

1 **Alternation-based generalizations are stored**
2 **in the mental grammar: Evidence from**
3 **a sorting task experiment***
4

5 FLORENT PEREK
6

7
8
9
10
11
12 *Abstract*
13

14 *According to constructional approaches, grammar consists of an inventory of*
15 *symbolic pairings of a syntactic form with an abstract meaning. Many of such*
16 *so-called constructions can be perceived as having highly similar meanings:*
17 *such pairs have been discussed under the name of alternations, especially in*
18 *the domain of argument structure, for example the widely documented dative*
19 *alternation (e.g. John gave Mary a book vs. John gave a book to Mary). This*
20 *paper explores what status such pairs of constructions can be given in con-*
21 *struction grammar, on the basis of a sorting task experiment.*

22 *Construction grammar traditionally recognizes generalizations of a common*
23 *syntactic form over semantically similar sentences, but the status of higher-*
24 *level generalizations of a common meaning over syntactically different forms*
25 *is rarely discussed. In our study, we devised a sorting task that subjects could*
26 *resolve by relying on generalizations of either of these two kinds. We find that*
27 *subjects rely on alternation-based generalizations more often than purely con-*
28 *structional ones in their sorting behavior. We suggest these results show that*
29 *generalizations of a common meaning between formally different construc-*
30 *tions are plausible categories stored by speakers and should be given more*
31 *attention in construction grammar research.*

32
33 *Keywords:* *construction grammar; argument structure; alternations; gener-*
34 *alizations; sorting task.*
35
36

37 **1. Introduction: syntactic alternations and construction grammar**

38 Languages are replete with pairs of syntactic constructions that are semantically
39 similar and can accommodate a common set of lexical items to fulfill roughly
40

41
42 * Email: (florent.perek@frias.uni-freiburg.de).

1 equivalent functions.¹ Countless examples from various domains of syntax can
 2 be cited, but in no research area have such pairs received more attention than
 3 in the study of argument structure. So-called ARGUMENT STRUCTURE ALTERNA-
 4 TIONS capture the notion that some verbs can be used with different syntactic
 5 realizations of the same set of arguments.² The dative alternation and the loca-
 6 tive alternation in English are classic examples of such phenomena. The dative
 7 alternation offers two different ways to encode events of transfer of a theme to
 8 a recipient, either in a physical sense (e.g. with *give*) or in an abstract sense
 9 (e.g. with verbs of communication like *tell*).³ For many verbs describing such
 10 events, the theme and recipient arguments can be realized either as two post-
 11 verbal noun phrases (the ditransitive or double-object variant), as in (1a) and
 12 (2a) below, or as a post-verbal noun phrase and a prepositional phrase headed
 13 by *to* (the *to*-dative or prepositional dative variant), as in (1b) and (2b).

- 14 (1) a. Mary gave John a book.
 15 b. Mary gave a book to John.
 16
 17 (2) a. John told Mary a joke.
 18 b. John told a joke to Mary.

19 The variants of the dative alternation clearly share much of their respective
 20 meanings and can be largely seen as paraphrases, although they do present
 21 subtle semantic differences. Most notably, the ditransitive variant is often
 22 argued to be the only ‘truly dative’ variant, while the *to*-dative variant is con-
 23 sidered as a locative construction primarily describing caused motion (cf.
 24 Pinker 1989, Goldberg 1995). Hence, in the ditransitive variant, the first NP
 25 argument is a true recipient and therefore must be animate, while in the other
 26 variant, the referent of the prepositional phrase is rather a goal argument, which
 27 with some verbs may take a recipient interpretation in case it is animate. When
 28 both variants are available, they are often interchangeable, and the choice of
 29 one variant in a given situation has been shown to depend on various properties
 30 of the alternating arguments themselves, such as their discourse accessibility
 31 (given vs. new) and their relative lengths; cf. *inter alia* Collins (1995), Bresnan
 32 et al. (2007) and the references therein.

-
- 35 1. This paper is largely based on material first presented at the 4th AFLiCo conference in Lyon
 36 on May 24th 2011. I would like to thank Bert Cappelle and Martin Hilpert, as well as the two
 37 anonymous reviewers and the Associate Editor appointed by Cognitive Linguistics, for their
 38 valuable comments on earlier versions of this paper.
 39 2. See Guerrero Medina (2011) for many studies of argument structure alternations within
 40 various modern frameworks.
 41 3. With the proviso that many lexical items can be used with only one of these constructions,
 42 even when both combinations would make perfect sense. The problem of such cases of partial
 productivity does however not concern us here.

1 The locative alternation⁴ displays similar properties, in that it offers two dif-
 2 ferent ways of encoding an event of caused change of location of some object,
 3 called the theme. In one variant (hereafter the locative variant), the theme is
 4 realized as the direct object and the location is mentioned in a path expression
 5 (typically a prepositional phrase); cf. (3a) and (4a). In the other variant (here-
 6 after the *with*-variant), the location is realized as the direct object and the theme
 7 as a prepositional phrase headed by *with*; cf. (3b) and (4b).

- 8 (3) a. John sprayed paint onto the wall.
 9 b. John sprayed the wall with paint.

- 10 (4) a. John loaded hay into the truck.
 11 b. John loaded the truck with hay.

12
 13 More so than the dative alternation, the locative alternation seems to involve a
 14 tangible difference in meaning. The sentence pairs (3) and (4) exemplify the
 15 so-called “holistic/partitive effect”, described by Anderson (1971: 389) as “a
 16 matter of whether the whole of something is affected by the action described
 17 by the sentence, or just a part of it is affected”. In other words, the *with*-variant
 18 triggers a holistic interpretation implying that the location has been totally
 19 affected, whereas it need not be in the other variant. Hence, (3b) implies that the
 20 wall is totally covered with paint, and (4b) implies that the truck is full of hay.

21 While such comments are in order for these two examples, the correlation of
 22 the *with*-variant with the holistic effect has probably been overstated in earlier
 23 treatments of the alternation, as there exist similar pairs of sentences for which
 24 the holistic interpretation is not the relevant semantic difference. Jeffries and
 25 Willis (1984: 717) note that “the holistic/partitive relationship can be readily
 26 neutralised simply by [. . .] choosing different lexical items to fill the NP
 27 slots”. They report the following pairs of sentences:

- 28 (5) a. The English boy sprinkled the hot water with tea.
 29 b. The Japanese boy sprinkled tea on the hot water.

- 30 (6) a. The fireman sprayed the fire with water.
 31 b. The fireman sprayed water on the fire.

32 In the *with*-variants (5a) and (6a), it is hard to imagine how the location argu-
 33 ment could be more affected than in the locative variants (5b) and (6b). Jeffries

34
 35
 36
 37
 38 4. What we refer to here as the locative alternation is actually known in the literature as the
 39 *spray/load* alternation, thus named with reference to the two verbs that are commonly used to
 40 illustrate it. The *spray/load* alternation is one member of a family of several so-called locative
 41 alternations (cf. Levin 1993: 2.3) that offer different ways of encoding events of motion of a
 42 theme vis-à-vis some location. For the sake of simplicity, we will use the term ‘locative alter-
 nation’ to refer exclusively to the *spray/load* alternation throughout this article.

1 and Willis argue that this is because of our world knowledge of the objects
2 denoted by the NPs. The scenario of tea making evoked by sentences (5a) and
3 (5b) “causes us to envisage a restricted surface area of hot water which would
4 most likely be covered by tea in both instances” (Jeffries and Willis 1984:
5 717). Similarly, (6a) and (6b) are both compatible with an outcome in which
6 most of the fire did not get any water on it, because “fires do not have well
7 defined edges and the question of whether the whole fire is affected is difficult
8 to answer” (1984: 718).

9 Such cases show that the holistic effect is not inherently associated with the
10 *with*-construction; otherwise examples (5a) and (6a) would be semantically
11 incoherent. Yet, this does not imply that the variants of the locative alternation
12 are synonymous constructions. They do differ semantically, but the difference
13 lies at a more abstract level, in that the variants of the locative alternation
14 describe the same event but reflect a different construal of this event. The loca-
15 tive variant construes the event as an action by the agent on the theme, causing
16 it to move, whereas the *with*-variant construes it as an action affecting the loca-
17 tion, and the motion of the theme is merely the means whereby this effect is
18 brought about. The latter construal calls for a significant effect that the agent
19 intends to bring about on the location, but this effect does not always relate to
20 the spatial extent of the final configuration of the theme vis-à-vis the location,
21 as in the wall-painting scenario of (3b) and the truck-loading scenario of (4b).
22 In (5a), the intended effect is turning water into tea; in (6a), it is the extinguish-
23 ing of the fire. On this account, the holistic interpretation can be seen as a mere
24 pragmatic effect of each construal. In sum, the variants of the locative alterna-
25 tion share a substantial part of their constructional meaning, and can be largely
26 seen as two constructional options for the description of events of caused
27 motion involving alternate construals.

28 This paper addresses the question of how such pairs of semantically related
29 constructions should be dealt with in construction grammar. In most construc-
30 tional models of argument structure, alternations as such have no independent
31 theoretical status. This is in striking contrast with earlier transformational (e.g.
32 Larson 1988) or lexicalist (e.g. Jackendoff 1975, Pinker 1989) accounts, in
33 which specific operations were posited to derive one variant of an alternation
34 from the other variant. Construction grammarians strongly argue against deri-
35 vational accounts (whether those derivations are at the syntactic or semantic
36 level) and instead put forward a monostratal view of grammar, in which lin-
37 guistic forms of any degree of schematicity are directly paired with meaning.
38 Hence, variants of an alternation are seen as independent constructions, i.e.
39 they are pairings of a different syntactic form with a (usually) different abstract
40 meaning, and whether a verb is said to enter into an alternation depends on
41 whether it is semantically compatible with both constructions (see for example
42 Ruiz de Mendoza Ibáñez and Mairal Usón [2011] for a detailed account of the

1 English causative alternation along these lines). This position is clearly stated
2 in Goldberg's (2002: 329) *surface generalizations hypothesis*:

3
4 There are typically broader syntactic and semantic generalizations associated with a
5 surface form than exist between the same surface form and a distinct form that it is
6 hypothesized to be syntactically or semantically derived from.

7
8 In other words, Goldberg emphasizes the importance of generalizations based
9 on the same form and meaning, but downplays generalizations over formally
10 different patterns, even if they can be shown to be semantically and/or syntac-
11 tically related. She therefore takes a strong stance against derivational theories,
12 in line with the commitments of construction grammar. Following the surface
13 generalization hypothesis, most research in construction grammar focuses on
14 contrasting alternating constructions, by showing in which respect(s) they
15 differ, at the semantic as well as discursive levels (e.g. Gries 2003). But few
16 models try to capture their similarity, and the alternation itself is rarely consid-
17 ered as more than a mere pre-theoretical observation.

18 While we agree that it is important to describe constructions in their own
19 right, we may still wonder whether a grammar containing only independent
20 constructions provides an accurate picture of speakers' linguistic knowledge.
21 Surely, speakers are aware that there can be different ways to convey the same
22 message, and use this knowledge wittingly. But a construction grammar focus-
23 ing exclusively on the constructions and disregarding possible relations be-
24 tween them fails to capture that knowledge. A similar observation is made by
25 Cappelle (2006):

26 [. . .] by averting our attention from regular alternations in a language (to focus on the
27 poles of the alternations only), we may fail to represent an important component of the
28 language user's linguistic knowledge. This would be a serious shortcoming of Con-
29 struction Grammar, which advertises itself as a theory within which all linguistic data
30 of a language can be accommodated: "To adopt a constructional approach is to under-
31 take a commitment in principle to account for the entirety of each language" (Kay and
32 Fillmore 1999: 1).

33
34 Goldberg herself (2002) does not totally deny paraphrase relations (which is
35 basically what many alternations are) any role in grammar or language use.
36 She acknowledges that their "statistical use [. . .] in actual discourse contexts
37 is critical to unlocking Baker's paradox of partial productivity",⁵ and that they

38
39
40 5. Goldberg is referring here to the mechanism of statistical preemption, proposed to explain
41 how children figure out that a verb cannot occur in some argument structure in view of its
42 repeated use in another less felicitous structure. See Goldberg (2006: 5.1) and Goldberg
(2011) for more details.

1 “can also be seen to be relevant to on-line choices made in production” (Gold-
2 berg 2002: 329). Thus, there does seem to be room in construction grammar
3 for generalizations over formally different constructions. As a matter of fact,
4 proposals to integrate alternations in constructional representations are not
5 unheard of. For example, Goldberg (1995: 91) posits a link of “S-synonymy”
6 between the variants of the dative alternation. Although little is said about what
7 such links truly are, how they emerge and what role they play in grammar,
8 language use and language development, they do capture the speakers’ aware-
9 ness that two constructions have the same “descriptive” meaning, i.e. that they
10 can be used to describe the same set of situations. Along the same lines, Cap-
11 pelle (2006: 18) proposes to describe the (near-)equivalence of constructions
12 by modeling them as “allostructions”, defined as “variant structural realizations
13 of a construction that is left partially underspecified” (we return to Cappelle’s
14 proposal in the concluding section of this article). But apart from these rare
15 exceptions, very few construction grammarians consider generalizations based
16 on alternation relations.

17 In this paper, we add to this line of research by presenting empirical evi-
18 dence that alternations should be considered part and parcel of grammar, in the
19 sense that generalizations over formally distinct constructions expressing sim-
20 ilar kinds of events are plausibly stored along with generalizations based on
21 surface similarity in both form and meaning. We devised a sorting task experi-
22 ment, in which native speakers were asked to sort sentences into groups
23 according to their overall meaning. The set of sentences to be sorted contains
24 both construction-based and alternation-based generalizations as possible sort-
25 ing strategies, and the instructions forced subjects to make a choice between
26 either kind of generalization. As our results show, not only do speakers readily
27 perceive the semantic similarity between variants of an alternation and use it to
28 form an alternation-based group, but they chose this kind of strategy strikingly
29 more often than that based on simple constructional generalizations. While the
30 question of the cognitive reality of alternation-based generalizations should
31 certainly be addressed with additional kinds of evidence, the results of our
32 study suggest that such generalizations over formally different constructions
33 constitute coherent and perceptible categories that might well be part of a
34 speaker’s linguistic knowledge.

35 In the next section, we present an earlier sorting task experiment by Bencini
36 and Goldberg (2000), which inspired our own study. Bencini and Goldberg
37 investigated whether the semantics of constructions is a significant determi-
38 nant of sentence meaning, along with verbs. In Section 3, we present our own
39 experiment, which consists of an adaptation of Bencini and Goldberg’s (2000)
40 study with a different kind of dataset, to test whether a generalization based on
41 an alternation can be another significant determinant of sentence meaning,
42 along with purely constructional generalizations. We conclude in Section 4 that

1 the results of our experiment are better accounted for by a grammar which
2 contains alternation-based generalizations.

3 4 **2. Constructions as a sorting criterion**

5
6 Bencini and Goldberg (2000) question the common assumption that the verb is
7 the main determinant of sentence meaning. They cite an earlier study by Healy
8 and Miller (1970), who compared the relative contribution of verbs and subject
9 arguments to sentence meaning through a sorting task experiment. Healy and
10 Miller created twenty-five sentences by crossing five transitive verbs with five
11 subject arguments; all sentences had the same patient argument. They then
12 asked participants to sort the sentences according to their similarity in mean-
13 ing, and found that participants sorted sentences together more often when
14 they had the same verb than when they had the same subject argument. Healy
15 and Miller conclude that the verb is the main determinant of sentence meaning.

16 However, Healy and Miller did not consider another possible source of
17 meaning beside verbs: the syntactic construction with which the verb is used.
18 In construction grammar (Goldberg 1995; 2006), constructions convey mean-
19 ing independently of the verbs embedded in them. Sentences with the same
20 construction thus constitute a coherent semantic category. If constructions in-
21 deed contribute aspects of meaning to the sentence, it is expected that speakers
22 in a semantic sorting task similar to Healy and Miller's (1970) would group
23 together sentences with the same construction.

24 To test this hypothesis, Bencini and Goldberg (2000) reproduced Healy and
25 Miller's (1970) experiment with a different set of stimuli: they crossed four
26 verbs chosen from different semantic fields (*get, slice, take, throw*) with four
27 constructions (the transitive construction, the ditransitive construction, the
28 caused-motion construction and the resultative construction). The semantic
29 divergence between verbs insured that subjects could not plausibly resort to
30 some shared aspects of verbal meaning to put sentences with different verbs in
31 the same category.

32 They asked seventeen native speakers of English to sort the sixteen sen-
33 tences into four groups. It is clear that subjects can use two sorting strategies:
34 either to rely on the meaning of verbs which is shared between instances of that
35 verb in different constructions, or to rely on the meaning of constructions
36 (hypothesized by construction grammar), which is shared by instances of that
37 construction with different verbs.

38 They found that many subjects do sort by constructions, even more so when
39 they are explicitly reminded in the instructions that expressions with the same
40 words can mean various different things. Gries and Wulff (2005) obtained
41 similar results from a replication of this experiment with native speakers of
42 German learning English as a foreign language. These findings suggest that

1 verbs are not the sole determinants of sentence meaning, and Bencini and
2 Goldberg conclude that “constructions are psychologically real linguistic cat-
3 egories that speakers use in comprehension” (p. 649–650).

3. Alternations as a sorting criterion

4
5
6
7 In our study, we used the same experimental paradigm as Bencini and Gold-
8 berg (2000) with a different set of sentences which includes the factor of alter-
9 nations: specifically, instead of contrasting verbal vs. constructional sorting,
10 we investigated whether the presence of possible alternation relations has an
11 influence on the way speakers categorize sentences.

3.1. *Hypotheses*

12
13
14 The experiment presented in this section weighs the relative likelihood of two
15 competing hypotheses on the kind of generalizations that grammar contains:
16 the constructional hypothesis and the alternations hypothesis.

17 The **constructional hypothesis** predicts that there are only construction-
18 based generalizations. The semantic similarity between variants of an alterna-
19 tion may be noticed by speakers, but it does not lead to the storing of a gener-
20 alization. Constructional generalizations over expressions which share aspects
21 of both form and meaning are in any case more robust than generalizations
22 over different forms and (possibly) slightly different (yet related) meanings.

23 The **alternations hypothesis** predicts that there are also alternation-based
24 generalizations in the mental grammar of speakers (like Goldberg’s [1995]
25 synonymy links or Cappelle’s [2006] allostructions). Such generalizations are
26 based on semantic similarities between formally distinct constructions and
27 capture the fact that a given event type may be expressed in various ways. They
28 constitute a higher level of generalization than regular constructions, and may
29 be involved in language processing, development, and change.

3.2. *Stimuli*

30
31
32 Our stimuli set is based on four sentence types related by two alternations: (i) the
33 ditransitive and the *to*-dative constructions, related by the aforementioned
34 dative alternation, and (ii) the caused-motion and the *with*-applicative construc-
35 tions, related by the locative alternation. Importantly, these four sentence types
36 instantiate only three constructions from the perspective of construction gram-
37 mar, since *to*-datives are arguably metaphorical uses of the more general caused-
38 motion construction, relying on the construal of transfer of ownership as phys-
39 ical transfer (cf. Goldberg 1995: 3.4.2). The four sentence types and the relations
40 holding between them (either through constructional inheritance or alterna-
41 tions) are represented in Figure 1. We created four sentences of each type.
42

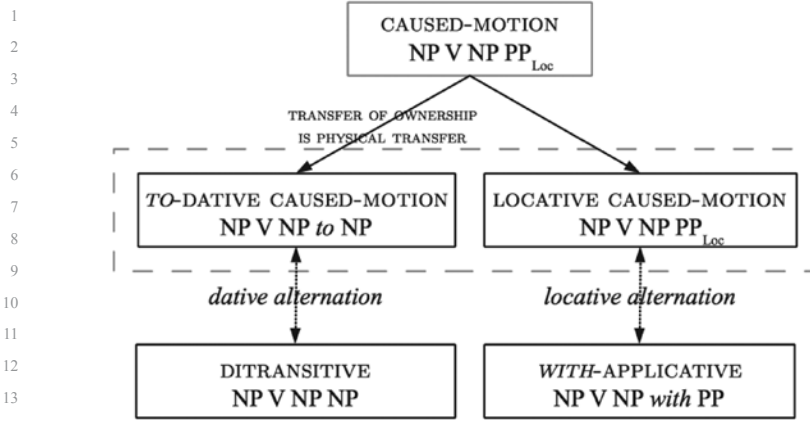


Figure 1. *Constructions and alternations in our stimuli set*

Now, how should we use this dataset to obtain evidence for either of the hypotheses given in Section 3.1? If we leave the number of possible sorting categories open, subjects will probably sort according to the four sentence types or perhaps make even finer-grained distinctions. But this is not likely to help us discriminate between the two hypotheses. We must force them to make more abstract generalizations, at a level where they would have to rely on the similarity between instances of a construction or of variants of an alternation, and thus instruct them to sort sentences into a given, and fairly limited, number of groups. Since, as we mentioned earlier, the dataset consists of at most three constructions (in the strict sense, i.e. abstraction of the *same* form and meaning), a sensible option would be to ask them to make three groups. Given this instruction, the constructional generalization over the *to*-datives and locative caused-motion sentences is liable to be noticed by subjects, which would promote a group following this generalization. But the semantic generalization over variants of either alternation might be more readily available, and a group containing formally distinct constructions might be preferred over a caused-motion group relying on a possibly weaker generalization. The extent to which subjects rely on either of these expected sorting strategies should allow us to decide which of the two hypotheses is more likely. According to the constructional hypothesis, there are only construction-based generalizations; subjects might see the similarity between the variants of an alternation, but the constructional generalization should be more directly available and stronger. Thus, most subjects should sort the locative caused-motion and *to*-dative sentences together. Under the alternation hypothesis, there are also alternation-based generalizations; subjects should thus easily see the possible generalization between instances of variants of an alternation, and prefer this generalization if

Table 1. *Stimuli set for the sorting task*

	ditransitive	to-dative	caused-motion	with-applicative
4	Kim lent Rose something.	Audrey kicked something to Sue.	Lyn splashed something on Maggie.	Dana plastered Marge with something.
6	Barbara served Claire something.	Nancy threw something to Juliet.	Michelle sprinkled something over Sarah.	Pat rubbed Helen with something.
9	Paula passed Liz something.	Rachel tossed something to Anna.	Linda sprayed something on Jessica.	Meg brushed Shannon with something.
11	Anita offered Kate something.	Jennifer chucked something to Tara.	Beth injected something into Lisa	Laura dabbed Jane with something.

they find it stronger than the purely constructional one. Hence, many subjects (if not most) should sort together either the ditransitives and the *to*-datives, or the caused-motion and the *with*-applicative sentences.

The sixteen sentences of our stimuli set can be found in Table 1, sorted by sentence type. As can be seen in this table, we tried to keep the differences between sentences to a minimum by reducing the variability in the expression of the three arguments, in order to prevent subjects from focusing on irrelevant sorting dimensions and develop parasitic sorting strategies. All sentences include two human arguments (agent and recipient/goal), which were referred to by thirty-two different female first names. The exact nature of the third argument (the theme, i.e. the object that is given or moved) was left unspecified, as it was always referred to by the indefinite pronoun *something*. Indeed, preliminary tests showed that subjects are susceptible to select particular features of the theme arguments (such as liquid vs. solid) for their sorting, rather than properties of the events themselves. Replacing all themes by *something* saw a drastic decrease of this tendency, even though the verbs themselves obviously impose more or less stringent restrictions on the nature of the theme. With these precautions, we ensured that all that is left for speakers to sort is the kind of event that each sentence describes (whether it be determined by the verb, construction or alternation that the sentence exemplifies).

As for the verbs, we could not use the same design as Bencini and Goldberg (2000) (i.e. crossing four verbs with the four sentence types), as there are no verbs which can be used in all four constructions. Therefore we decided that each of the sixteen sentences should exemplify a different verb. Our first intention was to use eight widely different verbs for each alternation, but it proved impossible, at least for the locative alternation. First, the set of alternating verbs in the locative alternation is fairly limited semantically, in that they are all somehow verbs of caused-motion: it is therefore difficult to find eight

1 verbs which are maximally different, and the criteria to decide whether they
 2 are different enough are unclear. Second, since our locative sentences contain
 3 an animate goal, many verbs cannot be used felicitously in one or both
 4 variant(s) of the alternation (for example *heap* and *pile*, cf. the awkwardness of
 5 *Sue heaped/piled Sarah with books*), which further reduces the list of candi-
 6 dates. To get around this problem, we decided to use semantically similar verbs
 7 for each sentence type, picked from the semantically coherent classes posited
 8 by Pinker (1989). The ditransitive sentences contain verbs of giving (*pass*,
 9 *lend*, *offer*, *serve*), the *to*-dative sentences contain verbs of “instantaneous
 10 imparting of force in some manner causing ballistic motion” (*throw*, *toss*,
 11 *chuck*, *kick*), the caused-motion sentences contain verbs of “[caused] ballistic
 12 motion in a specified spatial distribution along a trajectory” (*inject*, *splash*,
 13 *spray*, *sprinkle*), and the *with*-applicative sentences contain verb of “simulta-
 14 neous forceful contact and motion of a mass against a surface” (*brush*, *dab*,
 15 *plaster*, *rub*).

16 Obviously, the verbs in each class are very similar in meaning, which would
 17 suggest that subjects will be likely to sort together sentences of the same
 18 sentence type, though not on the basis of shared constructional semantics, but
 19 of the similarity between the lexical meaning of the verbs. This is however not
 20 a problem for our purpose, since a verb-based strategy will work only up to a
 21 point. Namely, sorting according to semantic verb classes leads to four groups,
 22 and since we ask subjects to make three groups, they will have to decide which
 23 two groups they will merge, or come up with another sorting strategy. This is
 24 where event-level semantics come into play: subjects will have to find more
 25 abstract commonalities between the kind of interactions that the sentences
 26 describe. In the dataset, at least three types of inter-sentential abstraction are
 27 possible: the abstraction “cause something to change locations” over the *to*-
 28 dative and caused-motion sentences, the very similar abstraction “cause some-
 29 thing to go on or in somebody” over the caused-motion and *with*-applicative
 30 sentences, and the abstraction “cause someone to have something” over the
 31 ditransitive and *to*-dative sentences.

32 The stimuli sentences were printed on 15 × 10.5 cm white cards in black 18
 33 pt Arial font. Each card was uniquely numbered on the backside (from 1 to 16)
 34 for later reference, following a random sequence, so as to avoid that sentences
 35 1 to 4 correspond to one construction, then 5 to 8 to another etc., and that sub-
 36 jects notice the sentence types from the numbering pattern.

37

38 3.3. *Participants*

39

40 The participants were 26 native speakers of English, all students at the Univer-
 41 sity of Freiburg (either as exchange students or as regular students), aged
 42 between 19 and 33 (22 on average). All of them were offered a compensation

1 for their participation, except for two subjects who took the experiment for
2 course credit.

3 Most of them come from the main English-speaking countries, chiefly the
4 United Kingdom and the United States, with a minority from Australia and
5 Canada. In a questionnaire given at the beginning of the experimental session,
6 they were asked to report their country of origin and the variety of English they
7 claim to speak, for us to test for possible effects of dialectal variation. As it
8 turns out, we did not find any substantial differences between varieties as far as
9 the overall sorting behavior of subjects is concerned.

10 11 3.4. *Procedure*

12 We followed the same procedure as Bencini and Goldberg (2000). After filling
13 out a form of consent and a questionnaire, the subjects were given a pile of
14 cards, which was shuffled in each trial. They were asked to read the sentences
15 and write for each of them a paraphrase on a response sheet which was pro-
16 vided to them. As in Bencini and Goldberg (2000), this was to ensure that they
17 read the sentences carefully and paid attention to their meaning, and more gen-
18 erally that all subjects performed the same sentence processing task prior to the
19 sorting task proper.

20 Participants were then asked to sort the cards into three groups according to
21 the overall meaning of the sentence. In the instructions given to them verbally,
22 we added the caveat that they should not pay attention to the words individually
23 (i.e. compare the words in each sentence and group together sentences with
24 semantically similar words), but that they should consider the meaning of the
25 sentence as a whole. The participants were allowed as much time as they
26 needed to fulfill both the paraphrasing task and the sorting task.

27 When the participants were done with their sorting, we asked them to explain
28 their strategy to us, i.e. what made sentences belong together in each group,
29 and what differed between groups. An outline of their comments was written
30 down by the experimenter as they were talking.

31 32 3.5. *Results*

33 The sortings performed by each subject must be evaluated with respect to the
34 two hypotheses that we formulated on the nature of grammatical generalizations.
35 Under the constructional hypothesis, speakers form grammatical categories on
36 the basis of the generalization of a common form with a common abstract
37 meaning. This hypothesis predicts that subjects will be able to sort by construc-
38 tions, yielding the following three groups: the caused-motion group (contain-
39 ing all *to*-datives and locative caused-motion sentences), the ditransitive group
40 (containing all ditransitive sentences) and the *with*-applicative group (contain-
41 ing all *with*-applicative sentences). This is the constructional sorting.
42

1 Under the alternation hypothesis, in addition to constructional categories,
 2 speakers store higher-level generalizations over constructions related by an
 3 alternation. Our dataset exemplifies two of such generalizations, motivated by
 4 the dative alternation and the locative alternation. The alternations hypothesis
 5 predicts that subjects will be able to sort by constructions *and* alternations, and
 6 thus will have two additional available sorting strategies: the dative sorting and
 7 the locative sorting. A dative sorting corresponds to the following three groups:
 8 a dative group (all *to*-datives and all ditransitives), a caused-motion group (all
 9 locative caused-motion sentences) and a *with*-applicative group (all *with*-
 10 applicative sentences). A locative sorting corresponds to the following three
 11 groups: a locative group (all locative caused-motion and *with*-applicative sen-
 12 tences), a ditransitive group (all ditransitive sentences) and a *to*-dative group
 13 (all *to*-dative sentences).

14 Among our twenty-six subjects, four produced a locative sorting, one pro-
 15 duced a dative sorting, and none produced a constructional sorting. This might
 16 look as if both our hypotheses have little predictive power (even less so for the
 17 constructional hypothesis). However, restricting this counting to the idealized
 18 sortings predicted by the hypotheses is a very restrictive way of evaluating the
 19 results, which does not entail that the generalizations predicted by either
 20 hypothesis do not exist. As a matter of fact, we observed that many subjects do
 21 not sort the whole set according to the same kind of criteria, in our case, event-
 22 level semantics. Several subjects produced a group that actually matches an
 23 alternation, but the other eight sentences were not necessarily sorted according
 24 to constructional meaning. If we only look at whether sortings contain a group
 25 based on an alternation or on the caused-motion construction, we find that six
 26 subjects produced a group containing all datives and eleven subjects produced
 27 a group containing all locatives. No subject produced a group containing all
 28 caused-motion sentences, but three did produce a group containing all four *to*-
 29 dative sentences and three caused-motion sentences, which can be considered
 30 as a near-constructional sorting. Finally, six subjects used various other sorting
 31 strategies which do not follow either constructions or alternations, and for
 32 which the resulting groups contain a mix of sentences of different types. An
 33 examination of the post-experiment explanations provided by these subjects
 34 reveals that they sorted either according to a very specific semantic feature of
 35 the verbs (such as the degree of forcefulness, or whether it involves contact
 36 or a liquid, etc.), or according to some subjective evaluation of the events
 37 described by the sentences (such as whether they see it as something good, bad
 38 or neutral vis-à-vis the other human participant). In any case, the sortings of
 39 this type do not match either the constructional or the alternations hypothesis.

40 The distribution of sorting strategies according to this looser classification is
 41 summarized in Table 2. It appears that only a minority of subjects (3 on 26)
 42 sorted the stimuli following the abstract caused-motion construction. On the

Table 2. *Distribution of sorting strategies*

Sorting strategy	Subjects
dative	6
locative	11
constructional	3
other	6

other hand, sortings based on a generalization over variants of an alternation were much more frequent, and within that category there seems to be a preference for a sorting based on the locative alternation (11 vs. 6 subjects).

Even though this first evaluation of the results allows us to already observe a clear trend, it must be admitted that by focusing exclusively on sorting characteristics that we expected to find, we ignored many finer-grained details that could also provide evidence in favor of or against our starting hypotheses. In particular, this coarse classification resulted in a fourth group of sorters that were not categorizable according to our predictions, but these subjects may also have been using an alternation-based or constructional generalization of a more limited scope when they ignored the event-level semantics associated to each sentence type. To give a more complete picture of the sorting results, we relied on another method used by both Bencini and Goldberg (2000) and Gries and Wulff (2005). Following Lassaline and Murphy (1996), Bencini and Goldberg quantified to what extent the sorting behavior on their subjects relied on verbal meaning or on constructional meaning by computing two deviation scores measuring how many sentences needed to be recategorized in a given sorting solution to obtain a perfect verb-based or construction-based sorting. They then performed significance tests on the resulting mean scores.

Along the same lines, we counted for each subject the number of sentences that needed to be recategorized in their sorting in order to obtain a group based on the locative or dative alternations, or on the caused-motion construction. We call these deviation scores respectively *LDev*, *DDev* and *CDev*. We obtained the mean values of 2.3 for *LDev*, 3.46 for *DDev*, and 4.57 for *CDev*. *LDev* is significantly lower than *CDev* (paired $t(25) = 4.5299$; $p = 0.0001$). *DDev* is only marginally significantly lower than *CDev* (paired $t(25) = 2.0382$; $p = 0.0522$). These results confirm that participants were overall more influenced by the semantic similarity involved in both alternations than by the semantic similarity found between instances of the abstract caused-motion construction, although the evidence appears to be weaker for the dative alternation. The difference between *DDev* and *LDev* is not significant (paired $t(25) = 1.6779$; $p = 0.1058$), showing that both alternations seem to be equally salient as possible sorting strategies.

1 Finally, to complement the analysis by subject presented above, we also
 2 analyzed our results from the perspective of the stimuli themselves, to give an
 3 account of the semantic similarity between sentences as reflected by the sort-
 4 ings, and of the corresponding semantic generalizations. To do so, we followed
 5 Gries and Wulff (2005) in submitting our data to hierarchical clustering.⁶ Hier-
 6 archical clustering is an unsupervised learning technique aimed at the classifi-
 7 cation of a set of objects into homogenous categories (cf. Aldenderfer and
 8 Blashfield 1984), according to a set of numerical variables against which each
 9 object (here, each sentence) is characterized. In our case, it is a vector record-
 10 ing how many times a sentence was sorted together with each of the other
 11 sentences in our stimuli set; in other words, the more frequently two sentences
 12 end up together in the same group, the more semantically similar they are con-
 13 sidered. The pairwise distances between sentences are calculated following a
 14 distance metric (here, the euclidean, or geometric, distance), and submitted to
 15 the hierarchical clustering algorithm, which proceeds in several recursive
 16 passes by merging in each pass the two most similar clusters into a higher-level
 17 cluster, until there is only one cluster containing all objects; the distance
 18 between clusters is assessed according to which linkage criterion is chosen.
 19 The output of the hierarchical clustering algorithm is thus, as the name indi-
 20 cates, a hierarchy of clusters.

21 The results of the cluster analysis are presented in a dendrogram in Fig-
 22 ure 2.⁷ This kind of diagram arranges objects (here, the stimuli sentences) ac-
 23 cording to their similarity, and as it were, traces the history of cluster mergers
 24 by the algorithm, from the earliest one at the very bottom of the graph, to the
 25 last one at the top. More similar sentences are grouped earlier by the algorithm,
 26 and appear lower in the tree. Clusters are recursively merged at a more distant
 27 level of similarity as we go higher in the tree.

28 Two observations can be made from the results of the cluster analysis. First,
 29 at the bottom of the diagram, we find four sets of sentences that stand out as
 30 they are clustered particularly early: these groups are respectively composed of
 31 (from left to right) the three caused-motion sentences with *sprinkle*, *spray* and
 32 *splash*, the three *with*-applicative sentences with *dab*, *brush* and *rub*, the
 33 three ditransitive sentences with *lend*, *offer* and *serve*, and all four *to*-dative
 34

35
 36 6. We used the `hclust` function of the R environment (<http://www.r-project.org/>) [accessed
 37 March 2012].

38 7. We used the euclidean distance and complete linkage to generate Figure 2. However, it should
 39 be noted that the same clustering structure can be obtained with single, average and Ward link-
 40 age and/or the Manhattan distance. Thus, the sentence clusters produced by the analysis do not
 41 depend on specific parameters of the clustering algorithm, which suggests that the sorting
 42 tendencies they reflect are not generated by some specific analysis but correspond to actual
 behavioral properties found in the dataset.

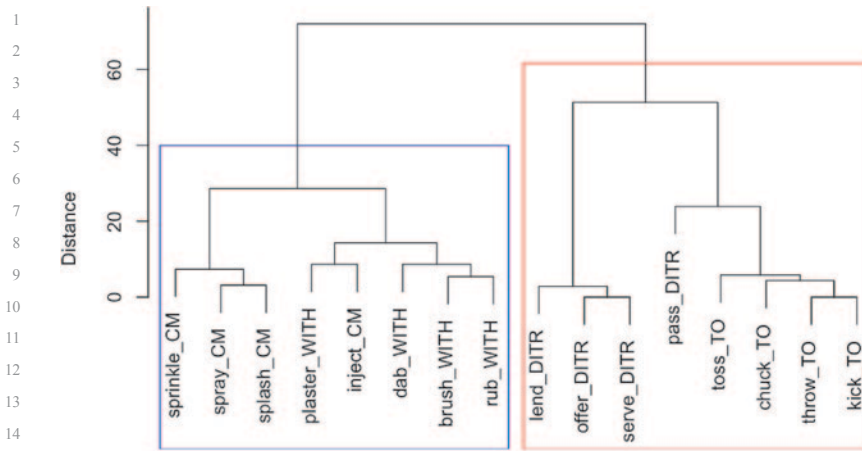


Figure 2. Cluster dendrogram of the stimuli sentences; the labels indicate the verb and construction used in each sentence (DITR = ditransitive, TO = to-dative, CM = locative caused-motion, WITH = with-applicative)

sentences.⁸ This means that a large majority of our subjects chose to put these sentences in the same group, which, not incidentally, contain verbs from the coherent semantic classes that we used in our stimuli. While this observation does not directly relate to our main question, it confirms that subjects behaved like we expected: they primarily noticed the semantic similarity between verbs of the same class, and chose to put them together. However, this strategy yields four groups, which is one more than what they were instructed to make. They therefore had to either rearrange their sorting or choose to merge two verb-based groups, which is arguably where the semantic similarity between variants of an alternation or instances of the caused-motion construction comes in.

Secondly, if we now look at the higher levels of the tree, we see that the dataset is clearly split into two broad categories (surrounded by boxes in the dendrogram) containing respectively all locative sentences and all dative sentences.⁹ Correspondingly, no cluster at any level of similarity contains a

8. This leaves three sentences that are more distantly related to these groups: the *with*-applicative use of *plaster*, the caused-motion use of *inject* (which constitute a cluster of their own), and the ditransitive use of *pass*. Interestingly, we can observe that the latter two are more closely related to sentences instantiated by another construction, which means that in those cases the constructional meaning is not taken into account. We comment on these cases in Section 3.7, which deals with the role of verb meaning.

9. This impressionistic observation can be confirmed by applying the so-called elbow criterion to choose the 'right' number of clusters, as in Gries and Wulff (2005: 193). This method consists in plotting the percentage of variance explained by the classification as a function of the

1 caused-motion and a *to*-dative sentence. This shows that the abstract caused-
 2 motion construction exerted little influence in judgments of semantic similarity,
 3 while both alternation-based generalizations clearly prevailed. In sum, the
 4 results of the cluster analysis strongly support the alternations hypothesis.

5 To summarize our findings, the three kinds of quantitative analysis applied
 6 to our results, namely (a) the distribution of broadly-defined sorting types, (b)
 7 the deviation scores from the expected sortings, and (c) a cluster analysis of
 8 the stimuli sentences according to how often they are categorized together,
 9 all point to a preference for a semantic generalization based on either the loca-
 10 tive or dative alternation over the abstract caused-motion construction. In the
 11 next section, we turn to a more qualitative analysis of the results by examin-
 12 ing the descriptions of groups provided by subjects in the post-experiment
 13 interviews.

14 3.6. Analysis of the post-experiment interviews

16 Regarding the quantitative analysis reported in the previous section, it might
 17 be argued that there is no guarantee that subjects producing similar sortings
 18 actually shared a common sorting strategy (i.e. with the same underlying gen-
 19 eralizations): two subjects might well apply distinct sorting criteria and still
 20 eventually provide similar groups. To control for this, it is important to com-
 21 pare the quantitative analysis with the qualitative data collected through the
 22 post-experiment interviews. As it turns out, the descriptions given by subjects
 23 largely match our expectations.

24 Table 3 reports how subjects who produced a locative group (i.e. containing
 25 all caused-motion and *with*-applicative sentences) described this group (the
 26 numbers on the left correspond to each subject's unique identifier). It appears
 27 that seven subjects (highlighted with boldface in the left-hand column) out of
 28 eleven used purely locative terms in their description. All seven used typical
 29 verbs of caused-motion: mostly *put* (subjects 03, 06, 10 and 24), but also *apply*
 30 twice (22 and 26), and *transfer* once (08). This means that they indeed consid-
 31 ered that the semantic commonality between the eight locative sentences is the
 32 notion that an agent causes something to move, which corresponds to the
 33 meaning shared by the variants of the locative alternation. They also frequently
 34 mentioned the type of resulting spatial configuration of the theme and goal
 35 arguments. Most of them mentioned a "contact with surface" relation, either
 36 through the verb *apply* or the preposition *on*. In addition, two of them also
 37

39 number of clusters, and identifying the point at which an elbow or a sharp bend occurs, which
 40 indicates that increasing the number of clusters beyond this point is not worth the improve-
 41 ment. We found that the gain in the percentage of variance explained by the classification
 42 drops drastically (from about 20% to 6%) when the number of clusters exceeds 2.

Table 3. Descriptions of the locative groups by the eleven locative sorters. Boldface font is used to highlight important content, commented on in the text.

03	something not very pleasant [is] done to another person, but [is] not necessarily wanted by the recipient, [it does] not [involve] possession of something but something is put on the person
04	something [is] being done to somebody else
06	something [is] put on the person or inside the person, it has something to do with the body
08	something is transferred but the recipient has a passive role
09	physical events, with a result, an end-effect, it involves the body
10	physically putting something on or in somebody
12	[involves] close contact with the other person
22	something is applied to them
23	something almost malicious, a one-way action, like pranks or jokes
24	someone is putting a substance on somebody else, whatever it is: solid, fluid, liquid
26	[there is] direct contact, usually some kind of substance [is] being applied to someone else

noticed that this spatial configuration is at odds with the caused-motion use of *inject* (for which the relation is rather one of containment), and accordingly added the preposition *inside* or *in* (subjects 06 and 10), showing that they effectively abstracted away from the meaning of individual verbs and only kept the notion of caused motion vis-à-vis some landmark, regardless of the resulting spatial configuration.

The descriptions provided by the remaining four locative sorters were either too vague to qualify as a good definition of the meaning of the locative alternation (cf. 04 and 09), or made obvious mention to another semantic criterion not directly related to the alternation (cf. 12 and 23). Interestingly, subject 04's description in terms of "something [. . .] done to somebody else" reminds one of the construal imposed by the *with*-applicative variant (i.e. an action on the goal), but since it does not explicitly mention the idea of caused motion, it is not clear whether it does qualify as a definition of the kind we expect for the locative alternation. By the same token, it is interesting to note that subject 03 also provided a similar description as "something [. . .] done to another person", in addition to the description mentioned above involving caused motion with the verb *put*: this can be interpreted as meaning that this subject identified both construals involved by the two variants of the locative alternation.

1 Table 4. Descriptions of the dative groups by the six dative sorters. Boldface font is used to
2 highlight important content, commented on in the text.

3	01	things [are] given directly or violently
4	14	something [is] passing from one person to another
5	15	someone [is] giving something tangible to somebody
6	17	somebody gives something to somebody else
7	18	one person gave something to another person
8	20	an object was exchanged , went from one person's possession to another's
9		
10		
11		
12		
13		

14 Table 4 reports how subjects who produced a dative group (i.e. containing
15 all ditransitive and *to*-dative sentences) described this group. It turns out that
16 these descriptions are even more alike than those of the locative groups, as
17 nearly all of them clearly relate to the idea of giving. Out of the six dative
18 sorters, four precisely used the verb *give* (01, 15, 17 and 18), one the similar
19 verb *pass* (14), and one the verb *exchange* (20). In addition, the latter also
20 explicitly mentioned the notion of “possession”, and, interestingly, captured
21 the idea of giving in terms of motion, which is something that linguists often
22 do. Similarly, the description provided by subject 14 seems to focus more on
23 the motion of the theme than on the agent’s action. Such descriptions are rem-
24iniscent of the metaphor ‘TRANSFER OF OWNERSHIP IS PHYSICAL TRANSFER’ which is
25 argued to motivate the use of a caused-motion syntax (i.e. the *to*-dative) to
26 express events of giving. We cannot be sure whether these subjects had this
27 metaphor in mind, but in any case, it is worth noting that they used this defini-
28tion, more in line with the *to*-dative, to encompass the ditransitives, and not the
29 other way around, as the other subjects did. What is more, despite the locative
30 construal of events of giving which transpires in these descriptions, this meta-
31phor did not provide a basis for a caused-motion group including the *to*-datives
32 and the purely locative caused-motion sentences. In sum, the descriptions
33 provided by dative sorters are all in line with the meaning “cause someone to
34 receive” associated with the variants of the dative alternation.

35 Finally, the definitions of the caused-motion group provided by the three
36 constructional sorters are reported in Table 5. As a general observation, it
37 appears that these descriptions are generally less well-articulated and accurate,
38 probably because the relationship between the *to*-dative and caused-motion
39 sentences is more ineffable and might not be so easily captured in concrete
40 terms for non-specialists. Yet, subject 02 did mention that the sentences in this
41 group involve interactions “at a distance”, i.e. involving caused motion. Sub-
42ject 05 explained it in terms of “indirect contact”, which, when asked, s/he

Table 5. Descriptions of the caused-motion groups by the three constructional sorters

02	[actions performed] at a distance
05	involves indirect contact
25	two people interacting, they don't touch each other, something is done to someone else, it has to do with sports

clarified as contact being made between two people not directly but with the intervention of some object or substance used by the first person, which is another way of putting “caused motion of some object to some goal”. Subject 25’s comment that the two protagonists “don’t touch each other” arguably relates to the same idea.

We can conclude that the post-experiment interviews largely confirm our interpretation of the quantitative results presented in the previous section, in that in most cases the semantic explanation put forward by each subject corresponds to the semantic commonality between variants of an alternation or instances of a construction. In the next section, we turn to the influence of verb meaning in our subjects’ sortings and address the question of whether it could constitute a possible confound.

3.7. The role of verb meaning: a possible confound?

As one of our anonymous reviewers aptly points out, there is a possible confound in our dataset: the meaning of the verbs could perhaps explain the sorting behavior of subjects, in that they would put a given sentence in a group because the verb in this sentence is semantically similar to the other verbs in the group, regardless of the constructions with which these verbs are used. As a matter of fact, there is some evidence that subjects do at times rely on the meaning of the verb, especially with regard to how they sort the sentences that do not fall in either their dative, locative, or caused-motion group. For example, many subjects (6) among the locative sorters interpreted the verb *pass* in its “ballistic” reading (as in *pass the ball*) instead of its intended ‘giving’ sense (as in *pass the salt*), and accordingly sorted the ditransitive sentence containing *pass* with the more similar verbs of throwing used in the *to*-dative rather than with the other ditransitive sentences, thus ignoring possible (though subtle) semantic differences induced by each construction. Similarly, a recurrent tendency among dative sorters (3 subjects) was to put the caused-motion use of *inject* in the *with*-applicative group, by virtue of the fact that an act of injecting involves contact between the agent and the recipient of the injection, just like the action described by the verbs used in the *with*-applicative sentences (viz. *brush*, *dab*, *rub* and *plaster*).

1 It should not be surprising that subjects attend to verb meaning: after all, it
 2 was shown by Healy and Miller (1970) to be an important determinant of verb
 3 meaning, and even when controlling for constructional semantics, Bencini and
 4 Goldberg (2000) did find some extent of verb-based sorting. However, the real
 5 question is whether the tendency of subjects to sort variants of an alternation
 6 together can be explained by the semantics of the verb used instead of shared
 7 event-level meaning. To do so, they would have to consider all eight sentences
 8 as being united by semantic properties attributable to the verb alone, independ-
 9 dently of the particular construction with which they are used. It seems unlikely
 10 in the case of the ditransitive verbs vs. the *to*-dative verbs, as the two classes
 11 used have arguably little in common. All that unites the dative sentences is that
 12 they involve a recipient, but verbs of throwing only do so when used in the *to*-
 13 dative or ditransitive construction. The distinction between verb classes is per-
 14 haps less clear-cut in the case of the caused-motion vs. *with*-applicative verbs:
 15 even though the gestures performed by the agent and the potential props
 16 involved are quite different in each verb class, it might be argued that the
 17 actions referred to by many verbs from both classes are similar with respect to
 18 the fact that they can be performed in the same real-world contexts (for
 19 example, care-taking), and, more importantly, that they lead to a similar result
 20 (namely, some substance being spread or scattered on the surface of an object
 21 for *spray*, *splash*, *sprinkle*, *brush*, *rub* and *plaster*). Thus, the overall prefer-
 22 ence for the locative alternation over the dative alternation happens to be cor-
 23 related with a potential difference in similarity between pairs of verb classes.
 24 That being said, even though the role of verb meaning could explain this prefer-
 25 ence, it does not necessarily account for why subjects chose to sort by relying
 26 on an alternation over a construction in the first place. In fact, if verb meaning
 27 was a decisive criterion to merge different sentence types, we would expect
 28 constructional sortings to be more frequent than at least dative sortings, since
 29 there is an evident semantic dimension of verb meaning shared between the
 30 *to*-dative verbs and the caused-motion verbs (especially *splash* and *spray*) that
 31 is yet rarely drawn upon by our subjects, namely the notion of translational
 32 motion. Only one subject arguably noticed this, as he put these verbs with *pass*,
 33 obviously understood in its ballistic reading. For the two other constructional
 34 sorters, it is not clear whether they based their strategy on the semantics of the
 35 caused-motion construction or on the translational motion feature of the verbs,
 36 since both of them excluded *inject* from the caused-motion group.

37 The influence of verbal semantics as a motivation for sorting together sen-
 38 tences with verbs from different classes can be more concretely evaluated by
 39 looking at the definitions provided by subjects. Remember that our intention
 40 when designing the dataset was to provide subjects with clearly identifiable
 41 verb-based groups (which also matched constructions), two of which they had
 42 to merge to obtain a three-group sorting. It is clear from the discussion of post-

1 experiment interviews presented in the previous section that they mostly did so
 2 on the basis of event-level semantics, as very few subjects mentioned semantic
 3 characteristics that are unambiguously attributable to the meaning of the verbs
 4 alone. Only two of the six dative sorters used words relating to motion in their
 5 descriptions of the dative group (cf. subjects 14 and 20 in Table 4). A similar
 6 comment applies to the locative sorters, as their descriptions rarely included
 7 precisions that unequivocally refer to the semantics of particular verbs; the
 8 only remarks that could qualify as such are comments like “it involves the
 9 body” or “close/direct contact”, each occurring only twice (subjects 06, 09, 12
 10 and 26) among the eleven locative sorters (cf. Table 3). Subject 23 described
 11 the locative group as containing “pranks or jokes”, which qualifies as a
 12 description in terms of the contexts in which the actions described by the verbs
 13 are performed, although it seems to be a very personal judgement. But as was
 14 shown in the previous section, subjects more consistently defined this group in
 15 terms of putting or applying. Thus, verbal meaning did not seem to exert much
 16 influence on the decision to merge sentences instantiating variants of an alter-
 17 nation, compared to event-level semantics.

18 While there are arguably good reasons to assume that subjects based their
 19 sortings primarily on event-level semantics, it must be admitted that the influ-
 20 ence of verb meaning is hard to evaluate with precision. This confound could
 21 however not be totally avoided given the requirements of our stimuli set, which
 22 perhaps calls for a replication of this experiment with a different set of stimuli
 23 that avoids this confound (if such a set exists at all). That being said, we can
 24 certainly learn a lot about the organization of constructional knowledge from
 25 the results of this study, which we will turn to in the last section of this article.
 26 Before that, we address the question of whether our results could be accounted
 27 for by following the approach to syntactic alternations endorsed by Frame
 28 Semantics.

30 3.8. *Comparison with the frame-semantic approach to alternations*

31
 32 In this section, we compare our results with another major approach to verb
 33 valency and argument structure in Cognitive Linguistics: Frame Semantics. As
 34 its name indicates, Frame Semantics (FS) is a theory of word meaning that
 35 revolves around the concept of semantic frame, defined by Fillmore (1985:
 36 223) as “some single coherent schematization of experience or knowledge”. A
 37 semantic frame makes reference to a particular scenario within which certain
 38 aspects or entities, called frame elements (FEs), are highlighted; FEs are basi-
 39 cally the FS equivalent of the traditional notion of thematic roles. FS primarily
 40 aims at a semantic characterization and classification of words (particularly,
 41 though not exclusively, verbs) in terms of semantic frames. A lexical unit (LU)
 42 is defined as a pairing of a lemma with a particular semantic frame; in FS ter-

1 minology, a LU is said to *evoke* a frame. The FrameNet project¹⁰ is the lexico-
 2 graphic pendant of FS: it provides a database of semantic frames derived from
 3 careful analysis of example sentences extracted from the British National
 4 Corpus and freely accessible online. As of February 2012, FrameNet contains
 5 12411 LUs (including 4766 verbs) attached to 1138 frames.

6 Syntactic alternations, defined as alternative realizations of the same set of
 7 arguments of a verb, are not captured as such in FS; rather, they are considered
 8 as an epiphenomenon that results from the fact that the same verb stem corre-
 9 sponds to several different lexical units, each evoking a different frame. For
 10 example, following Boas (2010; 2011), the two variants of *load* in the locative
 11 alternation correspond to two distinct LUs: the caused-motion variant evokes
 12 the Placing frame, while the *with*-variant evokes the Filling frame. The
 13 observation that a given verb enters into the locative alternation is thus trans-
 14 lated in FS as a mere case of verbal polysemy (cf. also Nemoto [2005] for a
 15 similar conclusion). Yet, the relatedness of variants of an alternation may still
 16 be captured through relations between frame. As Boas (2010: 70–71) puts it:

17
 18 While FrameNet provides no explicit link or connection between the valence patterns
 19 of the two LUs, there exists a frame-to-frame relation between the frames evoked by the
 20 two LUs, i.e. the Filling frame uses the Placing frame. Thus, syntactic alternations
 21 are accounted for in terms of frame-to-frame relations and the valencies of pairs of
 22 lexical units evoking frames that are semantically related.

23 The “uses” relation between the Filling frame and the Placing frame captures
 24 the fact that “the endpoint of a filling event requires a number of placing events
 25 that temporally precede this endpoint” (Boas 2011: 218). In sum, in Frame
 26 Semantics, a syntactic alternation does not amount to a relation between LUs
 27 themselves, but to a relation between the frames they evoke,¹¹ which is only
 28 identified as a (semi-)regular pattern because many verb stems evoke both
 29 frames.

30 On this account, categories of sentences instantiating different construc-
 31 tions may well emerge only by virtue of the relation between frames evoked
 32 by the verbs, but not necessarily because the constructions themselves are per-
 33 ceived as semantically similar. This idea obviously relates to the verb meaning
 34 confound discussed in the previous section. We argued that verb meaning
 35 was not likely to exert much influence on the sortings, on the grounds that the
 36 verb meanings were after all quite different in each sentence type, and, more
 37

38
 39 10. <https://framenet.icsi.berkeley.edu> [accessed March 2012].

40 11. See also Iwata (2005) for a similar account of the locative alternation in terms of different but
 41 related construals of the same abstract scene. García Velasco (2011) makes similar proposals
 42 concerning the English causative alternation.

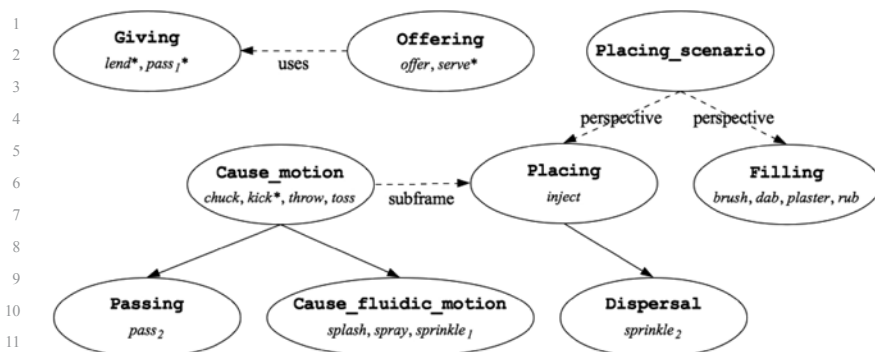


Figure 3. *Semantic frames evoked by the verbs in our stimuli set (source: FrameNet). Plain arrows indicate inheritance links, dashed arrows indicate other types of relations, labelled accordingly.*

importantly, on the basis of the group descriptions provided by our subjects, which rarely included information clearly related to the verbs. However, we did not take frame-semantic considerations into account, so the question must be asked whether the FS approach could provide an alternative explanation of our results, without resorting to cross-constructional generalizations.

To check this, we looked up the FrameNet database for the semantic frames evoked by the verbs used in our stimuli sentences. The resulting set of frames and the relations between them are summarized in Figure 3. Three of our verbs, *kick*, *lend* and *serve*, were not found in their relevant meanings in FrameNet, so we had to attach them ourselves to an appropriate frame; these verbs are marked with a star in Figure 3. The *to*-dative use of *kick* straightforwardly evokes the *Cause_motion* frame, by analogy with the other verbs of throwing. We assumed that *serve* evokes the *Offering* frame (or possibly an elaboration thereof), since its meaning also conveys the idea of “making something available to somebody”, like *offer*. Since *lend* has basically the same meaning as *give*, with the proviso that it refers to only temporary transfer of possession, we attached it to the *Giving* frame. Two other verbs, *pass* and *sprinkle*, were ambiguous between two frames in the stimuli sentences, therefore we took both options into consideration and split these verbs into two LUs, each marked in Figure 3 by a different subscript. *Sprinkle₁* evokes the *Cause_fluidic_motion* frame, and *sprinkle₂* evokes the *Dispersal* frame. As to the verb *pass*, it is reported in FrameNet as being the sole LU in the *Passing* frame, but according to the definition of the frame and since it inherits the *Cause_motion* frame, it seems that this LU corresponds to the throwing sense of *pass* rather than its giving sense. Just as we did with *sprinkle*, we split this verb into two entries, *pass₁* evoking the *Giving* frame, and *pass₂* evoking the *Passing* frame.

1 Since a majority of our subjects chose to sort the caused-motion and *with-*
 2 applicative sentences together, we should expect the frames evoked by the
 3 verbs in these sentences to be particularly closely related in the FrameNet
 4 hierarchy. These frames are however on the whole quite scattered: while the
 5 Filling frame and the Placing frame (evoked by *inject* and, through
 6 inheritance, by *sprinkle*₂) are quite close by virtue of being two perspectives on
 7 the abstract Placing_scenario frame,¹² the other verbs are more distantly
 8 related since the Cause_fluidic_motion frame is but a cousin of the Plac-
 9 ing frame: it inherits the Cause_motion frame, which Placing is a sub-
 10 frame of.¹³ Be that as it may, the similarity of these sentences can still arguably
 11 be traced back to more or less direct relations between frames. What is more
 12 surprising is that there is clearly more semantic coherence between the verbs
 13 used in the *to*-dative and caused-motion constructions, since all frames evoked
 14 by the former verbs inherit (either fully or partially through a subframe link)
 15 the Cause_motion frame evoked by the latter. Yet, these verbs are very rarely
 16 sorted together into what we called a caused-motion group.

17 The dative alternation receives a different treatment from the locative alter-
 18 nation. In FrameNet, the double-object and prepositional variant are recorded
 19 as alternative realizations of the same set of frame elements for a number of
 20 LUs both in the Giving and Offering frames and in the Cause_motion
 21 frame. Hence, the dative alternation is not captured in terms of verbal poly-
 22 semy like the locative alternation, which predicts that speakers should not
 23 perceive any semantic difference between sentences instantiating different
 24 variants of the alternation, beyond of course the difference between the frame-
 25 semantics of their verbs. Therefore, we should expect the frequent tendency of
 26 our subjects to sort together the ditransitive and *to*-dative sentences to correlate
 27 with a fairly close relatedness of the Giving¹⁴ and Cause_motion frames,
 28 but thus is not the case: from all the frames mentioned in Figure 3, they are by
 29 far the most distant; in fact they are only related at the most abstract level in the
 30 frame hierarchy (viz. they inherit the Event frame), which amounts to saying
 31 that they are not related at all.

32
 33

-
- 34 12. This account slightly differs from that presented by Boas (2010; 2011), mentioned earlier.
 35 We presume that this might be because of a change in FrameNet that was made after these
 36 studies were written.
- 37 13. The subframe link is akin to an inheritance link, except that only a part of the parent frame is
 38 inherited by the child frame; hence, it captures metonymical relations between frames. Here,
 39 the subframe link between Cause_motion and Placing captures the fact that the latter only
 40 profiles the end-point of a full event of caused motion, namely the arrival of the theme at the
 41 goal.
- 42 14. Since the Offering frame uses the Giving frame, for the sake of simplification we subsume
 the former into the latter.

1 In sum, Frame Semantics, as it is currently implemented in the FrameNet
 2 database, falls short of explaining the pattern of results of our sorting task in
 3 terms of relations between frames. Contrary to what should be found, the two
 4 most closely related frames evoked by our verbs actually correspond to the
 5 least frequent sorting strategy (the constructional sorting); conversely, sen-
 6 tences with verbs evoking more distantly related or even totally unrelated
 7 frames are frequently sorted together by our subjects. There thus seems to be
 8 more than relatedness of frames, as the FS approach would have it, to the
 9 semantic similarity of our stimuli sentences as reflected by our subjects' sort-
 10 ings. Of course, this does not as such invalidate the FS approach to verb mean-
 11 ing. Instead, this apparent failure might be due to the fact that FrameNet does
 12 not as yet capture the notion of construction. Efforts are currently being made
 13 to complement the frame hierarchy with information about constructions
 14 (cf. Boas 2010, Fillmore et al. to appear) using the same descriptive appara-
 15 tus. Once the constructions used in our dataset are covered by FrameNet,
 16 construction-to-construction and possibly construction-to-frames relations
 17 might better correlate with our results.

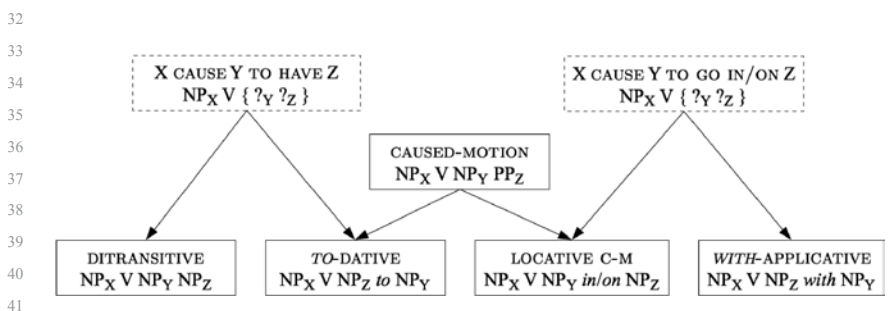
20 4. Discussion

22 In this study, we used a sorting task paradigm to investigate how speakers
 23 categorize sentences. We exposed 26 native speakers of English to a set of
 24 16 sentences instantiating three argument structure constructions: (a) the
 25 caused-motion construction, (b) the ditransitive construction, and (c) the *with*-
 26 applicative construction. Importantly, the caused-motion sentences we used
 27 fall into either of two semantic types: locative caused-motion sentences and
 28 *to*-dative caused-motion sentences. While the caused-motion sentences of both
 29 types can be unified under the same constructional meaning 'physical trans-
 30 fer', each type also shares a substantial part of their meaning with one of the
 31 other constructions appearing in the stimuli set. Namely, the *to*-dative type is
 32 similar to the ditransitive construction with respect to the shared notion of
 33 'transfer of possession', and the locative type is similar to the *with*-applicative
 34 construction in that they both describe events of (physical) change of location.
 35 In fact, sentences of both types could be rephrased with the other construction,
 36 with little variation in meaning,¹⁵ which is what prompted researchers to
 37 describe these pairs of constructions as variants of a syntactic alternation, in
 38 this case called the dative alternation and the locative alternation respectively.

41 15. As a matter of fact, one of our subjects spontaneously issued this comment concerning the
 42 caused-motion sentence with *inject*.

1 What we were concerned with in this study is whether and to what extent
 2 speakers perceive the semantic relatedness of sentences instantiating different
 3 constructions. We asked our subjects to sort the stimuli set into three groups. It
 4 is already expected that they notice the semantic similarity between the two
 5 types of caused-motion sentences, since previous research has shown that con-
 6 structural meaning is a relevant dimension of sentence categorization. There
 7 is no reason to doubt that they are also able to notice the similarity between
 8 variants of either alternation, but the question is whether (and to what extent)
 9 some of them would actually resort to this similarity in their sorting and prefer
 10 it over the caused-motion construction, thus forming an alternation-based
 11 group of sentences. As we reported at length in the last section, subjects rarely
 12 used the caused-motion construction in their sortings. They much more fre-
 13 quently presented a sorting solution in which the variants of one of the alterna-
 14 tions were together in one group. In other words, alternation-based generaliza-
 15 tions are reflected in the sorting behavior of our subjects much more often than
 16 the purely constructional ones. This result is more in line with the alternations
 17 hypothesis, spelled out in Section 3.1: speakers are evidently able to formulate
 18 broader generalizations of a constructional meaning shared by formally distinct
 19 constructions, and in our case they use the former more often than the latter in
 20 categorizing the stimuli sentences.

21 The generalizations that subjects relied on to sort the stimuli sentences are
 22 modeled as a constructional network in Figure 4, following a notation similar
 23 to that of Goldberg (1995), Langacker (2000) and Cappelle (2006), to name
 24 only but a few. In this diagram, pairings of form with meaning (i.e. construc-
 25 tions) are represented by plain boxes. For abbreviatory purposes, we did not
 26 include a description of the meaning of each construction, we simply refer to it
 27 through the construction's name. A full specification of each constructional
 28 meaning would include a description of the kind of event it refers to (for
 29 example, and event of transfer of a theme from the agent to a recipient for the
 30 ditransitive construction), but should also include the finer-grained distinctions
 31 mentioned in Section 1, such as semantic properties of the arguments (e.g. that



42 Figure 4. Constructional network of the dative and locative alternation and their variants

1 the argument marked by a Y subscript in the ditransitive construction is a
 2 recipient and should therefore be animate), discourse profiles (i.e. information
 3 about the discourse accessibility of the arguments), or event construals (e.g. the
 4 fact that the locative caused-motion and the *with*-applicative construction
 5 respectively construe the event of caused change of location as an action
 6 affecting the theme or affecting the location). Inheritance relations are repre-
 7 sented by arrows and indicate that the child construction (at the pointy end of
 8 the arrow) is more specific than the parent construction, in that the former
 9 describes particular aspects of the form and/or meaning of the latter in more
 10 details. For example, the *to*-dative and locative caused-motion constructions
 11 inherit the form and meaning of the general caused-motion construction, but
 12 add specifications concerning the spatial relation between the theme and
 13 location arguments, namely one of path-to-goal for the former (marked by the
 14 preposition *to* in the form of the construction), and one of containment or
 15 contact-with-surface for the former (respectively marked by the prepositions *in*
 16 and *on*¹⁶). Note that the general caused-motion construction may subsume
 17 other sub-constructions (for example, encoding the removal of the theme from
 18 a source location), but only these two are relevant to our discussion. Following
 19 Goldberg (1995), we intend these inheritance links to symbolize default
 20 inheritance, in that the information inherited from the parent construction is
 21 redundantly duplicated in the specification of the children constructions,
 22 although a model relying on complete inheritance (i.e. without redundant
 23 information) could just as well capture the same data; actually the issue of
 24 default vs. complete inheritance is not truly relevant to the kind of generaliza-
 25 tions we wish to describe here.

26 In addition to constructions, Figure 4 contains two alternation-based gener-
 27 alizations, represented as dash-lined boxes. Loosely following the notation
 28 introduced by Cappelle (2006), we represent these generalizations as pairings
 29 of (i) a constructional meaning abstracted from the meaning of the variants of
 30 the alternation, with (ii) an underspecified form which contains only the
 31 commonalities between variants, and thus leaves unspecified the syntactic
 32

33
 34 16. Of course, this is clearly a semantic constraint and should therefore not be encoded in the
 35 formal pole of the construction; what is more, many other prepositions are possible, like *into*,
 36 *inside*, *over*, or *against*. We use this notation as a mere shorthand, since Figure 4 does not
 37 describe the semantics of constructions; a more accurate characterization would specify the
 38 possible spatial relations in the meaning of the construction. Also, not all kinds of caused-
 39 motion sentences are allowed to be rephrased with the *with*-variant, which has much to do
 40 with the spatial relation instantiated by the preposition: this is chiefly why we need to repre-
 41 sent this restriction somehow in the diagram. On a related note, the name “locative caused-
 42 motion” is perhaps too general to be entirely appropriate, since this construction is meant to
 capture the generalization over our caused-motion sentences, which do not exemplify the
 whole range of locative relations; again, we use this label anyway for abbreviatory purposes.

1 type (marked by question marks in our diagram) and linear order (marked
 2 by curly brackets) of the post-verbal complements. We call these higher-level
 3 alternation-based constructions CONSTRUCTEMES.¹⁷ The dative constructeme (on
 4 the left) pairs the meaning ‘Agent CAUSE Recipient TO HAVE Theme’ with a
 5 syntactic form in which the Agent is realized as subject and the Recipient
 6 and Theme arguments receive underspecified syntactic realizations. The loca-
 7 tive constructeme (on the right) pairs the meaning ‘Agent CAUSE Theme TO GO
 8 IN/ON Location’ with a similar syntactic form. The ditransitive and *to*-dative
 9 constructions, on the one hand, and the locative caused-motion and *with*-
 10 applicative constructions, on the other hand, inherit respectively the dative
 11 and locative constructemes; following Cappelle’s (2006) terminology, they are
 12 ALLOSTRUCTIONS¹⁸ of these constructemes. The allostructions fully specify their
 13 syntactic form and add semantic and pragmatic information to the meaning
 14 inherited from the constructeme (not indicated in the diagram). Letter sub-
 15 scripts indicate the different linear ordering of arguments specified in each
 16 allostruction.

17 Returning to the central question of this paper, can these results allow us to
 18 affirm that alternation-based generalizations are stored in the mental grammar?
 19 The fact that speakers do perceive variants of an alternation as closely related
 20 in meaning is certainly a prerequisite for the actual storing of such cross-
 21 constructional generalizations, like the constructemes of Figure 4, but it is in
 22 no way a sufficient condition. Indeed, it might be argued that the generaliza-
 23 tions that subjects made in the context of the experiment do not necessarily
 24 correspond to categories that they actually store as part of their mental gram-
 25 mar, and that these generalizations are “ad hoc” categories (Barsalou 1983)
 26 that result from conscious reasoning about how the meanings of different
 27 sentences relate. As one of our reviewers points out, sorting tasks are highly
 28 reflective and open to strategic responding; these limitations should be duly
 29 acknowledged.

30 Such comments are in order, but it can still be argued that stored categories
 31 should be more readily available than those created “on the fly”, and thus
 32 expected to be used more often. Since alternation-based generalizations were
 33 relied on much more often in the sorting task than constructional ones, it is
 34 reasonable to hypothesize that they correspond to stored generalizations. The
 35 statistical bias towards alternation-based generalizations is all the more strik-
 36 ing considering that our dataset arguably favors a constructional sorting. First,
 37 a constructional sorting is the only solution which appeals to a similar de-
 38 gree of abstractness: since we asked subjects to make three groups, the three
 39

40 _____
 41 17. This term was suggested by Bert Cappelle, although it is not used in Cappelle (2006).
 42 18. Through analogy with the terms ‘allophone’ and ‘phoneme’.

1 constructional generalizations exemplified by the dataset more neatly and read-
 2 ily fits a three-way distinction, whereas an alternation-based sorting resorts to
 3 more abstract generalizations and thus involves different levels of generality.¹⁹
 4 Second, the verbs we used in the *to*-dative sentences (verbs of “ballistic
 5 motion”: *throw, chuck, toss, kick*) also favor a categorization of this sentence
 6 type with the other instances of the caused-motion construction. *To*-datives
 7 sentences with these verbs straddle the border between a caused change of pos-
 8 session reading and an interpretation in terms of physical caused motion of a
 9 theme to some person, which means that the pure caused-motion interpretation
 10 is more readily available with these verbs than with more abstract ones such as
 11 *tell* or *promise*. Despite this bridge that we placed on purpose, subjects were
 12 still reluctant to group the *to*-datives with the caused-motion sentences.

13 Furthermore, two recent priming experiments provide supporting evidence
 14 for the existence of alternation-based generalizations. In cognitive psychology,
 15 priming refers to the phenomenon whereby prior exposure to a stimuli A influ-
 16 ences (usually positively) the processing of a subsequent stimuli B or increases
 17 the likelihood of producing a particular response, and is usually taken as evi-
 18 dence that the two stimuli (or the stimuli and the response type) are related at
 19 some level in cognition. Priming effects have also been identified in language,
 20 notably with the phenomenon of syntactic priming (Bock 1986), whereby
 21 exposure to a particular syntactic structure increases the production of utter-
 22 ances with the same structure. Goldwater et al. (2011) investigate priming
 23 effects in the dative alternation with children. They find that exposure to dative
 24 primes increases subsequent production of both kinds of dative structures
 25 relative to a baseline (i.e. without priming). In line with previous findings,
 26 responses matching the structure of the primes are more frequent than mis-
 27 matching ones, but this effect depends on the semantic similarity between
 28 prime and target, and increases with the age of the child; as it turns out, 4-year
 29 olds are equally likely to produce either variant of the dative alternation after
 30 exposure to both types of primes when similarity is low. Goldwater et al. con-
 31 clude that “semantic representations (independent of sequence) are primed in
 32 structural priming tasks” (2011: 168). In a similar study, Vasilyeva and Water-
 33 fall (2011) investigate the priming of transitive vs. passive constructions with
 34 speakers of Russian. They find that, compared to the transitive prime condi-
 35 tion, exposure to passives not only increases the production of the same
 36 construction both by children and adult speakers, but also the production of a
 37 number of other constructions that, while formally different from the primes,
 38 fulfill the same discourse function, namely emphasizing the patient argument.
 39 The authors conclude that “what gets primed is [. . .] a particular way of look-

40
 41
 42 19. I am indebted to Bert Cappelle for making this point.

1 ing at and interpreting a given situation that is captured by the priming sen-
2 tence” (2011: 20): in other words, a construal, independent of the form it is
3 paired with.

4 The results of both studies remarkably dovetail with ours. They both show
5 that formally distinct but semantically similar constructions can prime each
6 other, which is evidence that they are indeed related at some level of represen-
7 tation in the mental grammar of speakers. These results suggest that the lin-
8 guistic knowledge of speakers might well contain a higher level of generaliza-
9 tions composed of highly abstract constructional meanings detached from any
10 particular form, which is tantamount to the notion of constructemes. In sum,
11 these findings strengthen our argument that the sorting tendencies displayed by
12 our subjects are revealing of readily available generalizations between con-
13 structions with a different form and a common meaning.

14 An obvious theoretical consequence of that proposal is that it weakens the
15 assumption that variants of an alternation should be considered as independent
16 constructions, since they may be explicitly subsumed by a cross-constructional
17 generalization. The long-standing reluctance of construction grammarians to
18 include syntactic alternations in the set of entities stored in linguistic knowl-
19 edge probably stems from the fact that they were the hallmark of earlier trans-
20 formational and derivational analyses, and therefore are seen with some suspi-
21 cion by proponents of a monostratal approach to grammar. But a constructional
22 approach does not necessarily exclude an account of semantic similarity and
23 syntactic correspondences between constructions, as “regularities that speakers
24 can extract from a number of analogical usage events” (Cappelle 2006: 3–4).
25 Our finding that speakers perceive variants of an alternation as highly similar
26 provides evidence of their awareness that these constructions are alternative
27 ways to encode a particular category of events. Including alternations explicitly
28 in the grammar serves to capture this knowledge, whether they are modelled as
29 lexical rules (as in Pinker’s 1989 account), as synonymy links (as in Goldberg
30 1995), or as allostructions, as in Cappelle (2006) and this article. Just like some
31 construction grammarians acknowledge (albeit controversially, cf. Goldberg
32 2006: chapter 8) the existence of purely formal generalizations, i.e. generaliza-
33 tions of common formal features independently of a shared meaning, like the
34 subject-auxiliary inversion construction (Fillmore 1999), we argue that a thor-
35 ough description of the constructicon should also include semantic generaliza-
36 tions that are (at least partly) independent of syntactic form.

37 In essence, the semantic relatedness of constructions could as well be cap-
38 tured by direct links between constructions, like Goldberg’s synonymy links.
39 However, one benefit of the allostructions model is that it does not require to
40 posit a new type of construction-to-construction relation, since it relies on the
41 more basic and widely accepted taxonomic relation. In addition, this model
42 is more flexible than synonymy links with regard to the description of how

1 the constructions are related: the constructemes capture the level at which
 2 constructions are semantically equivalent and the allostructions specify exactly
 3 how these constructions differ from each other. Under that view, the allostruc-
 4 tions model offers a constructional framework in which onomasiological varia-
 5 tion in syntax can be captured: the constructeme captures the onomasiological
 6 field that this portion of the constructicon is concerned with, while the allos-
 7 tructions capture the parameters of variation each variant is subject to, includ-
 8 ing descriptive meaning, construal, and discourse considerations.

9 That being said, the question arises as to why speakers would actually store
 10 such generalizations. After all, an ample body of research substantiates the
 11 claim that grammatical knowledge is better seen as organized around general-
 12 izations of limited scope rather than highly abstract schemas (cf. *inter alia*
 13 Boas 2003; Bybee and Eddington 2006; Zeschel 2009; Perek in press); since
 14 alternation-based generalizations correspond to the highest level of abstrac-
 15 tion, they seem at odds with this conception of grammar. We suggest that
 16 speakers plausibly form cross-constructional categories for the same reason as
 17 they form any category: because they are useful to them. For one thing, orga-
 18 nizing the construction into groups of semantically related constructions pro-
 19 vides straightforward pathways to productivity: they provide speakers with
 20 an indication as to what the possible forms of their language might be, in that
 21 the occurrence of some verb in a particular allostruction triggers the expecta-
 22 tion that this verb can also be used in the other allostructions of the con-
 23 structeme. Such a process seems to be at play in the course of language acqui-
 24 sition, for example with children erroneously using verbs in a variant of the
 25 dative alternation in which they are not allowed by the conventions of their
 26 language, e.g. *Don't say me that* (Gropen et al. 1989). Similar phenomena are
 27 also attested in adult speech, albeit to a much lesser extent (cf. Pinker 1989:
 28 153–160). What is more, as we briefly mentioned in Section 1, it is suggested
 29 in usage-based accounts of language acquisition that children recover from
 30 such errors through repeated exposure to the use of a verb in the conventional
 31 but less felicitous construction (according to such contextual considerations as
 32 information structure), a mechanism referred to as statistical preemption (cf.
 33 Goldberg 2006: 5.1). Interestingly, this mechanism presupposes that children
 34 notice the relatedness of formally distinct constructions (which they do, as
 35 shown by Goldwater et al. 2011), a fact which is readily captured by positing a
 36 level of constructemes. The influence of alternations can also be observed on
 37 the diachronic plane, as there are cases of language change involving variation
 38 in the scope of an alternation. For example, while the use of *provide* in the
 39 double-object construction is still disallowed in present-day British English,
 40 this is no longer the case in some post-colonial varieties, as it is reported to be
 41 gaining acceptance in American English and is perfectly acceptable in contem-
 42 porary Indian English (cf. Mukherjee and Hoffmann 2006). Such cases point

1 to the fact that speakers arguably recognize the equivalence of constructions in
2 synchrony and exploit this knowledge to increase the encoding capacities of
3 their language.

4 There are clearly many other cognitive aspects of alternations that are yet to
5 be explored. Notwithstanding, we hope to have shown that viewing alternations
6 as a higher level of grammatical generalizations is a thought-worthy (and yet
7 under-studied) avenue of research which deserves more attention in the con-
8 struction grammar literature.

9
10 *Received 18 July 2011*

Albert-Ludwigs Universität Freiburg &

11 *Accepted 31 March 2012*

Université Lille III

13 References

- 14
15 Aldenderfer, Mark & Roger Blashfield. 1984. *Cluster Analysis*. Newbury Park: Sage Press.
16 Anderson, Stephen. 1971. On the role of deep structure in semantic interpretation. *Foundations of*
17 *Language* 7(3), 387–396.
18 Barsalou, Lawrence. 1983. Ad hoc categories. *Memory and Cognition* 11(3), 211–227.
19 Bencini, Giulia & Adele Goldberg. 2000. The contribution of argument structure constructions to
20 sentence meaning. *Journal of Memory and Language* 43(4), 640–651.
21 Boas, Hans. 2003. *A Constructional Approach to Resultatives*. Stanford: CSLI Publications.
22 Boas, Hans. 2010. The syntax-lexicon continuum in construction grammar: A case study of En-
23 glish communication verbs. *Belgian Journal of Linguistics* 24, 54–82.
24 Boas, Hans. 2011. A frame-semantic approach to syntactic alternations: the case of build verbs. In
25 P. Guerrero Medina (ed.), *Morphosyntactic Alternations in English. Functional and Cognitive*
26 *Perspectives*, 207–234. London/Oakville: Equinox.
27 Bock, Kathryn. 1986. Syntactic persistence in language production. *Cognitive Psychology* 18(3),
28 355–387.
29 Bresnan, Joan, Anna Cueni, Tatiana Nikitina & R. Harald Baayen. 2007. Predicting the dative
30 alternation. In G. Boume, I. Kraemer & J. Zwarts (eds.), *Cognitive Foundations of Interpreta-*
31 *tion*, 69–94. Amsterdam: Royal Netherlands Academy of Science.
32 Bybee, Joan & David Eddington. 2006. A usage-based approach to Spanish verbs of ‘becoming’.
33 *Language* 82(2), 323–355.
34 Cappelle, Bert. 2006. Particle placement and the case for “allostructions”. In D. Schönefeld (ed.),
35 *Constructions Special Volume 1—Constructions all over: case studies and theoretical implica-*
36 *tions*. urn:nbn:de:0009-4-6839. Available at: (<http://www.constructions-online.de/>) [accessed
37 March 2012].
38 Collins, Peter. 1995. The indirect object construction in English: an informational approach. *Lin-*
39 *guistics* 33, 35–49.
40 Fillmore, Charles. 1985. Frames and the semantics of understanding. *Quaderni di Semantica* 6(2),
41 222–254.
42 Fillmore, Charles. 1999. Inversion and constructional inheritance. In G. Webelhuth, J. Koenig &
A. Kathol (eds.), *Lexical and Constructional Aspects of Linguistic Explanation*, 113–128. Stan-
ford: CSLI Publications.
Fillmore, Charles, Russell Lee-Goldman & Russell Rhodes. to appear. The FrameNet Con-
struction. In Hans Boas & Ivan Sag (eds.), *Sign-based Construction Grammar*. Stanford: CSLI
Publications.

- 1 García Velasco, Daniel. 2011. The causative/inchoative alternation in Functional Discourse
2 Grammar. In P. Guerrero Medina (ed.), *Morphosyntactic Alternations in English. Functional*
3 *and Cognitive Perspectives*, 115–136. London/Oakville: Equinox.
- 4 Goldberg, Adele. 1995. *Constructions: A Construction Grammar Approach to Argument Structure*.
5 Chicago: University of Chicago Press.
- 6 Goldberg, Adele. 2002. Surface generalizations: An alternative to alternations. *Cognitive Lin-*
7 *guistics* 13(4), 327–356.
- 8 Goldberg, Adele. 2006. *Constructions at Work: The Nature of Generalization in Language*.
9 Oxford: Oxford University Press.
- 10 Goldberg, Adele. 2011. Corpus evidence of the viability of statistical preemption. *Cognitive Lin-*
11 *guistics* 22(1), 131–153.
- 12 Goldwater, Micah, Marc Tomlinson, Catharine Echols & Bradley Love. 2011. Structural priming
13 as structure-mapping: Children use analogies from previous utterances to guide sentence pro-
14 duction. *Cognitive Science* 35, 156–170.
- 15 Gries, Stefan. 2003. *Multifactorial Analysis in Corpus Linguistics: A Study of Particle Placement*.
16 London & New York: Continuum Press.
- 17 Gries, Stefan & Stefanie Wulff. 2005. Do foreign language learners also have constructions?
18 Evidence from priming, sorting, and corpora. *Annual Review of Cognitive Linguistics* 3, 182–
19 200.
- 20 Gropen, Jess, Steven Pinker, Michelle Hollander, Richard Goldberg & Ronald Wilson. 1989. The
21 learnability and acquisition of the dative alternation in English. *Language* 65(2), 203–257.
- 22 Guerrero Medina, Pilar (ed). 2011. *Morphosyntactic Alternations in English. Functional and Cog-*
23 *nitive Perspectives*. London/Oakville: Equinox.
- 24 Healy, Alice & George Miller. 1970. The verb as the main determinant of sentence meaning. *Psy-*
25 *chonomic Science* 20, 372.
- 26 Iwata, Seizi. 2005. The role of verb meaning in locative alternations. In M. Fried & H. Boas (eds.),
27 *Grammatical Constructions: Back to the Roots*, 101–118. Amsterdam/Philadelphia: Benjamins.
- 28 Jackendoff, Ray. 1975. Morphological and semantic regularities in the lexicon. *Language* 51(3),
29 639–671.
- 30 Jeffries, Lesley & Penny Willis. 1984. A return to the spray paint issue. *Journal of Pragmatics* 8,
31 715–729.
- 32 Kay, Paul & Charles Fillmore. 1999. Grammatical constructions and linguistic generalizations:
33 The What's X Doing Y? construction. *Language* 75(1), 1–33.
- 34 Langacker, Ronald. 2000. A dynamic usage-based model. In M. Barlow & S. Kemmer (eds.),
35 *Usage-Based Models of Language*, 1–63. Stanford: CSLI Publications.
- 36 Larson, Richard. 1988. On the double object construction. *Linguistic Inquiry* 19(3), 335–391.
- 37 Lassaline, Mary & Gregory Murphy. 1996. Induction and category coherence. *Psychonomic Bul-*
38 *letin & Review* 3(1), 95–99.
- 39 Levin, Beth. 1993. *English Verb Classes and Alternations: A Preliminary Investigation*. University
40 of Chicago Press.
- 41 Mukherjee, Joybrato & Sebastian Hoffmann. 2006. Describing verb-complementational profiles
42 of New Englishes: A pilot study of Indian English. *English World-Wide* 27(2), 147–173.
- Nemoto, Noriko. 2005. Verbal polysemy and frame semantics in construction grammar: some
observations about the locative alternation. In M. Fried and H. Boas (eds.), *Grammatical Con-*
structions: Back to the Roots, 119–138. Amsterdam/Philadelphia: Benjamins.
- Perek, Florent. in press. Rethinking constructional polysemy: the case of the English conative
construction. In D. Glynn & J. Robinson (eds.), *Polysemy and Synonymy. Corpus Methods and*
Applications in Cognitive Linguistics. Amsterdam: Benjamins.
- Pinker, Steven. 1989. *Learnability and Cognition: The Acquisition of Argument Structure*. Cam-
bridge: MIT Press/Bradford Books.

1 Ruiz de Mendoza Ibáñez, Francisco & Ricardo Mairal Usón. 2011. Constraints on syntactic alter-
2 nation: Lexical-constructional subsumption in the lexical-constructional model. In P. Guerrero
3 Medina (ed.), *Morphosyntactic Alternations in English. Functional and Cognitive Perspectives*,
4 62–82. London/Oakville: Equinox.
5 Vasilyeva, Marina & Heidi Waterfall. 2011. Beyond syntactic priming: Evidence for activation of
6 alternative syntactic structures. *Journal of Child Language* 39(2), 1–26.
7 Zeschel, Arne. 2009. What’s (in) a construction? In V. Evans & S. Pourcel (eds.), *New Directions*
8 *in Cognitive Linguistics*, 185–200. Amsterdam: Benjamins.
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42