 % of the 7,602 initial log transformed datapoints).[5] Finally, we removed all trials with an incorrect sentence continuation before the predetermined ROIs and, in the case of incorrect baseline or priming sentences, we also removed the following sentence as they could not have

5 For TARGET and PRIME, trials where the logged RT was above/below 2.5*SD of the respective participant’s logged mean (for the ROI), no further outliers emerged.

been primed; the same procedure was applied to primes without correct target continuations. The number of useable trials included in our analyses across our sets of baselines, primes, and targets is distributed as follows: 1,838 trials from version one of the experiment, and 1,879 from version two, resulting in a total of 3,717 useable prime-target trial pairs.

Using R (R Core Team 2023), we first fit a linear mixed-effect model using *lme4* (Bates et al. 2015) to investigate the effect of the priming conditions on RT at the predetermined ROI for each of the four pairings of target constructions: the SOC and the COC, the COC and the ROC, the SOC and the ROC, as well as the bare SOC and the *at*-SOC. Additionally, we fit models that controlled for transitivity of the verb in COC primes across the two versions of the experiment (with SOC and ROC as target). For the comparison across the sisterhood of constructions and variants of the SOC (RQ3), we fit another glm model, taking the SOC (Target) as the constructional anchor for comparison. This meant that the regression model was restricted to the 947 trials where the SOC serves as anchor point.

The fixed effects consisted of ‘target construction’, ‘prime construction’, and their interaction. Additional predictors were added to the model in a backward stepwise fashion, retaining only those that significantly improved the model fit. We also used the “bobyqa” optimiser to facilitate model convergence (see Brown 2021).

Table 2 shows the predictors selected in each of the models we fit to our data (predictors in parentheses were selected only for the data in the first version of our experiment; those with an asterik only for the second version).

While our mixed models improved with the inclusion of additional predictors (with ‘age’ as the only consistent and strong effect across all models), none of these factors showed interaction effects. As for the random intercepts that led to model convergence, these consisted of participant public ID (all models); additionally also SET (*at*-SOC:bareSOC) in the first version of the experiment.

Table 2: Predictors (main effects) in mixed models.

Construction pair(s)	Age	Education	Gender	Handedness
COC:SOC	x			(x)
COC:ROC	x	(x)		(x)
ROC:SOC	x	x*	x*	
COC-I:SOC/ROC (all data)	x			
COC-T:ROC/ROC (all data)	x			
at-SOC:bareSOC	x			
Cross-cxnal (all data): *at*-SOC/COC/ROC/SOC:SOC	x			

The interactions between prime and target constructions were further explored via pairwise comparisons using the package *emmeans* (Lenth 2023) in R. The Tukey method was used to adjust the *p*-values for multiple comparisons. In the next section, we report the findings from the pairwise comparison (the complete models are available in the set of Supplementary Materials; see RCODE folder).

4 Results

4.1 Priming effects and the sisterhood of OCs

We start off with the comparisons between the SOC and the COC, the COC and the ROC and the ROC and the SOC as target constructions. Table 3a shows the results from the first version of the experiment (without the possessive in the ROC's objoid) and

Table 3a: Output from pairwise comparisons of log-transformed response times between prime constructions for each target construction (Experiment Version 1).

Target cxn	Diff. between prime cxns (A minus B)	Estimate	*SE*	*T*	*p* (adjust.)	Sign.	Diff. in ms	Relative difference
COC	**COC-SOC**	**0.033**	**0.013**	**2.63**	**0.024**	*	**31.1**	**7.3 %**
	COC-Unrel	**−0.031**	**0.013**	**−2.35**	**0.050**	*	**−31.2**	
	SOC-Unrel	**−0.064**	**0.013**	**−4.89**	**<0.0001**	***	**−62.3**	**−15.9 %**
SOC	**COC-SOC**	**0.077**	**0.013**	**6.12**	**<0.0001**	***	**69.7**	**16.2 %**
	COC-Unrel	−0.028	0.013	−2.22	0.069			
	SOC-Unrel	**−0.105**	**0.013**	**−8.27**	**<0.0001**	***	**−98.7**	**−27.3 %**
COC	COC-ROC	0.009	0.014	0.67	0.782			
	COC-Unrel	**−0.036**	**0.015**	**−2.46**	**0.038**	*	**−40.3**	**−8.6 %**
	ROC-Unrel	**−0.045**	**0.014**	**−3.11**	**0.006**	**	**−48.8**	**−10.6 %**
ROC	COC-ROC	0.016	0.018	0.89	0.649			
	COC-Unrel	−0.018	0.015	−1.21	0.447			
	ROC-Unrel	−0.034	0.019	−1.83	0.160			
ROC	ROC-SOC	0.036	0.020	1.79	0.173			
	ROC-Unrel	−0.035	0.021	−1.67	0.217			
	SOC-Unrel	**−0.071**	**0.016**	**−4.33**	**0.0001**	***	**−144.7**	**−17.7 %**
SOC	**ROC-SOC**	**0.172**	**0.016**	**10.85**	**<0.0001**	***	**262.9**	**32.8 %**
	ROC-Unrel	**0.062**	**0.016**	**3.84**	**0.0004**	***	**106.7**	**13.3 %**
	SOC-Unrel	**−0.111**	**0.016**	**−7.09**	**<0.0001**	***	**−156.2**	**−28.96 %**

'*' $p < 0.05$; '**' $p < 0.01$; '***' $p < 0.001$; SOC = Superlative Objoid Construction; COC = Cognate Objoid Construction; ROC = Reaction Objoid Construction; Unrel = baseline. Results with $p < 0.05$ in bold.

Table 3b shows the results from the second version of the experiment (with the possessive). We only report statistically significant findings and omit any tendencies from our tables. In our analysis, we do, however, include some descriptive trends on the putative differences in the strength of priming effects. The boxplots in Figures 5a and 5b graphically represent the results with statistically significant differences highlighted; comparisons with the baseline (Unrel) are highlighted at the bottom of all boxplots).

Interestingly, the results for the SOC as target replicate across the two versions of the experiment, with facilitatory priming effects from the SOC (*within-construction* priming) and inhibitory priming effects from the ROC (*cross-constructional* priming) when compared with the baseline construction. The ROC in the second version of the experiment, featuring the additional possessive pronoun, exhibits stronger inhibitory effects on the SOC. This is unsurprising seeing that the ROC with the possessive is structurally closer to the SOC than the variant without the possessive, e.g., *murmured (his) agreement* – prime => *fought his fiercest* – target. This finding could be interpreted as lexical boosting as the magnitude of the priming effect is

Table 3b: Output from pairwise comparisons of log-transformed response times between prime constructions for each target construction (Experiment Version 2).

Target cxn	Diff. between prime cxns (A minus B)	Estimate	*SE*	*T*	*p* (adjust.)	Sign.	Diff. in ms	Relative difference
COC	COC-SOC	0.024	0.013	1.86	0.152			
	COC-Unrel	−0.020	0.014	−1.47	0.307			
	SOC-Unrel	**−0.044**	**0.014**	**−3.19**	**0.004**	**	**−66.6**	**−10.7 %**
SOC	**COC-SOC**	**0.060**	**0.013**	**4.45**	**<0.0001**	***	**86.1**	**12.8 %**
	COC-Unrel	−0.020	0.014	−1.47	0.308			
	SOC-Unrel	**−0.080**	**0.013**	**−5.96**	**<0.0001**	***	**−117.5**	**−20.0 %**
COC	COC-ROC	0.002	0.015	0.12	0.992			
	COC-Unrel	−0.017	0.015	−1.11	0.511			
	ROC-Unrel	−0.019	0.016	−1.21	0.450			
ROC	**COC-ROC**	**−0.058**	**0.015**	**−3.79**	**0.0005**	***	**−109.99**	**−14.4 %**
	COC-Unrel	**0.086**	**0.015**	**5.65**	**<0.0001**	***	**137.7**	**18.0 %**
	ROC-Unrel	**0.145**	**0.015**	**9.37**	**<0.0001**	***	**247.7**	**28.3 %**
ROC	**ROC-SOC**	**0.052**	**0.017**	**3.02**	**0.008**	**	**106.8**	**11.3 %**
	ROC-Unrel	**0.146**	**0.017**	**8.47**	**<0.0001**	***	**269.2**	**28.5 %**
	SOC-Unrel	**0.094**	**0.017**	**5.49**	**<0.0001**	***	**162.3**	**19.4 %**
SOC	**ROC-SOC**	**0.218**	**0.017**	**12.70**	**<0.0001**	***	**407.8**	**39.4 %**
	ROC-Unrel	**0.140**	**0.017**	**8.13**	**<0.0001**	***	**285.2**	**27.6 %**
	SOC-Unrel	**−0.078**	**0.017**	**−4.62**	**<0.0001**	***	**−122.7**	**−19.6 %**

‘*’ $p < 0.05$; ‘**’ $p < 0.01$; ‘***’ $p < 0.001$; SOC = Superlative Objoid Construction; COC = Cognate Objoid Construction; ROC = Reaction Objoid Construction; Unrel = baseline. Results with $p < 0.05$ in bold.

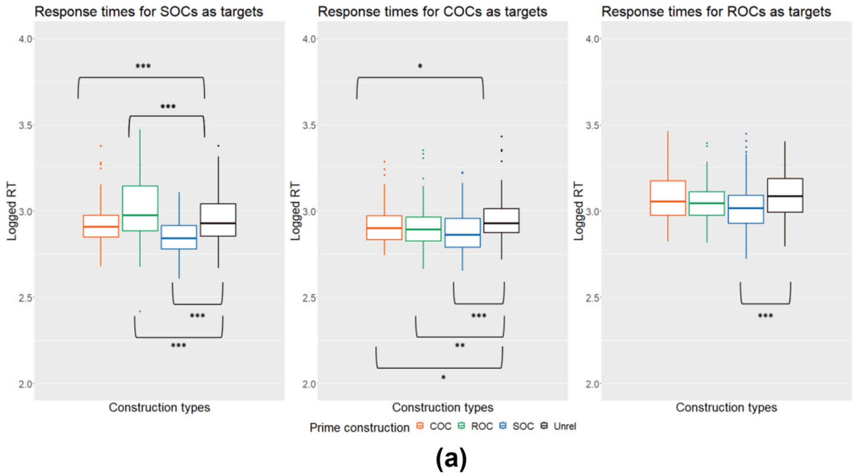


Figure 5a: Log-transformed response times at the critical words for the sisterhood of constructions (Experiment Version 1).

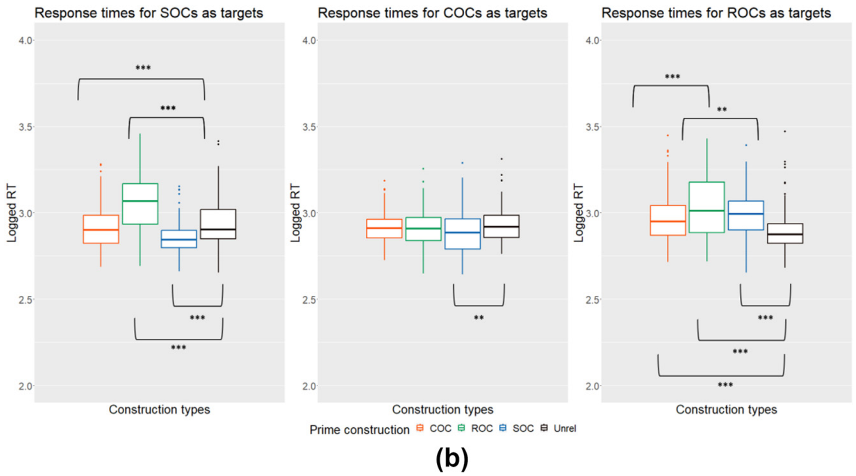


Figure 5b: Log-transformed response times at the critical words for the sisterhood of constructions (Experiment Version 2).

larger for the ROC:SOC pairing in the second version of the experiment (13.3 % vs. 27.6 %; see Tables 3a and 3b). Finally, the difference in the priming effect of the COC and the baseline is not significant across the two versions of the experiment.

For the COC as target, we get a facilitatory effect from the SOC, the ROC, and the COC as prime (when compared with the baseline). In other words, there is both *cross-*

constructional (from the SOC and the ROC) and *within-construction* priming for the COC, with cross-constructional facilitatory priming from the SOC being more pronounced than from the ROC. In the second version of the experiment, there is only evidence of facilitatory priming from the SOC, which indicates that the ROC with the possessive does not have a facilitatory priming effect on the COC as target. The facilitatory priming effect from the COC on the COC from the first version of the experiment does not repeat in the second version of the experiment, indicating that within-construction priming might not be a stable finding for the COC.

For the ROC as target, the variable presence of the possessive affects priming results. Without a possessive in the target ROC, only the SOC has a facilitatory priming effect on the ROC when compared to the baseline and the ROC as prime. In other words, there is cross-constructional priming from the SOC on the ROC in the first version of the experiment. Surprisingly, with a possessive in the ROC, this facilitatory effect from the SOC disappears, and like the COC and the ROC, the SOC shows now inhibitory priming effects on the ROC as target when compared with the baseline. As with the ROC:SOC pairing in the second version of our experiment, we can also observe a slight lexical boost effect (the effect of the SOC on the ROC, though different in nature from the first version of the experiment, is of slightly greater magnitude: –17.7 % vs. 19.4 %; see Tables 3a and 3b). Within-construction priming from the ROC itself in the second version of the experiment is notably more inhibitory than cross-constructional priming from the SOC.

Table 4 reports the results of the models with the combined data from both versions of the experiment, this time controlling for transitivity in the COC (COC-I vs. COC-T) as prime for the SOC and the ROC, respectively. While we included transitive and intransitive COCs as primes for both ROCs and SOCs as targets in our critical stimuli, we decided to exclude such variability of primes for the COC itself as we did not want to make an already complex experimental set-up even more complex. Figure 6 visualises the results with significant pairwise comparisons highlighted.

Table 4: Output from pairwise comparisons of log-transformed response times with transitive (COC-T) and intransitive (COC-I) variants of the COC.

Target cxn	Diff. between prime cxns (A minus B)	Estimate	*SE*	*T*	*p* (adjust.)	Sign.	Diff. in ms	Relative difference
ROC	**COC-I – Unrel**	**0.036**	**0.015**	**2.43**	**0.016**	*	62.5	**7.9 %**
SOC	**COC-I – Unrel**	**–0.036**	**0.014**	**–2.56**	**0.011**	*	**–332.2**	**35.82 %**
ROC	**COC-T – Unrel**	**0.045**	**0.015**	**3.08**	**0.002**	**	**77**	**9.92 %**
SOC	COC-T – Unrel	–0.017	0.015	–1.16	0.247			

'*' $p < 0.05$; '**' $p < 0.01$; '***' $p < 0.001$; SOC = Superlative Objoid Construction; ROC = Reaction Objoid Construction. Results with $p < 0.05$ in bold.

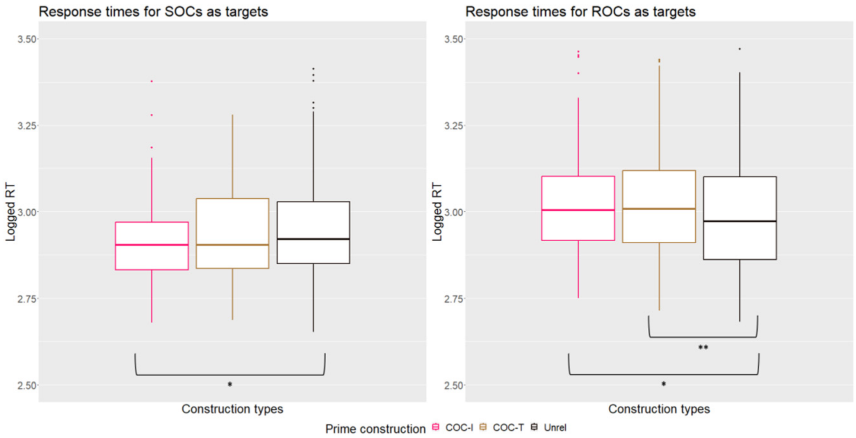


Figure 6: Log-transformed response times at the critical words for the transitive/intransitive COCs (pooled data from versions 1 and 2 of the experiment).

The comparison across different sub-types of COC shows that the priming effect from the COC with intransitive verbs is present for the ROC and the SOC whereas the COC with a transitive verb only primes the ROC (when compared with the baseline). The effect achieved is a facilitatory one for the SOC and an inhibitory one for the ROC in both cases, for the COC-T and the COC-I, but with a stronger effect for the former.

4.2 Priming effects and constructional variation

Tables 5a and 5b report the results for the pairwise comparison of the *at*-SOC and the bare SOC in the two versions of the experiment. Figures 7a and 7b provide a graphic representation of the results.

The results for the priming effects among the variants of the SOC replicate in the second version of the experiment, albeit at slightly lower significance levels. Importantly, both the SOC and the *at*-SOC have a facilitatory priming effect on the *at*-SOC as target when compared with the baseline (cross- and within-construction priming) whereas only the bare SOC primes the bare SOC when compared with the baseline. The results therefore clearly confirm the asymmetric type of priming hypothesised in Section 2.3 for the two variants of the SOC (e.g., *did her best* – prime => *was at her loveliest* – target; *tried his utmost* – prime => *appeared at his wittiest* – prime vs unattested priming from the *at*-SOC to the bare SOC: *performed at his worst* – prime => *played his weakest* – target; *seemed at her funniest* – prime => *looked her prettiest* – target).

Table 5a: Output from pairwise comparisons of log-transformed response times between prime constructions for the *at*-SOC and the bare SOC (Experiment Version 1).

Target cxn	Diff. between prime cxns (A minus B)	Estimate	*SE*	*T*	*p* (adjust.)	Sign.	Diff. in ms	Relative difference
at-SOC	*at*-SOC-SOC	−0.015	0.016	−0.93	0.623			
	***at*-SOC-UNREL**	**−0.068**	**0.017**	**−4.12**	**0.0001**	***	**−108.4**	**−17 %**
	SOC-UNREL	**−0.053**	**0.016**	**−3.25**	**0.0035**	**	**−85.7**	**−12.9 %**
bare SOC	***at*-SOC-SOC**	**0.098**	**0.017**	**5.94**	**<0.0001**	***	**122.2**	**20.1 %**
	at-SOC-UNREL	−0.012	0.017	−0.69	0.769			
	SOC-UNREL	**−0.110**	**0.017**	**−6.55**	**<0.0001**	**	**−138.6**	**−28.7 %**

'*' $p < 0.05$; '**' $p < 0.01$; '***' $p < 0.001$; SOC = Superlative Objoid Construction; Unrel = baseline. Results with $p < 0.05$ in bold.

Table 5b: Output from pairwise comparisons of log-transformed response times between prime constructions for the *at*-SOC and the bare SOC (Experiment Version 2).

Target cxn	Diff. between prime cxns (A minus B)	Estimate	*SE*	*T*	*p* (adjust.)	Sign.	Diff. in ms	Relative difference
at-SOC	*at*-SOC-SOC	0.007	0.017	0.41	0.911			
	***at*-SOC-UNREL**	**−0.040**	**0.017**	**−2.37**	**0.048**	*	**−63.9**	**−9.6 %**
	SOC-UNREL	**−0.050**	**0.017**	**−2.81**	**0.014**	*	**−74.4**	**−11.3 %**
bare SOC	***at*-SOC-SOC**	**0.077**	**0.016**	**4.72**	**<0.0001**	***	**103.8**	**16.8 %**
	at-SOC-UNREL	−0.0003	0.017	−0.02	0.9997			
	SOC-UNREL	**−0.078**	**0.017**	**−4.70**	**<0.0001**	***	**−104.3**	**−19.6 %**

'*' $p < 0.05$; '**' $p < 0.01$; '***' $p < 0.001$; SOC = Superlative Objoid Construction; Unrel = baseline. Results with $p < 0.05$ in bold.

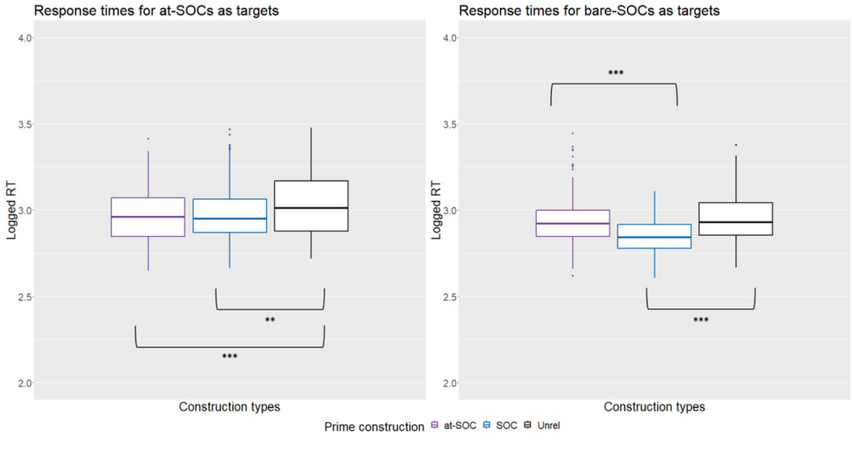
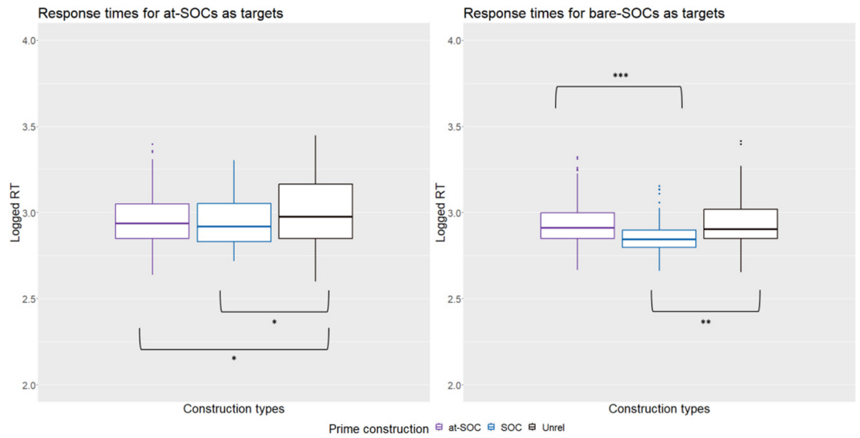


Figure 7a: Log-transformed response times at the critical words for the *at*-SOC and the bare SOC (Experiment Version 1).



(b)

Figure 7b: Log-transformed response times at the critical words for the *at*-SOC and the bare SOC (Experiment Version 2).

4.3 Comparing priming effects

Table 6 reports the results of the comparison across the sisterhood of constructions and the two variants of the SOC. These results are graphically represented in Figure 8.

Table 6: Output from pairwise comparisons of log-transformed response times between the (bare) SOC (Target), the ROC, the COC, and the *at*-SOC as Primes (pooled data from versions 1 and 2 of the experiment).

Target cxn	Diff. between prime cxns (A minus B)	Estimate	*SE*	*T*	*p* (adjust.)	Sign.	Diff. in ms	Relative difference
SOC	*at*-SOC-COC	0.018	0.012	1.52	0.426			
	***at*-SOC-ROC**	**−0.105**	**0.012**	**−8.92**	**<0.0001**	*******	**−172.8**	**−27.3 %**
	***at*-SOC-SOC**	**0.089**	**0.011**	**7.83**	**<0.0001**	*******	**117.6**	**18.6 %**
	COC-ROC	**−0.122**	**0.012**	**−10.30**	**<0.0001**	*******	**197.8**	**−32.5 %**
	COC-SOC	**0.072**	**0.012**	**6.24**	**<0.0001**	*******	**92.6**	**15.2 %**
	ROC-SOC	**0.194**	**0.012**	**16.48**	**<0.0001**	*******	**290.4**	**36.0 %**

'*' $p < 0.05$; '**' $p < 0.01$; '***' $p < 0.001$; SOC = Superlative Objoid Construction; COC = Cognate Objoid Construction; ROC = Reaction Objoid Construction. Results with $p < 0.05$ in bold.

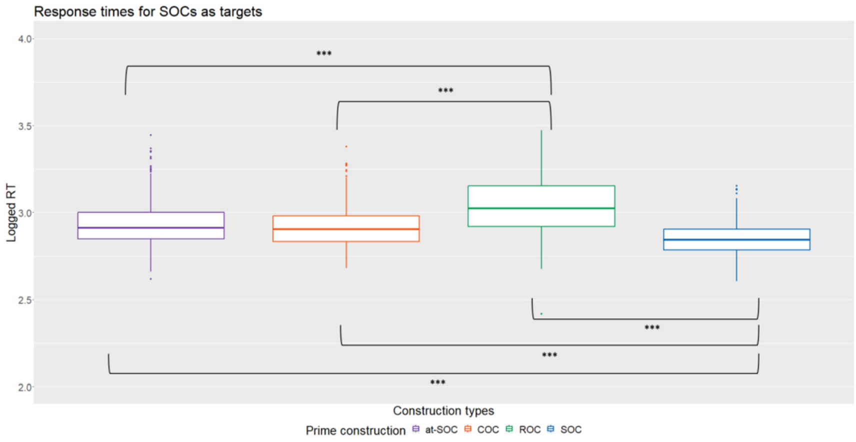


Figure 8: Log-transformed response times at the critical words for the OC sisterhood and the variants of the SOC (pooled data from versions 1 and 2 of the experiment).

The results for the cross-constructional modelling show that the logged RTs for the SOC as prime (within-construction priming) are significantly different from the RTs of any of the other constructions, including the variant of the *at*-SOC. Moreover, we do not observe any significant differences in the priming effect between the *at*-SOC and the COC when priming the SOC as target. In other words, cross-constructional priming effects are systematically different from within-construction priming effects (SOC–SOC).

5 Discussion

5.1 Evidence of cross-constructional priming and types of links

With respect to our first research question concerning *cross-constructional priming* among the sisterhood of OCs, we have obtained the following results: Cross-constructional priming effects from the ROC on the SOC are inhibitory (more strongly so with the possessive in the ROC than without a possessive). The effect of the ROC as prime is inhibitory rather than facilitatory most likely due to the salient nature of the ROC itself (see Ellis 2017). In other words, we attribute the type of priming effect observed with the ROC to the surprisal of this highly infrequent and unusual construction and the ensuing higher processing cost. As noted in Section 2.1, differences in transitivity between the ROC and the SOC alone are not the reason for such inhibitory effect, but we should stress that the

ROC and the COC construe different aspects of the semantics of the event in the objoid slot (ROCs add the reaction, while SOCs expand on the manner of the verbal event).

For the COC as target, the only facilitatory priming effect that repeats across the two versions of our experiment is from the SOC on the COC, i.e., cross-constructional facilitatory priming. That the COC does not prime itself could be the result of the differences in the transitivity of the stimuli used. Also, as noted in Section 3.2 when discussing the results of the acceptability judgements, the COC, being the most frequent OC is also the least marked. These results align with the well-attested finding that frequent patterns yield, if any, small priming effects. Both versions of the experiment provide evidence of the cline, with the SOC having a greater priming effect on the COC in the first version of the experiment (see Figure 5a; $p < 0.001$) than in the second (see Figure 5b; $p < 0.01$), and the COC with slight significant priming effects on itself in the first version ($p < 0.05$) and with no visible priming effects in the second. Finally, we did not find any stable significant facilitatory priming effects from the COC for target ROCs or vice versa. While effects that would have directly supported the hypothesis of a transitivity cline from the ROC (most transitive) via the COC to the SOC (least transitive) did not emerge, the transitivity gradient received support from a different result: We saw in the comparison of the COC with different types of verbs that the COC with intransitive verbs primed the SOC and the ROC whereas the COC with transitive verbs only primed the ROC. There is thus experimental evidence that the SOC is lower in transitivity than the ROC and the COC.

In our acceptability testing of the stimuli, participants occasionally provided what they felt were more ordinary alternatives. Particularly for the ROC, they often added a preposition or a possessive. We would have therefore expected for the variant of the ROC with a possessive to have a facilitatory priming effect on the ROC (within-construction priming). Across the two versions of the experiment, we find exactly the opposite, that is, inhibitory effects with the possessive in the ROC. This suggests that the ROC as a highly marked pattern is much more difficult to process when it is preceded by the possessive variant of the ROC (*laughed her defiance – prime* => *frowned her disdain – target*).

5.2 Primed constructional variants

With respect to the constructional variants of the SOC, the data from the two versions of the experiment support the hypothesis of asymmetric priming between the bare and *at*-SOC. Specifically, our results support Bouso and Hundt's (2024) preliminary corpus evidence that suggested priming from the bare to the *at*-SOC but not vice versa. The fact that this result repeats across the two versions of our experiment lends support to the robustness of this finding.

5.3 Priming and the modelling of network links

The asymmetrical type of priming between the bare and the *at*-SOC as well as the results from the cross-constructional model did not verify our hypothesis of a closer relationship between variants of the SOC when compared to the effect that other objoid constructions had as primes on the SOC as target. Importantly, the model did not reveal any difference in priming effects between the *at*-SOC as a variant of the SOC and the COC as another objoid construction. At the same time, the fact that the ROC turned out to have an inhibitory effect as a priming construction for the SOC supports the assumption of a greater distance between the ROC and the SOC, as postulated in Section 2 and visualised in Figure 1.

6 Conclusions

Our priming experiment did not show experimental evidence, at least from structural priming, that the bare and *at*-SOC are constructional ‘twins’. On the contrary, the asymmetric priming effects we observe are indicative of a more vertical relation between the two constructions. In other words, the variant of the SOC should be treated as an offspring rather than a sibling (to remain within the family metaphor). This would also be in accordance with the diachronic trajectory that emerged from Bouso and Hundt’s (2024) corpus data where they showed that the *at*-SOC historically grew out of the bare SOC. These results also concur with Hoffmann’s (2020: 150) and Cappelle’s (2024: 24–29) claims on the difficulty of testing the psycholinguistic reality of a mother node joining allostructions.

For the ROC, COC, and SOC, our results provide evidence that supports treating them as a sisterhood of constructions. A summary of our results is included in Tables 7a and 7b with an indication of the putative key factors at work in the nature of the priming effects attested.

All OCs are marked with respect to prototypical transitives with regular objects rather than objoids. Within the OCs, some are more marked than others. The more marked nature of the ROC and the *at*-SOC can be easily observed in the acceptability judgements of our participants (see Supplementary Materials; INFORMANTS folder). Importantly, the experimental data support the findings from previous corpus-based evidence showing that the ROC is the least frequent of all

Table 7a: Key factors in the nature of the priming effects (Version 1).

Prime:Target	Priming (with respect to an unrelated baseline)	Saliency (the ROC without a possessive and the *at*-SOC are considered to be less acceptable than the bare SOC and the COC, in that order)	
COC:SOC	(Facilitatory) NC[a]	Unmarked	Unmarked
ROC:SOC	**Inhibitory**	Marked	Unmarked
SOC:SOC	Facilitatory	Unmarked	Unmarked
COC:COC	Facilitatory	Unmarked	Unmarked
ROC:COC	Facilitatory	Marked	Unmarked
SOC:COC	Facilitatory	Unmarked	Unmarked
COC:ROC	(Facilitatory) NC	Unmarked	Marked
ROC:ROC	(Facilitatory) NC	Unmarked	Marked
SOC:ROC	Facilitatory	Unmarked	Marked

[a]NC = Not confirmed.

Table 7b: Key factors in the nature of the priming effects (Version 2).

Prime:Target	Priming (with respect to an unrelated baseline)	Boosting (= POSS; only controlled for ROC:SOC; SOC:ROC)	Saliency	
COC:SOC	(Facilitatory) NC	–	Unmarked	Unmarked
ROC:SOC	**Inhibitory**	Yes [13.3 % vs. 27.6 %]	Marked[a]	Unmarked
SOC:SOC	Facilitatory	–	Unmarked	Unmarked
COC:COC	(Facilitatory) NC	–	Unmarked	Unmarked
ROC:COC	(Facilitatory) NC	–	Marked[a]	Unmarked
SOC:COC	Facilitatory	–	Unmarked	Unmarked
COC:ROC	**Inhibitory**	–	Unmarked	Marked[a]
ROC:ROC	**Inhibitory**	–	Unmarked	Marked[a]
SOC:ROC	**Inhibitory**	Yes (but reversed) [−17.7 % vs 19.4 %]	Unmarked	Marked[a]

[a]Still marked but less marked than the bare ROC.

the patterns followed by the *at*-SOC (Bouso and Hundt 2024). The effects obtained for the ROC and the bare SOC as targets could have been the result of different degrees of markedness: inhibitory priming effects from the marked on the unmarked construction (ROC:SOC; *Luis murmured [his] agreement* – prime => *Arnold fought his fiercest* – target) and facilitatory ones from the unmarked to the marked construction (SOC:ROC; *Mat shouted his loudest* – prime => *Leo sighed [her] relief* – target).

As shown in Table 7b, this inverse symmetry disappears in the second version of our experiment involving the more natural ROC (i.e., the ROC with a POSS): the inhibitory effects of the ROC on the SOC prevail (the ROC is still conceived as a highly marked pattern), but the ROC and the COC now also show inhibitory effects towards the target ROC. Also, the effect of the SOC on the ROC is no longer facilitatory. The question that arises here is why this happens, especially if we consider that the ROC with a possessive presents lexical overlap with the prime SOC, a feature that has been shown to be the "most consistent moderator of syntactic priming" (Mahowald et al. 2016: 10). It remains for future research to explore the reasons for this surprising finding. A combination of actors rather than one potential cause could be the reason for such unexpected results for the ROC as target, among them the degree of lexicalization of our stimuli, the transitivity mismatches of the prime:target constructional pairings selected, or even *horror aequi* effects, that is the avoidance of the same form within a short time span (see Vosberg 2003). To elaborate further on this last point, when SOCs (*Mat shouted his loudest*) prime ROCs with the possessive (*Leo sighed his relief*), the critical word is the last one (*loudest*/*relief*); by this time, speakers have already read the possessive (*his*), which may strengthen their expectation that the target sentence will be a SOC. When they then realize at the last word that the sentence is actually a ROC, this may give rise to inhibition effects (similar to a garden path). For ROC targets without the possessive (*Leo sighed relief*), on the other hand, participants may not form this strong expectation. Instead, the fact that SOCs include a postverbal NP-like argument may reduce speakers' surpise at the (unusual) NP complement of the ROC, thus leading to facilitation.

Ungerer (2023a: 8) notes that priming often yields "coarse-grained effects". The results presented here do not support this assessment, probably because the study moved beyond the analysis of a pair of constructions, allowing us to model differential relations among members of the sisterhood. The findings presented in this paper do, however, lend additional support to previous research that stipulated an inverse relationship between priming effects and frequency of the constructions involved (Bernolet and Hartsuiker 2010; Jaeger and Snider 2013).

Data availability statement

All supplementary materials referred to in the article can be found here: https://osf.io/ezcpv/ (DOI: 10.17605/OSF.IO/EZCPV).

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Appendix A: List of experimental items, with ROIs in boldtype. Set 1

Baseline	At the Manhattan marathon, Peggy ran **her** fastest.	SOC	Block 1
Baseline	At the Cannes festival, Letitia wore **her** finest.	SOC	
Prime	For the most part, Anna lived a good life.	COC	
Target	Rising from a restful sleep, Joanne felt **her** strongest.	SOC	
Baseline	Thanks to a strong upward wind, Ryan flew **at** his highest.	At-SOC	Block 2
Baseline	With a fresh pair of horses, Luke travelled **at** his fastest.	At-SOC	
Prime	When asked to help his parents, Andy did **his** best.	SOC	
Target	Since the hike had been strenuous, John slept **a** deep sleep.	COC	
Prime	Having asked for help repeatedly, Jean muttered (her) **thanks**.	ROC	Block 3
Target	With months of training, Laura finally hit her **heaviest**.	SOC	
Baseline	In the end Lisa convinced her uncle to **come**.	Unr.	
Baseline	At art school Frida painted a modernist **painting**.	COC	
Prime	Full of joy and relief, Mat shouted **his loudest**.	SOC	Block 4
Target	At the end of a hard day, Leo sighed (his) **relief**.	ROC	
Baseline	To help fight climate change, Debby built a green **building**.	COC	
Baseline	Following the long drought, Tina planted a new **plant**.	COC	
Prime	Having received their thanks, Mary smiled (**her**) **gratitude**.	ROC	Block 5
Target	At the end of the performance, Celine danced a solo **dance**.	COC	
Baseline	After the competition Julia wiped **the** sweat from her face.	Unr.	
Baseline	Out of frustration, Penny roared **her** loudest.	SOC	
Baseline	In the afternoon Frank picked up **his** youngest son from school.	Unr.	Block 6
Baseline	During the negotiations, Lena bargained **at** her shrewdest.	At-SOC	
Prime	When asked by the judge, Sarah told a different **tale**.	COC	
Target	Once the press release was out, Lily snorted (**her**) **disgust**.	ROC	
Prime	In the final competition, Bethany did **her** best to win.	SOC	Block 7
Target	Dressed in a simple white dress, Helen was **at** her loveliest.	At-SOC	
Baseline	In reply to the Rabbi, Mel wrote **his** longest letter.	Unr.	
Baseline	After endless discussions, Chris mumbled (**his**) **consent**.	ROC	
Prime	Without time to rehearse, Julian performed **at** his worst.	At-SOC	Block 8

(continued)

Target	In the final set of the match, George played **his** weakest.	SOC
Baseline	When faced with a challenge, Hannah laughed (**her**) **defiance**.	ROC
Baseline	In front of the jury, Emma frowned (**her**) **disdain**.	ROC

Appendix B: List of experimental items, with ROIs in boldtype. Set 2 (excluding baselines, these were the same for both sets; for details, see Appendix A)

Prime	As his contribution, Charles gave a monetary **gift**.	COC	Block 1
Target	To achieve his goal, Jeremy worked **his** utmost.	SOC	
Prime	To help the team effort, Chloe tried **her** hardest.	SOC	Block 2
Target	When she stepped into the garden, Angie smelled **a** fragrant smell.	COC	
Prime	Following a long discussion, Luis murmured (his) **agreement**.	ROC	Block 3
Target	In the game last night, Arnold fought **his fiercest**.	SOC	
Prime	Towards the end of the concert, Sophie looked **her happiest**.	SOC	Block 4
Target	Faced with the insult, Vicky growled (her) **disapproval**.	ROC	
Prime	On hearing the horrible story, Susan whispered (**her**) **disbelief**.	ROC	Block 5
Target	After a hard day at work, Rosy drank a strong **drink**.	COC	
Prime	On that beautiful spring morning, Claire sang a beautiful **song**.	COC	Block 6
Target	In reply to his funny proposal, Amelia grinned (**her**) **acceptance**.	ROC	
Prime	Even without a watch, Daniel tried **his** utmost to be on time.	SOC	Block 7
Target	On the show last night, Hugo appeared **at** his wittiest.	At-SOC	
Prime	At the garden party, Rosie seemed **at** her funniest.	At-SOC	Block 8
Target	Walking down the aisle, Olivia looked **her** prettiest.	SOC	

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