John Benjamins Publishing Company

Sense-based and lexeme-based alternation biases in the Dutch dative alternation

Sarah Bernolet and Timothy Colleman
Ghent University

In semantic studies of argument structure alternations as well as in psycholinguistic studies on syntactic priming, lexical alternation biases are typically measured at the level of the verb lexeme. This study explores the hypothesis that the proper locus of subcategorization probabilities is the verb *sense*. It investigates the effects of lexical polysemy on the subcategorization probabilities of Dutch dative alternating verbs as reflected in frequency data from natural language corpora and from a priming experiment. A sense-based distinctive collexeme analysis on the corpus data indicates that distinct senses of the same verb may indeed display different alternation biases. The response patterns in our priming experiment suggest that language users keep track of verb subcategorization preferences at different levels of schematization.

1. Introduction[1]

Psycholinguistic research has shown convincingly that language users have implicit knowledge of verb subcategorization frequencies (verb biases) and that this knowledge influences their behaviour in the production and processing of language. For instance, in recent research on syntactic priming, priming effects have been shown to be sensitive to the alternation biases of both prime verbs and target verbs – i.e., to the lexical preferences of the test verbs for one of the two (or more) alternating constructions under investigation (see Gries, 2005; Jaeger and Snider, 2007; Bernolet and Hartsuiker, 2010). Similarly, the subcategorizing preferences of individual verbs have been shown to be relevant to the processing of sentences with temporary syntactic ambiguities, the ability to reproduce

---

sentences correctly, variation in phonetic production, etc. (see, e.g., Trueswell and Kim, 1998; Lombardi and Potter, 1992; Wilson and Garnsey, 2008; Gahl and Garnsey, 2004). In sum, there is an extensive – and growing – body of evidence for the idea that speakers and hearers have access to probabilistic knowledge on verb subcategorization frequencies.

In linguistic studies of argument structure alternations, the concept of lexical alternation bias plays a crucial role, too. Hypotheses about the subtle semantic contrasts between functionally equivalent constructions often refer to observations about the behaviour of individual verbs in the alternation. For a good example from the literature on one of the most well-studied grammatical alternation phenomena, the English dative alternation, it has been observed that verbs of refusal such as *refuse*, *deny*, and *spare* consistently prefer the double object construction over the so-called prepositional dative construction (i.e., the *to*-dative). Goldberg (1992:62), *inter alia*, reports the acceptability contrasts in (1) and (2) below, citing these as evidence for her general semantic hypothesis that the *to*-dative basically denotes 'caused motion' rather than 'caused reception'.

(1) a.   She refused Joe a raise.
     b.   *She refused a raise to Joe.

(2) a.   His mother denied Billy a cake.
     b.   *His mother denied a cake to Billy.

More recent corpus-based research has shown that such observations are better rephrased as statistical generalizations: it is not that *refuse* and *deny* are actually *impossible* in the *to*-dative construction, for instance, it is just that they are attested (much) more frequently with double object than with prepositional dative syntax in real language (see Stefanowitsch, 2006; Goldberg, 2011; specifically on *refuse* and *deny* also see Colleman and De Clerck, 2009:24). Conversely, there are verbs which are (strongly) biased towards the *to*-dative: good examples identified by Gries and Stefanowitsch (2004:106–107) on the basis of their distinctive collexeme analysis method include *bring*, *take*, and *pass*. Distinctive collexeme analysis (DCA) is a quantitative technique aimed at identifying the lexical items that are significantly biased towards one of two (or more) functionally similar constructions in a given corpus through the statistical evaluation of the observed frequencies of the lexical items in question in each of the alternating constructions in relation to the overall frequencies of the alternating constructions in the corpus. The output are two (or more) ordered lists of so-called *distinctive collexemes*, i.e. of those lexical items which significantly prefer one of the investigated constructions over the other(s). The method has been applied to various grammatical alternations from several languages in recent years, as the lists of strongly

biased collexemes resulting from the quantitative test can potentially provide a good insight into the semantic differences between the constructions under investigation. Existing case studies along these lines include Wulff (2006) on the *Go*-V vs. *Go-and*-V constructions, Gilquin (2006) on causative constructions in English, Levshina et al. (2010) on similar constructions in Dutch, Noël and Colleman (2010) on accusative-and-infinitive and nominative-and-infinitive constructions in English and Dutch, Hilpert (2008) on future constructions in various Germanic languages, Lauwers (2010) on near-synonymous complex prepositions in French, Strik Lievers (2011) on adjectives with infinitival vs. finite clause complements in Italian, and Colleman (2009a) on the dative alternation in Dutch. The latter of these studies will be discussed in some detail below.

However, the large majority of such studies do not address issues of *lexical polysemy*: the output of the distinctive collexeme analysis is typically two (or more) ordered lists of verbs, or nouns, or adjectives etc., which do not distinguish between the different *senses* of the lexical items in question. Similarly, in psycholinguistic studies, alternation biases are typically measured at the level of the verbal lexeme, abstracting away from issues of verbal polysemy. While this rather coarse-grained approach has of course produced interesting results in the past (see the references at the onset of this paper), it is somewhat at odds with the intuitively appealing hypothesis that the proper locus of subcategorization probabilities may well be the *verb sense* rather than the verbal lexeme. Roland and Jurafsky (2002: 335–336) posit the *Lemma Argument Probability hypothesis*: each lemma (i.e., each verb sense, their terminology following that of Levelt, 1989) contains a vector of probabilistic expectations for its possible argument frames, and the vectors of different senses of one and the same verb may differ in important respects; a similar proposal is made by Hare, McRae, and Elman (2003, 2004). Gries & Stefanowitsch (2004: 125, footnote 5) themselves note, in relation to the behaviour of the polysemous phrasal verb *have on* ('wear' as well as 'conduct') with regard to particle placement, that "in some cases it might be more precise and rewarding to not just look at the distinctive collexemes of verbs, but of verb *senses*, i.e. verb-sense specific patterns", pointing to work by Roland and Jurafsky and by Hare and colleagues, too. To date, the only two case studies we know of which have implemented this verb-sense specific approach to DCA are Wiechmann (2008) and Gilquin (2010: Ch. 8), both of which will be briefly discussed in subsection 3.2 below.

The present paper explores this issue of sense-based lexical bias in relation to the Dutch dative alternation, i.e. the variation between the double object (DO) construction in (3a) and the prepositional dative (PD) construction with *aan* in (3b). These constructions are discussed in somewhat more detail in Section 2 below, which also includes references to existing investigations of their syntax and semantics.

(3) a. *De man heeft zijn broer   een boek   gegeven / verkocht/*
         the man has   his brother a   book given   sold
         beloofd /   aangeboden.
         promised offered
         'The man has given/sold/promised/offered his brother a book'
     b. *De man heeft een boek aan zijn broer   gegeven/*
         the man has   a   book to   his brother given
         /verkocht /beloofd/ aangeboden.
         sold   promised offered
         'The man has given/sold/offered/promised a book to his brother'

After thus setting the stage, we will turn to an investigation of polysemy effects in the dative alternation. Section 3 will have a closer look at the double object and *aan*-dative frequencies of 15 selected polysemous ditransitive verbs included in the database of Colleman (2009a). We will label these occurrences for verb sense, re-enter the sense-specific frequencies into a DCA, and compare the resulting sense-specific biases to the overall alternation biases of the 15 verbs in question. The findings of this comparison will serve to fine-tune earlier semantic generalizations about the kinds of verbs preferring the double object construction over the *aan*-dative or vice versa. After this, Section 4 takes a somewhat different perspective: it reports on an experimental study on structural priming, focussing on the effects on priming strength of lexeme-based and sense-based lexical biases. The findings suggest that it is best to include *both* kinds of information in experimental designs. Section 5 is the conclusion.

2.   The dative alternation in Dutch

As is evident from Example (3a) above, the Dutch double object construction closely resembles the equivalent English construction formally: it is a three-argument construction with a subject and two bare NP objects which, in the prototypical case, encode the agent, recipient, and theme participant of a 'possessional transfer' event, respectively. Semantically, there is a large degree of overlap, too. Just like its English equivalent, the Dutch construction accommodates verbs of giving as well as verbs from a number of other, semantically related verb classes – verbs of future transfer, verbs of permission, verbs of teaching, telling, and showing, verbs of bringing and sending, etc. – so that it can be used to denote a variety of 'caused reception' scenarios (cf. the seminal analysis of the English ditransitive as a polysemous category built around a prototypical 'X causes Y to receive Z' sense in Goldberg, 1995, 2002, 2006). Interesting differences with English include the presence in Dutch of two sets of complex 'dispossession' verbs (with the prefix

ont- or the particle *af*, e.g. *ontnemen* and *afnemen*, both of which can be glossed 'take away') which can enter into the double object construction and the virtual absence in the present-day (Netherlandic) standard language of double object uses with verbs of creation and obtaining. Further details about the syntax and semantics of the Dutch DO construction are provided in studies such as Van Belle and Van Langendonck (1996), Janssen (1997), Geeraerts (1998), and Colleman (2009b), the latter two of which take an explicitly construction-based perspective.

In the construction in (3b) above, the recipient is marked by the preposition *aan*, which is cognate with English *on* and German *an*, but which is in this context of course relevantly similar to English *to*.[2] In fact, there are *several* three-argument constructions with prepositional objects in Dutch which display a certain degree of semantic overlap with the DO construction: double object uses with verbs of creation and obtaining, to the extent that these are still possible in the present-day language, alternate with a prepositional construction with *voor* 'for' rather than *aan*, double object uses with certain dispossession verbs alternate with a construction with the source preposition *van* 'from' rather than *aan*, etc. – we refer to Van Belle and Van Langendonck (1996) and Colleman and De Clerck (2009) for further details. This being said, the construction with *aan* is undeniably the default prepositional alternative for the Dutch double object construction, on a par with the *to*-dative in English: unlike the other prepositional constructions, it can denote largely the same array of '(projected) caused reception' scenes as the DO construction – see Colleman (2010) for a detailed corpus-based study of the the *aan*-dative's semantic range. Hence, the label "dative alternation" in Dutch refers first and foremost to the variation between the DO construction and the *aan*-dative; in what follows, wherever we use the term prepositional dative (PD) construction, we refer to this construction with *aan*, specifically.

Given the large degree of formal and semantic similarity between the double object constructions of English and Dutch *and* between the *to*-dative and the *aan*-dative, it should not come as a surprise that existing hypotheses about subtle differences in construal between the constructions involved in the Dutch dative alternation revolve around very much the same set of semantic notions often invoked in the linguistic literature about the English alternation: the DO construction and the prepositional dative differ in the degree of emphasis put on the affectedness and/or involvement of the recipient participant (the DO construction according a more central position to this participant than the *aan*-dative), the PD construction highlights the spatial aspects of the denoted 'transfer' scene whereas

---

2. See Colleman and De Clerck (2009), however, for discussion of a number of (minor) semantic differences between the English *to*-dative and the Dutch *aan*-dative that can be traced back to the different basic spatial semantics of *to* vs. *aan*.

the DO construction highlights the possessional aspects, etc. (see, e.g., Schermer-Vermeer, 1991, 2001; Janssen, 1997; Van Belle and Van Langendonck, 1996). Empirical investigations into the semantic relation between the two constructions are scarce, however: the majority of existing studies rely on semantic judgments about constructed minimal sentence pairs and/or introspection-based observations about the constructional preferences of selected (subclasses of) 'transfer' verbs. In contrast to such studies, Colleman (2009a) builds on the results from a distinctive collexeme analysis of the DO and PD frequencies of 252 potentially alternating ditransitive verbs in a 9 million word sample from the newspaper component of the CONDIV corpus of present-day written Dutch (Grondelaers et al., 2000). 58 verbs were found to be significantly biased towards the *aan*-dative at the 0.05 level of statistical confidence, and 73 verbs showed a likewise significant preference for the double object construction. The lists of the 30 most highly distinctive collexemes for each of the two constructions resulting from the test provided the basis for a number of semantic generalizations, some of which will be revisited below.

## 3.   Polysemy effects: A sense-based distinctive collexeme analysis

3.1   Word-sense variation

In a previous joint investigation, Colleman and Bernolet (2012), we compared the findings from the above-mentioned corpus-based investigation to the findings from a series of picture description experiments conducted in the framework of an experimental study on syntactic priming (which was part of Bernolet, 2008).[3] We noticed a striking contrast in the overall proportions of DO and PD occurrences. In the natural language data from CONDIV, the DO construction was found to occur more than twice as frequently as the *aan*-dative, viz. 11,116 double object instances vs. 4949 *aan*-instances, which amounts to 69.2 and 30.8% of relevant occurrences, respectively. The participants in the picture description experiments, however, produced DO datives in slightly over one-fifth of the total number of relevant responses only, viz. 237 (= 21.8%) DOs versus 851 (= 78.2%) PDs (see Colleman and Bernolet, 2012 for further details on both datasets). One of the factors contributing to this noticeable contrast identified in the 2012 article was *word-sense variation*. The pictures used in the experiments all depicted prototypical 'transfer' scenes involving a concrete object being passed from one human participant to another: the participants were instructed to use the verb printed

---

3.   *Syntactic* or *structural priming* refers to the tendency of speakers – first demonstrated in Estival (1985) and Bock (1986) – to repeat syntactic structures across otherwise unrelated utterances, i.e. to re-use structures from the (immediately) preceding discourse.

underneath the picture in their description of the scene; see Figure 1 for an example involving the verb *geven* 'give'. Of course, many of the verbs participating in the dative alternation, including *geven*, are polysemous and can denote all kinds of other scenes besides material transfers of possession, too. Whereas, by definition, the pictures used in the experiment trigger the basic 'transfer of possession' sense, the corpus frequencies reported in Colleman (2009a) generalize over *all* the senses of the verbs included in the investigation. In Colleman and Bernolet (2012), we briefly discussed three cases of verbs where such polysemy effects were at least partly responsible for the less-than-complete agreement between the results from the corpus investigation and those from the experimental study.
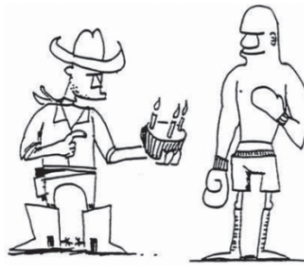
GEVEN

Figure 1. Example of a target picture for *geven* 'give'. Intended result: *De cowboy geeft de bokser een/de taart* 'The cowboy gives the boxer a/the cake' or *De cowboy geeft een/de taart aan de bokser* 'The cowboy gives a/the cake to the boxer'

The present investigation wants to explore this issue of word sense variation in the dative alternation in somewhat more detail. To this end, we selected 15 polysemous ditransitive verbs included in the database compiled for Colleman (2009a). The selected verbs had to meet a double criterion:

– The dictionary description in the most recent edition (2006) of the *Van Dale Groot Woordenboek der Nederlandse Taal* (henceforth: GVD) distinguishes between at least two different senses;[4]
– These senses occupy different positions along a "concrete-to-figurative" gradient: there is a fairly prototypical 'transfer of possession/control' sense – a sense that can be depicted by pictures of the kind illustrated in Figure 1 – next to one or several more figurative or metaphorical senses.

---

4. There is a single exception: for *ontfutselen*, the dictionary mentions the two senses distinguished in the analysis (viz. '(secretly) take from' and 'fish out of') alright, but groups them under the same sense label.

In case of several figurative senses, only one of these was selected for the investigation. The 15 test verbs are listed in Table 1 below, together with glosses that give a first approximation of the selected senses. Some of these will be discussed in far more detail in subsection 3.3.

Table 1. The 15 ditransitive verbs selected for the investigation and their selected senses

	Sense 1 ("concrete")	Sense 2 ("figurative")
aanreiken	'hand (on), reach'	'suggest'
bezorgen	'deliver, bring'	'cause (with a DO referring to an effect caused in the IO referent)'
brengen	'bring'	'perform (of salutes, songs, tributes, etc.), pay (a visit)'
doorgeven	'pass (on), hand (on)'	'pass on, let know about (of news, information etc.)'
geven	'give'	'direct at (with a deverbal noun as the DO: kisses, blows, kicks, etc.)'
lenen	'lend'	'lend (one's name, one's cooperation, etc.)'
leveren	'supply, deliver (of goods, as part of a transaction)'	'furnish, bring forward, provide (of evidence, information, etc.)'
meegeven	'give with s.o.'	'tell (something construed as a lesson)'
ontfutselen	'(secretly) take from'	'fish out of (of secrets, information, etc.)'
presenteren	'offer (of food, drink, etc.)'	'show, describe (to an audience)'
schenken	'give (as a present)'	'focus on, devote to (of one's attention, one's energy, etc)'
toevertrouwen	'entrust with (of people or valuable goods)'	'confide in, pass on to (of important information)'
verkopen	'sell'	'direct at (with a deverbal noun as the DO: blows, kicks, head butts, etc.)'
voorhouden	'hold out to, show'	'confront with, remonstrate with'
voorstellen	'introduce'	'propose, suggest'

3.2   A sense-based distinctive collexeme analysis

We hand-coded all DO and PD instances of the 15 test verbs included in Colleman's (2009a) database for verb sense and re-entered these sense-specific observed frequencies in the DCA. Care was taken to select verbs with sufficiently distinct senses, which typically select very different kinds of direct object NPs: in case of

the "concrete" senses in the middle column of Table 1, the direct object slot is typically filled by an NP referring to concrete objects or, occasionally, people, whereas the "figurative" senses in the right-hand column select a variety of more abstract direct object referents (effects, actions, attributes, ideas, propositions, etc.). This greatly facilitated the semantic coding process; still, several verbs raised issues that had to be solved on an item-by-item basis, often to do with the demarcation between the selected figurative sense and *other* figurative or metaphorical senses. The added DO and PD frequencies of both senses hardly ever add up to the lexeme-based frequencies listed in Colleman (2009a): especially in the case of highly polysemous verbs such as *geven* 'give' or *bezorgen* 'deliver, provide, cause', many instances from CONDIV represent neither of the two senses selected for the investigation (also see below). The results are summarized in Table 2, which lists the lexeme-based as well as the sense-based collostruction strengths; the raw frequencies are mentioned in brackets (observed DO frequency:observed PD frequency). Negative values indicate a preference for the DO construction, positive values indicate a bias towards the PD construction. The measure of collostruction strength used is the log-transformed Fisher exact p-value (cf. Gries, Hampe, and Schönefeld, 2005) and the DCA was done with version 3.0 of the R-script for collostructional analysis developed by Gries (2004). For clarity's sake, it should be added that, for the lexeme-based as well as for the sense-specific DCA's, we used the overall token frequencies of 11,116 double object instances vs. 4,949 *aan*-instances from Colleman's (2009a) database – rather than simply adding up the attested DO and PD frequencies for this random selection of 15 verbs (in the lexeme-based analysis) or 30 verb senses (in the sense-based analysis). This makes sense, as these added frequencies for the near-exhaustive set of 252 potentially alternating verbs included in Colleman (2009a) provide the best approximation of the *total* frequencies of both constructions in the corpus used, and the whole idea of DCA is that it computes which items stand out in displaying a constructional preference that is significantly different from what would be expected on the basis of the *overall* proportions of the constructions at stake. This means that, for the sense-specific DCA, we simply entered 30 items in the analysis (15 selected verbs x 2 selected senses) and computed to what extent the observed distributions of DO and PD frequencies in these 30 cases differed from the expected distributions given an overall 11,116:4,949 proportion. Of course, for a *complete* verb-sense specific DCA of the Dutch dative alternation, we would have to check for *all* potentially alternating verbs whether it may not be more fruitful to distinguish between several senses. Also, ditransitive verbs may well have more than just *two* different senses. As pointed out by an anonymous reviewer, the 15 selected verbs are quite different in this respect. For *aanreiken*, for instance, the added DO and PD frequencies of both senses included in the analysis ('hand on' and 'suggest')

equal the overall frequencies that went into the lexeme-based analysis. For *bezorgen*, to give just one example, this is completely different: the 'deliver, bring' and 'cause an effect' senses add up to 162 tokens, which is only 45% of the grand total of 360 *bezorgen* instances in the database. This means that, for *bezorgen*, a complete sense-specific DCA of the Dutch dative alternation would have to include more than two senses.[5] The aim of the present exercise is somewhat more modest than that, however: we only want to illustrate the added value to be gained from including sense-specific frequencies in quantitative investigations of grammatical alternations, on the basis of a limited sample of verbs and senses. As will be shown below, even this rather small sample of test verbs suffices to shed additional light on the semantics of the dative alternation.

Table 2. Overall and sense specific alternation biases (*: p < .05, **: p < .01)

Verb	Overall bias	Sense 1	Sense 2
aanreiken	−0.83677 (12:2)	−0.95977 (6:0)	−0.27464 (6:2)
bezorgen	−28.4126** (335:25)	0.563741 (47:25)	−14.4423** (90:0)
brengen	43.28592** (61:177)	−1.78702* (16:1)	70.88457** (13:171)
doorgeven	21.88827** (9:61)	1.469655* (1:4)	11.57765** (7:35)
geven	−5.56451** (2461:939)	2.198693** (191:115)	−12.7718** (157:13)
lenen	3.626959** (11:19)	−1.75992* (11:0)	8.701446** (0:17)
leveren	54.55818** (28:162)	19.34166** (20:70)	7.270694** (8:26)
meegeven	−2.44322** (71:15)	−0.20069 (9:4)	−1.38007* (27:5)
ontfutselen	−2.37941** (29:3)	−1.05553 (14:2)	−1.65011* (15:1)
presenteren	2.611731** (14:18)	−0.53409 (9:2)	4.221796** (5:15)
schenken	13.27942** (71:100)	12.97423** (23:57)	7.177966** (16:34)
toevertrouwen	2.534262** (23:24)	2.357015** (1:6)	−0.3097 (20:8)
verkopen	66.26254** (39:204)	79.29087** (12:186)	−2.14544** (23:2)
voorhouden	−14.1203** (88:0)	−0.6398 (4:0)	−10.5814** (66:0)
voorstellen	2.719117** (72:55)	11.14599** (3:28)	−1.02233 (67:21)

---

5. To give an example, another sense of *bezorgen* frequently attested in the newspaper data is the one illustrated in (i) below. In reports of sports matches, but also of elections and political debates, *bezorgen* is often combined with direct objects such as *de zege/de overwinning* 'the victory', *een voorsprong* 'a lead', *de meerderheid* 'the majority', etc., meaning 'win, be the agent or cause of the indirect object referent getting something'. Such uses qualify neither as material 'bring, deliver' neither as the abstract 'cause an effect' sense selected for the investigation.

(i)   *Met   drie   goals   bezorgde   Gica Popescu   Roemenië   in   groep   8   in   zijn   eentje*
      with   3   goals   delivered   PN   Romania   in   group   8   in   his   one-DIM
      een   vlotte   0–3   zege   in   Macedonië.
      a   easy   0–3   victory   in   Macedonia
      'In group 8, Gica Popescu propelled Romania to an easy 0–3 victory away in Macedonia on his own, with three goals.'

In four out of fifteen cases, viz. with *brengen*, *geven*, *lenen*, and *verkopen*, one of the senses selected for the investigation displays a significant bias which is qualitatively different from the overall bias of the verbal lexeme, i.e. has the reverse orientation. In seven more cases, viz. with *bezorgen*, *meegeven*, *ontfutselen*, *presenteren*, *toevertrouwen*, *voorhouden* and *voorstellen*, there is a somewhat less dramatic contrast, in that one of the two senses does not mirror the lexeme-based bias but is found by the test to behave more neutrally – though, in some of these cases, this may simply be due to a lack of power, as the overall frequencies of the "concrete" senses, especially, tend to be quite low. In sum, the figures reported in Table 2 corroborate the position that different senses of the same verb may display quite different subcategorization preferences.[6] The sense-based information in the two rightmost columns is completely lost in a lexeme-based collexeme analysis which lumps together all occurrences of the investigated verbs regardless of the lexical semantics involved. Subsection 3.3 will discuss a number of cases where these sense-specific biases can shed more light on the semantic relation between the DO and PD constructions. First, however, we will briefly look into the results of two earlier investigations which included sense-based data in a distinctive collexeme analysis.

Wiechmann (2008) addresses the question what kind of lexical subcategorization information is used for the resolution of temporary syntactic ambiguities of the garden path kind. On the basis of frequencies culled from a sample of the British National Corpus, he computed the lemma-based and sense-based alternation biases of 20 English verbs which can take either a nominal or a sentential complement. The sense-based biases – but, relevantly, not the lexeme-based biases[7] – were found to correlate significantly with the reading time latencies in a self-paced reading experiment reported in Hare, McRae, and Elman (2003). This furnishes proof for the hypothesis that the relevant subcategorization information is not to be situated at the level of the verbal lexeme, but at a more fine-grained sense-specific level of lexical organization. Wiechmann does not, however, address issues of constructional semantics: the results of the sense-based collexeme analysis are not used to shed more light on the semantic relation between the constructions

---

6.   In fact, an interesting question is to what extent these different subcategorization probabilities contribute to the perception of distinct "senses". We will not dwell on such matters here, however.

7.   Wiechmann (2008) labels the overall biases as *form-based* rather than sense-based. This is a somewhat unfortunate label, in our view, as it suggests that a distinction was made between the different *word forms* of a single verb. Gilquin (2010) uses the label *lemma-based*, but that is even more prone to cause confusion, as in psycholinguistics, *lemma* is often used as a synonym for *verb sense*. To avoid such confusion, we will refer to the overall biases which lump together all the distinct senses and all the distinct word forms of a single verb as *lexeme-based* or *verb-based*.

involved. This is different in Gilquin (2010: Ch. 8), which includes sense-based frequencies in a multiple distinctive collexeme analysis of ten different periphrastic causative constructions in English with the specific aim of getting a better view on what distinguishes these constructions semantically. For instance, in a comparison of the [X *get* Y V_{PP}] and [X *have* Y V_{PP}] constructions, which are often mentioned in the same breath in the linguistic literature on periphrastic causatives, Gilquin shows that the 'deal with, sort out' sense of the verb *do* is the top collexeme of the *get* pattern (as in *I'll never get my bingo done*) whereas the 'clean, tidy, make attractive' sense of the same verb is much more distinctive for the *have* pattern (as in *I'm having my hair done tomorrow*). These lexical preferences – which would have gone completely unnoticed in a lexeme-based analysis – highlight the importance of the frame of effort/difficulty for the former pattern and the frame of professional service for the latter: the distinctive meanings of both patterns are paraphrased as 'to organise an activity in difficult circumstances or under a tight schedule' and 'to commission someone to do something', respectively (Gilquin, 2010: 220). In the same manner, we will discuss a number of cases in the next subsection where the sense-based alternation biases in Table 2 shed additional light on the semantic relation between the Dutch DO construction and the *aan*-dative.

3.3   Sense-based alternation bias and the dative alternation

The rationale behind DCA is that the lists of distinctive collexemes and their association strengths resulting from the quantitative analysis point towards subtle differences in meaning between the (functionally equivalent) constructions under investigation. In a usage-based approach to language which takes speakers' mental representations of the semantics associated with schematic syntactic patterns to be the result of generalizing over encountered instances, each of which involves specific lexical material filling the various slots of the construction (cf. Langacker, 2000; Goldberg, Casenhiser, and Sethuraman, 2004, *inter alia*), it is natural to assume that "the semantics of constructions can usually be read off from the words most strongly attracted to [them]" (Gries, 2006: 136). After all, schematic argument structure constructions such as the double object construction and the prepositional dative are considered to be composed of whole clusters of verb-specific sub-constructions (e.g. [NP *give* NP NP], [NP *hand* NP NP], [NP *sell* NP to NP], etc.), some of which are more central to the superordinate construction's semantics than others by dint of their high relative frequency. However, in such a bottom-up view of constructional semantics, there is nothing that precludes the existence – and relevance to the superordinate construction's semantics – of even lower subschemas, at the level of the verb sense. The results from our sense-based distinctive collexeme analysis corroborate that different senses of one and

the same verb may indeed display quite different degrees of association to the constructions involved in a grammatical alternation.

3.3.1   *The "light verb" uses of* geven *and* verkopen

Some of these observed contrasts can help to further pinpoint the semantic differences between the DO construction and the *aan*-dative. The first verb to be discussed in some detail is *geven* 'give', which displays an overall preference for the DO construction. In Colleman and Bernolet (2012), we already pointed out, on the basis of the frequencies in a 1.5 million word sample from CONDIV, that while the use of the *geven* verb to encode prototypical 'transfer of possession' scenes is typically the first one to come to mind, it is definitely not the most frequently attested use in corpora of natural language. The figures from the whole 9 million word newspaper corpus confirm this trend: the basic 'transfer' meaning accounts for 306 of the 3400 ditransitive *geven* instances in the database only (= 9%). A couple of such prototypical instances are given in (4) below.

> (4) a. *De president gaf zijn vrouw onlangs voor*
>   the president gave his wife   recently for
>   *Valentijnsdag   een hartvormige   gouden pin {waarbij*
>   Valentine's.day a   heart.shaped golden pin
>   *hij haar bezwoer nooit meer vreemd te gaan}.*   [Tel][8]
>   'Recently, the president gave his wife a heart-shaped gold pin for Valentine's Day {swearing never to cheat on her again}'
>   b. *{Nadat hij met pensioen was gegaan}, gaf   hij de banden*
>   gave he   the tapes
>   *aan een advocaat.*
>   to   a   lawyer
>   '{After his retirement}, he gave the tapes to a lawyer'

What is striking is that the alternation bias of this basic transfer of possession sense is qualitatively different from the lexeme-based bias: prototypical *geven* is shown in Table 2 to be significantly attracted to the *aan*-dative. This means that the overall DO bias must be due to the strong preferences for the DO construction of a number of extended senses. One of these is the 'direct at' sense in which the combination of *geven* with a deverbal noun such as *een kus* 'a kiss', *een schop* 'a kick', *een slag* 'a blow', etc. has approximately the same meaning as the base verb (e.g. NP *een kus geven* 'give NP a kiss' ~ NP *kussen* 'kiss NP'), see the instances in (5).

---

8.   All corpus instances are from the newspaper component of the CONDIV corpus, unless otherwise indicated. The labels in brackets refer to the exact newspaper: NRC = *NRC Handelsblad*, Tel = *De Telegraaf*, Lim = *De Limburger*, Sta = *De Standaard*, GvA = *Gazet van Antwerpen*, HBL = *Het Belang van Limburg*.

(5) a. *Toen   [de man] opstond   en   dreigend   op   hem   afkwam,*
          when   the man   up-stood   and threatening   up   him   off-came
          gaf   de   agent   hem   een   flinke   duw.   [GvA]
          gave   the   officer   him   a   good   push
          'When the man rose to his feet and threateningly came closer, the officer
          gave him a hefty shove'
     b. *Eind   jaren   zestig   gaf   VVD-senator   Baas   een   klap*
          end   years   60   gave   VVD-senator   PN   a   smack
          aan zijn collega   Adams   van   de   Boerenpartij.   [*Vk* 05/10/2002][9]
          to   his   colleague   PN   of   the   Farmer's.Party
          'In the late sixties, Senator Baas of the VVD gave a smack to his colleague
          Adams of the Farmer's Party'

There is some debate on the status of such "light verb" constructions as sub-
constructions of the schematic DO construction. Trousdale (2008) suggests that
English equivalents such as *to give s.o. a kiss* or *a beating* are better not analyzed
as instantiating the (regular) double object construction, but as representing a dif-
ferent construction dominated by the general "light verb" construction. Goldberg
(1995: 149) does analyse them as instantiations of the DO construction, moti-
vated by a metaphor which "involves understanding actions that are intentionally
directed at another person as being entities which are transferred to that person".
In any event, this particular cluster of *geven* uses displays a marked preference
for double object syntax: the collostruction strength listed for Sense 2 of *geven* in
Table 2 is −12,7718, making this the second strongest DO collexeme of all the inves-
tigated verb senses (second only to the 'cause an effect' sense of *bezorgen*, which
will be discussed below). As a further illustration of the considerable strength of
this attraction, it can be pointed out that in Colleman's (2009a) lexeme-based DCA,
a collostruction strength greater than 12 suffices to qualify among the *ten* most
strongly attracted DO collexemes out of 252 investigated alternating verbs. In other
words, the 'direct at' sense of *geven* is strongly associated with the DO construc-
tion: the *aan*-dative is not impossible, but it will only be reverted to if this strong
semantic preference for the DO construction is overruled by other considerations.
In (5b) above, for instance, the choice of PD syntax is probably triggered by the
considerable difference in length between the theme and recipient object NPs (as
well as by the fact that this is an excerpt from a whole article on sporadic acts of

---

9. This instance was not taken from the CONDIV corpus, but from the web archive of another
Dutch newspaper, *De Volkskrant* (last accessed 19/01/2012).

violence in the Dutch parliament, so that *een klap* 'a blow, a smack' may be considered to be highly topical).[10]

The preference of these light verb patterns for the DO construction has been observed before, albeit on the basis of introspection, and it has been attributed to the lack of a spatial transfer (i.e. nothing is actually moving towards the recipient) and/or to the strong degree of affectedness of the recipient participant in the denoted events. A semantic account of the Dutch dative alternation which reduces the alternation to an opposition of a 'caused reception' construction on the one hand and a 'spatial transfer' construction on the other is too simple: as will be shown below, there are clusters of uses which definitely do not involve 'caused motion' or 'spatial transfer', and which prefer the *aan*-dative nonetheless. While this does not rule out the possibility that the presence or absence of a path traversed by the direct object referent is a factor in the dative alternation, it does show that [+/− spatial transfer] cannot be the only semantic determinant. Affectedness is definitely an important part of the story, too: it goes without saying that the events described in (5a) and (5b) have a strong effect on the receiving party and – as has been observed by several authors – there is a strong tendency to encode such heavily affected participants as NPs rather than PPs (e.g. Kirsner, Verhagen, and Willemsen, 1987; Janssen, 1997; Schermer-Vermeer, 1991; Van Belle and Van Langendonck, 1996; see Wierzbicka, 1986; Langacker, 1991, and many others, for similar observations on indirect object affectedness in the *English* DO construction). In addition, there is no reason to choose a construction which focuses on the effect on the theme or on the agent-theme relation (see the hypothesis from Colleman, 2009a on the semantics of the *aan*-dative discussed below), as the theme hardly even exists outside of the action.

Another 'transfer' verb that can be used in combination with deverbal nouns to encode an action directed at another person is *verkopen*, the basic meaning of which is 'sell'. Relevant examples of the DO construction and the *aan*-dative, respectively, are shown in (6).[11]

---

10. It should be stressed that while this section focuses on semantic determinants, we do not want to suggest that the dative alternation is driven by such subtle semantic contrasts alone. Other parameters which have been shown to play a role include the discourse-accessibility of theme and recipient, the length of the theme and recipient NPs, syntactic priming effects, etc. See Gries (2003) and Bresnan et al. (2007), among others, for multifactorial quantitative investigations of the (English) alternation.

11. The lexical possibilities are more limited than with *geven*: as a light verb, *verkopen* only combines with 'blow', 'kick', and 'shove' as the direct object. While *een kus verkopen* (to sell a kiss), for instance, is not impossible, the verb will typically be interpreted in its basic 'commercial transaction' sense there: to offer a kiss for sale. Needless to say, in the examples in (6), Xena and the Mapei cycling team are offering nothing for sale.

(6) a. *De slechte god delft het onderspit als Xena*
the evil   god digs the under-spade when PN
hem een keiharde trap verkoopt {na een zevenvoudige
him a   INT.hard kick sells
salto vanaf een vlaggenstok hoog aan   de muur.}   [NRC]
'The evil god tastes defeat as Xena administers him a powerful kick {after
a septuble somersault from a flag pole high up on the wall.}'

b. *{Amper één dag nadat Tom Steels in volle spurt uit zijn voethaak catapulteerde}*
verkocht de Mapei-ploeg een forse   dreun aan de
sold   the Mapei-team a   heavy blow to the
georganiseerde   tegenstand.   [GvA]
organised   opposition
'{Just a single day after Tom Steels slipped out of his pedals in full sprint},
the Mapei team dealt a heavy blow to the organised opposition'

In Colleman's (2009a) lexeme-based DCA, *verkopen* came out as the second stron-gest *aan*-collexeme overall, the top collexeme being *overlaten* 'leave, pass on' with a distinctiveness score of 69.07. This strong PD-preference of *verkopen* – which, as it happens, is paralleled by English *sell*, see Gries and Stefanowitsch (2004) – is an argument in favour of one of the semantic hypotheses developed in Colleman (2009a), viz. that the *aan*-dative and the DO construction differ in the amount of emphasis put on the (changing) agent-theme relation. In terms of Goldbergian construction grammar, the *aan*-dative contains two constructionally profiled arguments, viz. the agent and the theme, plus an additional non-profiled recipient argument: the construction highlights the agent and theme participants and their interrelation and backgrounds the involvement of the recipient participant. The double object construction, by contrast, gives pride of place to all three partici-pants and their interrelations, as it has three constructionally profiled arguments. Since *verkopen* lexically profiles the seller and the goods – cf. the traditional frame semantic analysis of verbs of buying and selling in Fillmore (1977) – it tallies well with the hypothesized constructional semantics of the *aan*-dative. We refer to Colleman (2009a) for further elaboration. What matters most in the present context, however, is that *verkopen*'s bias towards the *aan*-dative is even larger if the light verb uses – which, just like the equivalent patterns with *geven*, display a strong preference for the DO construction – are discounted: the basic commercial transaction sense of *verkopen* has a collostruction strength of 79.29, which makes it the strongest PD-collexeme overall.

3.3.2   Bezorgen *'cause an effect'*

In passing, Colleman (2009a: 609) also notes that the constructional preference of *verkopen* 'sell' in the dative alternation is shared by several other verbs associated with the commercial transaction frame, such as *leveren* 'furnish, deliver' (3rd most distinctive *aan*-collexeme in the lexeme-based DCA out of the 252 verbs entered in the test) and *betalen* 'pay' (12th most distinctive *aan*-collexeme). In this light, the syntactic behaviour of *bezorgen* 'deliver, provide, furnish' may be quite surprising on first sight: unlike semantically related verbs such as *leveren* etc., *bezorgen* displays a strong overall bias towards the DO construction (in fact, it is the 4th strongest DO-collexeme overall according to the lexeme-based analysis in Colleman, 2009a). Even if we take into account the fact that the events of providing denoted by ditransitive *bezorgen* do not necessarily take place in a commercial context, this finding is still surprising: other "general" verbs of providing such as *verstrekken*, *verschaffen* and *bieden* – all three of which can be glossed as 'provide', though *bieden* can also mean 'offer' – are found to significantly prefer the *aan*-dative (e.g. *verstrekken*) or to behave neutrally (e.g. *verschaffen* and *bieden*). The *bezorgen* facts cease to be surprising, however, if we inspect the sense-specific alternation biases in Table 2. The verb is frequently used with a direct object NP referring to an effect caused in the indirect object referent, see the examples in (7), where it is translated as *cause* or plain *give* in English, not as *deliver* or *provide*. Such uses account for 25% of all ditransitive *bezorgen* clauses in the database (90 out of 360). They instantiate another metaphorical extension of the double object construction briefly discussed in Goldberg (1995: 144), which is based on a metaphor that "involves understanding causing an effect in an entity as transferring the effect, construed as an object to that entity".

(7) a. {*In Scandinavische landen is het eten vaak gepekeld.*} *Recepten   uit*
              recipes   from
          die   landen   bezorgen   ons   alleen   maar   veel   dorst.   [Lim]
          those   countries   deliver   us   only   but   much   thirst
          '{In the Scandinavian countries, the food is often pickled.} Recipes from
          those countries give us nothing but thirst.'
      b. {*[Bommel] is in zeker twintig talen en dialecten vertaald, in 21 landen*
          gepubliceerd} *en   heeft   miljoenen   lezers   intens   genoegen*
                           and   has   millions   readers   intense   pleasure
          bezorgd.   [NRC]
          delivered
          '{*Bommel* [a profoundly Dutch comic strip, SB&TC] is translated in at least
          twenty different languages and dialects and published in 21 countries} and
          it has given millions of readers intense pleasure.'

    c.   {*Leerkrachten klagen graag over hun stresserend beroep. Maar ze vergeten soms*} *dat   zij   op hun   beurt stress bezorgen aan*
                      that   they on their turn stress deliver   to
            duizenden   jongeren.
            thousands   youngs

                                <http://www.klasse.be/archief/we-verstressen-elkaar/>,
                                                  last accessed 19/01/2012

    '{Teachers like to complain about their stressful profession. But sometimes they forget} that in their turn, they give stress to thousands of young people.'

As shown in (7c), this sense of *bezorgen* is not incompatible with the *aan*-dative. Such instances are rare, however: *bezorgen* 'cause' is strongly biased toward the double object construction; in fact, (7c) is an example retrieved from the Internet as the database did not include a single instance of this kind. In the hierarchical constructional network, [NP [*bezorgen* NP NP['effect']] is a salient and highly entrenched sub-construction of the DO construction, whereas the [NP [*bezorgen* NP['effect'] *aan* NP]] sub-construction of the *aan*-dative is hardly entrenched. This preference for the DO construction can be related to the same semantic considerations we discussed in relation to the "light verb" patterns with *geven* and *verkopen* above: the indirect object referents in (7) are heavily affected by the denoted event, and there is no change in the agent-theme relation. The basic 'provide, deliver' sense accounts for 20% of the ditransitive *bezorgen* instances (72 out of 360) and behaves much more neutrally, just like other verbs of providing: it displays a slight preference for the *aan*-dative, which is not statistically significant.

3.3.3   The "figurative" senses of brengen 'bring' and lenen 'lend'

There are two more verbs with a marked contrast between the alternation biases of the distinct senses selected for the investigation, viz. *brengen* 'bring' and *lenen* 'lend'. In contrast to what we have seen with *geven* 'give' and *verkopen* 'sell', it is the figurative senses of these verbs which are strongly biased towards the PD construction, whereas the concrete 'transfer' senses display a preference for the DO construction. These figurative senses are illustrated in (8) and (9) below.[12]

   (8) a. *[De vrijwilligers] brengen de   zieken een bezoekje*
           the   volunteers   bring   the ill   a   visit
           op de kamer   [GvA]
           in   the   room
           'The volunteers pay the sick a visit in their rooms'

---

12. Again, (9a) is a Web example as there was no such example to be found in the original database.

b. *De Congolese president Kabila brengt deze week een*
the Congolese president PN   brings this week a
bezoek aan de paus.   [Lim]
visit to the pope
'The Congolese president Kabila pays a visit to the pope this week'

(9) a. {*Puss In Boots, de temperamentvolle kat uit Shrek 2, krijgt zijn eigen film.*}
Antonio Banderas leende het personage zijn stem
PN   lent the character his voice
{*en zal dit naar alle waarschijnlijkheid in de spin-off weer gaan doen.*}
<http://www.filmtotaal.nl/artikel.php?id=4228>, last accessed 19/01/2012
'{Puss In Boots, the temperamental cat in *Shrek 2* will get his own film.}
Antonio Banderas lent the character his voice {and will most probably do
that again in the spin-off.}'

b. *Actrice Ming Na-Wen … leende haar stem aan Mulan,*
actress PN   lent her voice to Mulan
{*maar voor de liedjes werd een beroep gedaan op Len Salonga.*}   [HBL]
'The actress Ming Na-Wen lent her voice to Mulan, but Len Salonga was
engaged for the songs'

The preference of these senses for the *aan*-dative warns us against an all too sim-
plistic account of the dative alternation in terms of abstract vs. concrete 'transfer'
scenarios: it is sometimes suggested that the DO construction has specialized in
the encoding of all kinds of "abstract" events, whereas the *aan*-dative is the default
construction for the encoding of "regular" transfers of possession in which the
theme traverses a spatiotemporal path from the agent to the recipient (e.g. Kooij,
1975; Ebeling, 2006: 262). The relevant senses of *brengen* and *lenen* clearly denote
abstract events in which the theme is definitely *not* moving along a spatiotemporal
path; it is not even readily thought of as a separate participant in the event, just
as in the case of *een kus/duw/schop/etc. geven* 'give a kiss/shove/kick/…' (also see
Kirsner, Verhagen, and Willemsen, 1987 and Schermer-Vermeer, 1991). Why then
do these semi-idiomatic *brengen* and *lenen* patterns prefer the *aan*-dative, whereas
the *geven* and *verkopen* patterns discussed above prefer the DO construction? The
most likely explanation is that it has got something to do with affectedness or the
lack thereof: unlike the receiver of, say, a smack to the head, the receiver of a visit
is not particularly affected by the event. Note that whereas both instances in (8)
feature animate entities which are being paid a visit, the indirect object slot in
een bezoek brengen 'pay a visit' is often filled by NPs referring to a location, too,
which, by definition, cannot be construed as particularly affected (e.g. *Hij bracht
een bezoekje aan Amsterdam* 'He paid a visit to Amsterdam'). Similarly, the indi-
rect object in ditransitive *lenen* clauses with a direct object NP from the class *zijn
naam/stem/gezicht/medewerking* (i.e. 'lend one's name/voice/face/collaboration')

often refers to an inanimate entity, such as a project, a product or a business. An additional factor contributing to the *aan*-preference in the case of these *lenen* patterns may be the possessive determiner of the direct object NP (e.g. in (9b) ***Zij leende haar*** *stem* 'She lent her voice'): a plausible formal hypothesis falling out from Colleman's (2009a) account of the *aan*-dative as highlighting the agent-theme relation would be that the use of a possessive pronoun referring back to the subject NP in the determiner slot of the direct object NP triggers the choice for the *aan*-dative construction. We leave this as a matter for future research, however.

To sum up, the sample of 15 test verbs contains several cases in which the corpus data show the distinct senses of one and the same verb to display markedly different alternation biases. The inclusion of sense-based data in a DCA provides information that is lost, or at least obscured, in a lexeme-based investigation, thus offering a finer-grained view on the semantic differences between the constructions at stake. Another question, however, is whether speakers have access to such sense-specific alternation biases – and, if so, whether these are stored *alongside* the overall alternation biases at the lexeme level, or *instead* of them. This question is to be addressed through psycholinguistic experimentation. The next section presents the results of a first experiment on the influence of both kinds of lexical bias on the strength of syntactic priming.

4. Lexeme-based and sense-based alternation bias in syntactic priming

4.1 The experiment

We further investigated the influence of lexeme-based and sense-based lexical biases on syntactic choices in a syntactic priming experiment in which participants alternated between reacting to written picture descriptions and describing target pictures of dative actions. Like in other syntactic priming experiments (see Pickering and Ferreira, 2008 for a review), the picture descriptions served as sentence primes that were used to influence the participants' target descriptions.

Twenty-five undergraduate students (all native speakers of Dutch) from Ghent University participated in our experiment in exchange for course credits. The set with critical stimuli for the participants contained 45 pictures (3 different target pictures for each target verb) showing line drawings of dative actions with one of the 15 test verbs printed beneath. For each of these pictures, five prime sentences were constructed (one for each prime condition): two prime sentences using the DO construction, two primes using the PD construction with *aan* and a baseline prime sentence using an ordinary monotransitive construction. In the DO and PD priming conditions, the verb used in the prime sentence was either

identical to the verb that was printed on the corresponding target picture (same verb conditions) or different (different verb conditions). While the prime sentences always used the dative verb in its figurative meaning, the target pictures always depicted the concrete 'transfer' meaning of the verb. The response patterns in the baseline condition were used to assess the participants' general syntactic preference in unprimed conditions, as well as their verb-specific preferences for the individual target verbs. Apart from the critical pictures, non-critical pictures were selected as fillers. The fillers showed pictures of intransitive scenes (e.g., a cowboy weeping). Additionally, 88 pictures were selected for the participant's verification set. These pictures were used for a verification task that was used to mask the real purpose of the experiment.

The prime sentences were presented in five counterbalanced lists. In each of these lists the primes were presented equally often in the five different priming conditions (DO-prime same verb, DO-prime different verb, PD-prime same verb, PD-prime different verb and baseline) and across all participants every target picture was presented equally often in each of the five conditions. Each verb was used three times in each list. For an example, the five prime sentences used in combination with one of the target pictures for *toevertrouwen* (see Figure 2) are listed in (10).

(10) a. *De ballerina verkoopt de lerares een kopstoot.*   **DO-diff**
          the dancer   sells   the teacher a   head-butt
          'The dancer gives the teacher a butt of the head.'

      b. *De ballerina verkoopt een kopstoot aan de lerares.*   **PD-diff**
          the dancer   sells   a   head-butt to   the teacher.
          'The dancer gives a butt of the head to the teacher.'

      c. *De secretaresse vertrouwt de pater haar geheim toe.*   **DO-same**
          the secretary   trusts   the monk her secret   to.
          'The secretary entrusts the monk with her secret.'

      d. *De secretaresse vertrouwt haar geheim toe*   **PD-same**
          the secretary   trusts   her secret   to
          aan de pater.
          to   the monk
          'The secretary entrusts her secret to the monk.'

      e. *De lerares kietelt de pater.*   *baseline*
          the teacher tickles the monk.
          'The teacher tickles the monk.'

Across all conditions, the participants produced 239 DO responses (21.2%), 824 PD responses (73.2%) and 62 other responses (5.5%). For the purpose of the present paper, however, we will only analyze the data of the baseline condition and the

TOEVERTROUWEN

Figure 2. Example of a target picture for *toevertrouwen* 'entrust with'. Intended result: *De zuster vertrouwt de pater het kind toe or De zuster vertrouwt het kind toe aan de pater* 'The nun entrusts the child to (the care of) the friar'

priming conditions in which a different verb was used in prime and target descriptions (DO-prime different verb and PD-prime different verb). This is because, when the same verb is used in prime and target, the syntactic priming effects may not only be artificially boosted by the verb repetition (cf. Pickering and Branigan, 1998), it is also impossible to disentangle effects of prime and target verb bias. Table 3 presents the response frequencies and percentages of DO datives in the three critical conditions of our experiment.

Table 3. DO and PD responses in the crucial conditions of the priming experiment

	Baseline		DO prime		PD prime	
	DO:PD	% DO datives	DO:PD	% DO datives	DO:PD	% DO datives
aanreiken	2:12	14.3%	6:8	42.9%	2:13	13.3%
bezorgen	5:10	33.3%	6:9	40.0%	5:10	33.3%
brengen	4:10	28.6%	4:8	33.3%	3:8	27.3%
doorgeven	0:14	0.0%	0:14	0.0%	0:15	0.0%
geven	2:12	14.3%	4:11	26.7%	2:13	13.3%
lenen	1:13	7.1%	5:8	38.5%	1:14	6.7%
leveren	1:13	7.1%	1:14	6.7%	3:11	21.4%
meegeven	5:10	33.3%	4:11	26.7%	2:13	13.3%
ontfutselen	2:13	13.3%	5:10	33.3%	2:12	14.3%
presenteren	7:8	46.7%	2:13	13.3%	3:12	20.0%
schenken	4:8	33.3%	7:8	46.7%	7:8	46.7%
toevertrouwen	3:12	20.0%	2:13	13.3%	5:9	35.7%
verkopen	2:12	14.3%	2:12	14.3%	3:12	20.0%
voorhouden	7:4	63.6%	11:2	84.6%	7:4	63.6%
voorstellen	0:15	0.0%	0:15	0.0%	0:12	0.0%

The participants' responses were fit using a mixed logit model (see Jaeger, 2008 for discussion of the use of mixed logit models for categorical data analysis) that predicts the logit-transformed likelihood of a PD-response. We included random intercepts for participants and items (nested under target verb) in the models discussed below (other random effects or interactions did not significantly improve the log-likelihood of the models).

The first model we built investigated to which extent the response patterns in our experiment were influenced by the bias of the target verb. We used the lexeme-based and sense-based alternation biases computed on the basis of the corpus data for this. There is a slight alteration in comparison with the figures reported in Table 2 above, however, in that, following Wiechmann (2008), we used discounted log odds ratios rather than log-transformed Fisher Exact p-values as a measure of association strength – this was done because odds ratios approximate the results of more accurate measures fairly well while being less dependent on sample sizes (cf. Wiechmann, 2008: 454). As the lexeme-based bias and the sense-specific bias of Sense 1 (= the bias of the verb used in its "concrete" sense) of the target verbs were correlated (Pearson's $r = 0.48$), we did not just add both predictors to the model: rather, we regressed the sense-specific verb bias of each target verb against its verb-based bias.[13] The residuals of this regression were then added as a continuous predictor in addition to the sense-specific verb bias of the target verbs. So the fixed factors in our full target verb bias model were as in (11).

(11)   lmer (Response ~ Prime + Specific Target Verb Bias + Residuals Target Verb Bias + Prime : Specific Target Verb Bias + Prime : Residuals Target Verb Bias + Prime : Specific Target Verb Bias : Residuals Target Verb Bias)

Model comparisons using the likelihood ratio test showed, however, that the three-way interaction between Prime, Specific Target Verb Bias and Residuals Target Verb Bias did not significantly improve the fit of the model ($\chi^2(2) = 0.27$, $p > .1$).[14] The same was true for the interaction between Specific Target Bias and Residuals Target Bias ($\chi^2(1) = 0.77$, $p > .1$) and the interaction between Prime and Residuals Target Bias ($\chi^2(2) = 2.03$, $p > .1$). The interaction between Prime and Specific Target Bias, however, *did* significantly improve the fit of our model ($\chi^2(2) = 8.77$, $p < .05$), as did the Residuals of the Target Bias ($\chi^2(1) = 12.83$, $p < .001$).

---

13. All biases were centered to their means before they were used in the analyses. Residuals Target Bias = residuals (lm(scale(Specific Target Bias, scale = F)) ~ scale(General Target Bias, scale = F)).

14. For this model as well as the other models, we started from a full model and performed a stepwise backward elimination of non-significant predictors.

As a next step, we tested a model that investigated the effect of the sense-specific and/or general verb bias of the *prime* verbs on the response patterns, while controlling for effects of target verb bias. Again, we first regressed the specific verb bias of each prime verb (in this case, the bias of Sense 2, the "figurative" sense in Table 2 above) against its verb-based bias, because both biases were highly correlated (Pearson's r = 0.76). The model included the residuals of this regression and the specific verb bias of each prime verb. The fixed factors in our prime verb bias model thus were Prime (BASELINE, DO PRIME, PD PRIME), Specific Prime Verb Bias and Residuals Prime Verb Bias and the interactions between these factors. Specific Target Verb Bias, Residuals Target Verb Bias and the interaction between Prime and Specific Target Verb Bias were added in order to control for effects of target verb bias (see (12) for the fixed factors in the full model).

(12)   lmer (Response ~ Prime + Specific Prime Verb Bias + Residuals Prime Verb Bias + Specific Target Verb Bias + Residuals Target Verb Bias + Prime: Specific Prime Verb Bias + Prime: Residuals Prime Verb Bias + Prime: Specific Target Verb Bias + Prime: Specific Prime Verb Bias: Residuals Prime Verb Bias)

Model comparisons showed that Specific Prime Verb Bias and Residuals Prime Verb Bias as well as their interactions with other factors in the model did not at all influence the response patterns or the priming effects observed in our experiment (all p-values > .08). The simplest model for our data was a model that only included Prime, Specific Target Verb Bias, Residuals Target Verb Bias and an interaction between Prime and Specific Target Verb Bias.

Table 4. Summary of the fixed effects in the mixed logit model (N = 675; log-likelihood = -262.5)

| Predictor	Coefficient	SE	Wald Z	p
Intercept	2.44	(0.466)	5.25	< .001
Prime DO	−0.54	(0.298)	−1.82	< .07
Prime PD	−0.06	(0.297)	−0.19	> .1
Specific Target Bias	−0.86	(0.333)	−2.57	< .05
Residuals Target Bias	−0.93	(0.237)	−3.92	< .001
Interaction = *Prime DO & Specific Target Bias*	−0.42	(0.408)	−1.02	> .1
Interaction = *Prime PD & Specific Target Bias*	0.78	(0.406)	1.92	< .06

The intercept of our final model, which is summarized in Table 4, represents the log-odds for a PD-response in the baseline condition, for items at the centre of the Specific Target Verb Bias variable. The significant positive intercept (2.44) indicates that there was an overall bias towards PD-datives: for a verb at the centre of the target verb bias variable the chances for a PD-response in the baseline were

significantly higher than 50%. The mean proportion of PDs in the baseline was 78%. This percentage decreased to 72% in the DO-condition; in the PD condition the percentage amounted to 78.1%. The effect of DO-priming (6.0%) was marginally significant; the effect of PD-priming was very small (0.1%) and not significant (see Table 4). The responses in the baseline condition were influenced by the specific bias of the target verb and by the residuals of the regression between the lexeme-based and the specific verb bias: the odds for a PD-dative in the baseline condition decreased significantly as the bias towards a DO-dative increased (see Figure 3). This means that the response patterns for each individual verb mirrored the verb biases measured in the corpus data. This effect of target verb bias in the baseline condition left more room for PD-priming for DO-biased verbs, resulting in a marginally significant interaction between Prime and Specific Target Verb Bias. Figure 4, which plots the effects of PD-priming against the specific verb bias of the target verbs, clearly shows negative priming effects on the left hand side of the graph, which increase in strength and become positive effects when the bias towards DO-datives increases.[15]
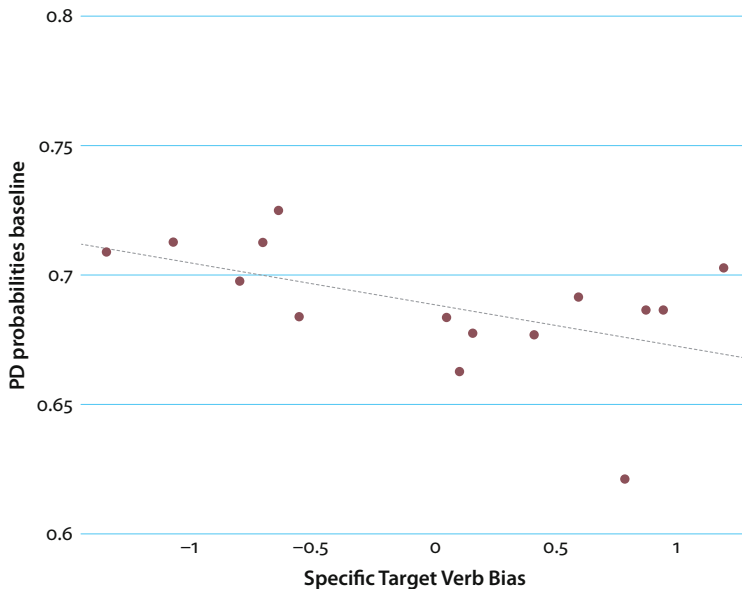
Figure 3. The probabilities of PD responses in the baseline condition plotted against the specific verb bias of the target verbs

---

15. Note that the plots do not show actual data points, but values predicted on the basis of the regression model.
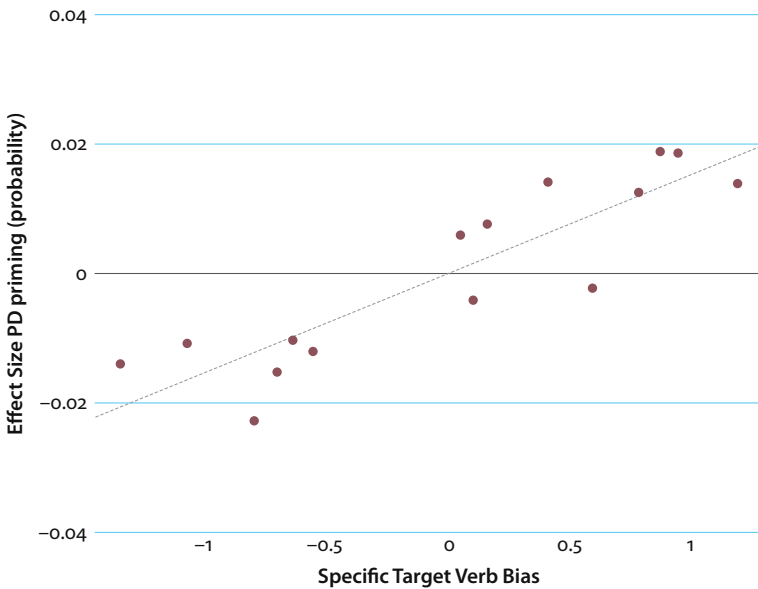
Figure 4. The effects of PD-priming plotted against the specific verb bias of the target verbs

Finally, the finding that specific target verb bias as well as the residuals of the regression between this bias and the general bias of the target verbs were significant predictors in our model might suggest that the lexeme-based bias of the target verbs alone might predict our data equally well as the model reported above. Table 5 summarizes the effects obtained with a model including Prime and General Target Verb Bias and their interactions as fixed factors (as in (13)).

(13)   lmer (Response ~ Prime + General Target Verb Bias + Prime : General Target Verb Bias)

The log-likelihood of the model including the sense-specific verb bias and the residuals is slightly better than the log-likelihood of the model including only the lexeme-based bias of the target verbs (−262.5 vs. −264.4). Both models yield very similar results. Crucially, however, the lexeme-based bias of the target verbs did not interact with the strength of PD-priming. Figure 5 shows that, when the general target verb bias is used as a predictor, there is no clear relationship between target verb bias and the strength of PD priming – though the figure may on first sight suggest something of a trend, note that the slope of the regression line is much flatter than in Figure 4.

Table 5. Summary of the fixed effects in the mixed logit model ($N = 675$; log-likelihood $= -264.4$)

Predictor	Coefficient	SE	Wald Z	p
Intercept	2.41	(0.468)	5.16	<.001
Prime DO	−0.54	(0.294)	−1.83	<.07
Prime PD	−0.05	(0.296)	−0.18	>.1
General Target Bias	−0.97	(0.286)	−3.41	<.001
Interaction = *Prime DO & General Target Bias*	−0.54	(0.354)	−1.52	>.1
Interaction = *Prime PD & General Target Bias*	0.36	(0.340)	1.02	>.1
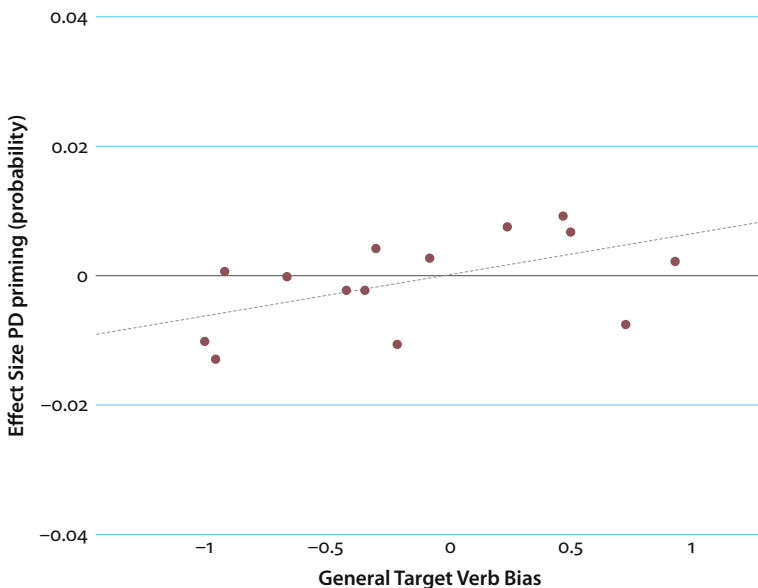
Figure 5. The effects of PD-priming plotted against the general verb bias of the target verbs

4.2   Discussion

The data obtained in our syntactic priming experiment showed stronger priming for DO-datives than for PD-datives, an effect of target verb bias in the baseline condition and an interaction between target verb bias and the strength of PD-priming. So far, the results of our experiment are very similar to the results of the Bernolet & Hartsuiker (2010) study. In their study, however, the effect of target verb bias on the baseline responses and priming effects was obtained when the lexeme-based bias of the target verbs was used in the analyses. When we used

this measure in our study, we only obtained an effect in the baseline condition. In addition to the effects of target verb bias, Bernolet and Hartsuiker (2010) also found an effect of prime verb bias on the strength of DO-priming: the strength of DO-priming decreased as the prime verbs became less biased towards a PD-dative and more biased towards a DO-dative. Effects of prime verb bias (the specific verb bias and the residuals of the regression between this bias and the general bias of the prime verbs) were, however, completely absent in our data.

Our failure to find effects of prime verb bias might be due to a lack of power in the current experiment: the Bernolet and Hartsuiker (2010) study included more than twice as many participants (57 vs. 25 in our experiment) and more items in each cell of the design (16 vs. 10). It is also possible, however, that the difference in results is caused by the primes that were used in both studies. In our study, all critical prime sentences used the dative verbs in their "figurative" meanings, while in Bernolet and Hartsuiker's study all primes used the "literal" meaning of the prime verb. Consequently, the concreteness of the theme participants used in the dative primes differs between both studies: our primes contained abstract themes, while the study by Bernolet and Hartsuiker (2010) used concrete themes. In both cases, however, the target pictures depicted actions involving concrete themes that were compatible with the literal meaning of the target verb. It is possible that this mismatch in the meaning of the prime and target verbs and/or the concreteness of the themes involved in the prime and target actions caused weaker priming in our study. It has not yet been investigated whether these factors influence the strength of syntactic priming, but there are some data that speak for this hypothesis. In the domain of word recognition, it has been shown, for example, that associative priming does not occur for word pairs that mismatch in concreteness (Bleasdale, 1987). A syntactic priming study that used primes containing abstract nouns and verbs with multiple senses is Hartsuiker and Kolk (1998), which investigates syntactic priming for Dutch active and passive transitives. Their experiments included prime sentences as *Het lawaai onderbreekt de journalist* [The noise interrupts the journalist] and *De transformator voedt de apparaten* [The transformer feeds the appliances]. The transitive priming effects obtained in their study are much weaker than the priming effects obtained in a study by Bernolet, Hartsuiker, and Pickering (2009) that used more concrete prime sentences in a comparable design (3 vs. 40% priming).

The most important result of our experiment is, however, that, in unprimed conditions, the syntactic choices made by the participants mirrored the sense-specific verb biases that were measured in the corpus data and that the priming effect caused by PD primes interacted with these sense-specific verb biases. Crucially, this interaction offered an explanation for the absence of an overall effect of PD priming in our data: the negative priming effects for PD-biased

target verbs cancelled out the positive priming effects for DO-biased target verbs. We admit that, like in other studies investigating syntactic priming for Dutch datives (Bernolet and Hartsuiker, 2010; Hartsuiker et al., 2008), the priming effects observed for PD primes were very small, due to the overall preference for PD datives. By looking at the interaction between the priming effects and the sense-specific bias of the target verbs, however, we were able to demonstrate that DO-biased target verbs offer some "room" for effects of PD priming. The analyses that used the general verb bias of the target verbs as a predictor did not provide this information.

Our results have repercussions for studies investigating effects of verb bias on syntactic priming and for studies on dative priming in general. They do not only indicate that sense-specific verb biases should be used to look at effects of verb bias, they also suggest that the response patterns might differ depending on which verb sense has to be used in the target sentence: in experiments using pictures to elicit target sentences the responses will be heavily influenced by the literal bias of the target verbs; if only the target verb is presented as a stimulus, the influence of the literal target verb bias might be much weaker. The fact that the baseline responses and the effects of PD priming were influenced by the sense-specific verb bias of the target verbs indicates that speakers are sensitive to sense-specific verb biases and that they store this information in memory. Hence, we still believe it should be possible to obtain effects of sense-specific prime verb bias on the strength of syntactic priming. Before we undertake any further attempts to investigate these effects, however, we should investigate whether dative priming is modulated by the abstractness of the themes in the dative prime sentences. If it turns out that dative primes with abstract themes cause weaker overall priming than primes with concrete themes, the chances of finding a sense-specific effect of prime verb bias might be higher if we use the latter kind of primes. It is also possible that priming effects are stronger when prime and target sentences use the same verb sense than when they use different senses. Such a 'sense boost' to dative priming would also point towards sense-contingent verb representations in the mental lexicon.[16]

---

16. These issues are further investigated in Bernolet, Colleman, and Hartsuiker (2014), a priming study that was conducted after the present investigation.

5.   Conclusion

The results of our sense-based DCA of 15 polysemous verbs which alternate between the Dutch double object construction and the *aan*-dative corroborate that distinct senses of one and the same verb may display widely different alternation biases. We have discussed several cases where this teasing apart of the various senses sheds more light on the behaviour of the investigated verbs in the dative alternation. Of course, this is not to say that interesting polysemy effects will be found in *every* case: some of the verbs selected for the investigation display a markedly consistent alternation bias across their different senses. This is most notably the case for *aanreiken*, *meegeven*, and *ontfutselen*, three verbs which are polysemous between a prototypical 'transfer of possession' sense and a 'communicative transfer' sense (the transfer taking place in the default direction from the subject referent to the indirect object referent in the first two cases, and in the reverse direction with *ontfutselen*). This finding suggests that, if no further semantic factors intervene, the simple distinction between material and communicative transfers does not matter very much for the dative alternation – though, needless to say, this hypothesis needs to be tested against the results of a sense-based DCA including *more* verbs which are polysemous between a 'material transfer' and a 'communicative transfer' meaning before this can be stated with any certainty. In any event, we hope to have illustrated the potential of the systematic inclusion of verb sense distinctions in linguistic studies of argument structure alternations for refining our view of distinctions in constructional semantics. In the second part of the paper, we have reported on an experiment aimed at the investigation of lexeme-based and sense-based bias effects on syntactic priming. Though the results of this experiment were somewhat less conclusive than might have been desirable – we found no effect of the lexeme-based or sense-based biases of *prime* verbs – they still corroborate the position that speakers are sensitive to sense-based verb biases and that they store this information in memory, since we found an interaction between the strength of PD priming and the sense-specific biases of target verbs. The lexeme-based bias of the target verbs, however, was found to be a significant factor in the model, too. In a usage-based perspective, it makes sense that speakers should keep track of verb subcategorization preferences at different levels of schematization, i.e., both at the level of specific verb senses and at the aggregated level of the verbal lexeme. We aim to further explore such matters in future research.

References

Bernolet, Sarah. (2008). *Lexical-syntactic representations in bilingual sentence production*. Unpublished Ph.D. dissertation, Ghent University.

Bernolet, Sarah, Colleman, Timothy, & Hartsuiker, Robert J. (2014). 'The "sense boost" to dative priming: evidence for sense-specific verb-structure links. *Journal of Memory and Language*, 76, 113–126. doi:10.1016/j.jml.2014.06.006

Bernolet, Sarah, & Hartsuiker, Robert J. (2010). Does verb bias modulate syntactic priming? *Cognition*, 114, 455–461. doi:10.1016/j.cognition.2009.11.005

Bernolet, Sarah, Hartsuiker, Robert J., & Pickering, Martin J. (2007). Shared syntactic representations in bilinguals: Evidence for the role of word-order repetition. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 33, 931–949. doi:10.1037/0278-7393.33.5.931

Bleasdale, Fraser A. (1987). Concreteness-dependent associative priming: Separate lexical organisation for concrete and abstract words. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 13, 582–594. doi:10.1037/0278-7393.13.4.582

Bock, J. Kathryn. (1986). Syntactic persistence in language production. *Cognitive Psychology*, 18, 355–387. doi:10.1016/0010-0285(86)90004-6

Bresnan, Joan, Cueni, Anna, Nikitina, Tatiana, & Baayen, Harald R. (2007). Predicting the dative alternation. In G. Boume, I. Kraemer, & J. Zwarts (Eds.), *Cognitive foundations of interpretation* (pp. 69–94). Amsterdam: Royal Netherlands Academy of Science.

Colleman, Timothy. (2009a). Verb disposition in argument structure alternations: A corpus study of the Dutch dative alternation. *Language Sciences*, 31, 593–611. doi:10.1016/j.langsci.2008.01.001

Colleman, Timothy. (2009b). The semantic range of the Dutch double object construction. A collostructional perspective. *Constructions and Frames*, 1, 190–220. doi:10.1075/cf.1.2.02col

Colleman, Timothy. (2010). Beyond the dative alternation: The semantics of the Dutch *aan*-dative. In D. Glynn & K. Fischer (Eds.), *Quantitative methods in cognitive semantics: Corpus-driven approaches* (pp. 271–303). Berlin/New York: Mouton de Gruyter.

Colleman, Timothy, & Bernolet, Sarah. (2012). Alternation biases in corpora vs. picture description experiments: DO-biased and PD-biased verbs in the Dutch dative alternation. In D. Divjak & S. Th. Gries (Eds.), *Frequency effects in language representation* (pp. 87–125). Berlin/New York: Mouton de Gruyter.

Colleman, Timothy, & De Clerck, Bernard. (2009). 'Caused motion'? The semantics of the English *to*-dative and the Dutch *aan*-dative. *Cognitive Linguistics*, 20, 5–42. doi:10.1515/COGL.2009.002

Ebeling, C. L. (2006). *Semiotaxis. Over theoretische en Nederlandse syntaxis* [Semiotaxis. On theoretical and Dutch syntax]. Amsterdam: Amsterdam University Press. doi:10.5117/9789053568866

Estival, Dominique. (1985). Syntactic priming of the passive in English. *Text*, 5, 7–22.

Fillmore, Charles J. (1977). Topics in lexical semantics. In R. Cole (Ed.), *Current issues in linguistic theory* (pp. 76–138). Bloomington: Indiana University Press.

Gahl, Susanne, & Garnsey, Susan M. (2004). Knowledge of grammar, knowledge of usage: Syntactic probabilities affect pronunciation variation. *Language*, 80, 748–775. doi:10.1353/lan.2004.0185

Geeraerts, Dirk. (1998). The semantic structure of the indirect object in Dutch. In W. van Langendonck & W. Van Belle (Eds.), *The Dative. Volume II: Theoretical and Contrastive Studies* (pp. 185–210). Amsterdam/: John Benjamins. doi:10.1075/cagral.3.08gee

Gilquin, Gaëtanelle. (2006). The verb slot in causative constructions. Finding the best fit. *Constructions*, 1–3.

Gilquin, Gaëtanelle. (2010). *Corpus, cognition and causative constructions*. Amsterdam: John Benjamins. doi: 10.1075/scl.39

Goldberg, Adele E. (1992). The inherent semantics of argument structure: The case of the English ditransitive. *Cognitive Linguistics*, 3, 37–74. doi: 10.1515/cogl.1992.3.1.37

Goldberg, Adele E. (1995). *Constructions: A construction Grammar approach to argument structure*. Chicago: University of Chicago Press.

Goldberg, Adele E. (2002). Surface generalizations: an alternative to alternations. *Cognitive Linguistics*, 13, 327–56.

Goldberg, Adele E. (2006). *Constructions at work: The nature of generalization in language*. Oxford: Oxford University Press.

Goldberg, Adele E. (2011). Corpus evidence of the viability of statistical preemption. *Cognitive Linguistics*, 22, 131–153. doi: 10.1515/cogl.2011.006

Goldberg, Adele E., Casenhiser, Devin, & Sethuraman, Nitya. (2004). Learning argument structure generalizations. *Cognitive Linguistics*, 15, 289–316. doi: 10.1515/cogl.2004.011

Gries, Stefan Th. (2003). Towards a corpus-based identification of prototypical instances of constructions. *Annual Review of Cognitive Linguistics*, 1, 1–27. doi: 10.1075/arcl.1.02gri

Gries, Stefan Th. (2004). *Coll.analysis 3.0. A program for R for Windows*.

Gries, Stefan Th. (2005). Syntactic priming: A corpus-based approach. *Journal of Psycholinguistic Research*, 34, 365–399. doi: 10.1007/s10936-005-6139-3

Gries, Stefan Th. (2006). Exploring variability within and between corpora: Some methodological considerations. *Corpora*, 1, 109–151. doi: 10.3366/cor.2006.1.2.109

Gries, Stefan Th., Hampe, Beate, & Schönefeld, Doris. (2005). Converging evidence: Bringing together experimental and corpus data on the association of verbs and constructions. *Cognitive Linguistics*, 16, 635–676. doi: 10.1515/cogl.2005.16.4.635

Gries, Stefan Th., & Stefanowitsch, Anatol. (2004). Extending collostructional analysis: A corpus-based perspective on "alternations". *International Journal of Corpus Linguistics*, 9, 97–129. doi: 10.1075/ijcl.9.1.06gri

Grondelaers, Stefan, Deygers, Katrien, Van Aken, Hilde, Van den Heede, Vicky, & Speelman, Dirk. (2000). Het CONDIV-corpus geschreven Nederlands [The CONDIV corpus of spoken Dutch]. *Nederlandse Taalkunde*, 5, 356–363.

GVD = den Boon, Ton, & Geeraerts, Dirk (Eds.). (2006). *Van Dale Groot Woordenboek van de Nederlandse Taal* [Van Dale Comprehensive Dictionary of the Dutch Language]. 14th, revised edition. Utrecht/Antwerpen: Van Dale Lexicografie.

Hare, Mary, McRae, Ken, & Elman, Jeffrey L. (2003). Sense and structure: meaning as a determinant of verb subcategorization preferences. *Journal of Memory and Language*, 48, 281–303. doi: 10.1016/S0749-596X(02)00516-8

Hare, Mary, McRae, Ken, & Elman, Jeffrey L. (2004). Admitting that admitting verb sense into corpus analyses makes sense. *Language and Cognitive Processes*, 19, 181–224. doi: 10.1080/01690960344000152

Hartsuiker, Robert J., Bernolet, Sarah, Schoonbaert, Sofie, Speybroek, Sara, & Vanderelst, Dieter. (2008). Syntactic priming persists but the lexical boost decays: Evidence from written and spoken dialogue. *Journal of Memory and Language*, 58, 214–238. doi: 10.1016/j.jml.2007.07.003

Hartsuiker, Robert J., & Kolk, H. H. J. (1998). Syntactic persistence in Dutch. *Language and Speech*, 41, 143–184.

Hilpert, Martin. (2008). *Germanic future constructions. A usage-based approach to language change*. Amsterdam: John Benjamins. doi:10.1075/cal.7

Jaeger, T. Florian. (2008). Categorical data analysis: Away from ANOVAs (transformation or not) and towards logit mixed models. *Journal of Memory and Language*, 59, 434–446. doi:10.1016/j.jml.2007.11.007

Jaeger, T. Florian, & Snider, Neal. (2007). Implicit learning and syntactic persistence: Surprisal and cumulativity. *University of Rochester Working Papers in the Language Sciences*, 3, 26–44.

Janssen, Theo. (1997). Giving in Dutch: An intra-lexematical and inter-lexematical description. In J. Newman (Ed.), *The linguistics of giving* (pp. 267–306). Amsterdam: John Benjamins. doi:10.1075/tsl.36.10jan

Kirsner, Robert S., Verhagen, Arie, & Willemsen, Mariëtte. (1987). Over PP's, transitiviteit en het zgn. indirekt objekt [On PPs, transitivity and the so-called indirect object]. *Spektator*, 14, 341–347.

Kooij, J. G. (1975). Diachronic aspects of idiom formation. In A. Kraak (Ed.), *Linguistics in the Netherlands 1972/73* (pp. 122–127). Assen: Van Gorcum.

Langacker, Ronald W. (1991). *Foundations of cognitive grammar. Volume II: Descriptive application*. Stanford: Stanford University Press.

Langacker, Ronald W. (2000). A dynamic usage-based model. In M. Barlow & S. Kemmer (Eds.), *Usage based models of language* (pp. 1–63). Stanford: CSLI Publications.

Lauwers, Peter. (2010). Comment dissocier des locutions prépositives quasi-synonymiques?: Essai d'analyse collostructionnelle. *Revue canadienne de linguistique*, 55, 55–84. doi:10.1353/cjl.0.0066

Levelt, Willem. (1989). *Speaking: From intention to articulation*. Cambridge: MIT Press.

Levshina, Natalia, Geeraerts, Dirk, & Speelman, Dirk. (2010). Changing the world vs. changing the mind: Distinctive collexeme analysis of the causative construction with *doen* in Belgian and Netherlandic Dutch. In F. Gregersen, J. Parrot, & P. Quist (Eds.), *Language variation – european perspectives III. Selected papers from the 5th International Conference on Language Variation in Europe, Copenhagen, June 2009* (pp. 111–123). Amsterdam/philadelphia: John Benjamins. doi:10.1075/silv.7.09lev

Lombardi, Linda, & Potter, Mary C. (1992). The regeneration of syntax in short-term memory. *Journal of Memory and Language*, 31, 713–733. doi:10.1016/0749-596X(92)90036-W

Noël, Dirk, & Colleman, Timothy. (2010). Believe-type raising-to-object and raising-to-subject verbs in English and Dutch: A contrastive investigation in diachronic construction grammar. *International Journal of Corpus Linguistics*, 15, 157–182. doi:10.1075/ijcl.15.2.02noe

Pickering, Martin J., & Branigan, Holly. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language*, 39, 633–651. doi:10.1006/jmla.1998.2592

Pickering, Martin J., & Ferreira, Victor S. (2008). Structural priming: A critical review. *Psychological Bulletin*, 134, 427–459. doi:10.1037/0033-2909.134.3.427

Roland, Douglas, & Jurafsky, Daniel. (2002). Verb sense and verb subcategorization probabilities. In P. Merlo & S. Stevenson (Eds.), *The Lexical basis of sentence processing: Formal, computational, and experimental issues* (pp. 325–345). Amsterdam/philadelphia: John Benjamins. doi:10.1075/nlp.4.17rol

Schermer-Vermeer, E. C. (1991). *Substantiële versus formele taalbeschrijving: het indirect object in het Nederlands* [Formal versus substantial language analysis: The indirect object in Dutch]. Amsterdam: Universiteit van Amsterdam.

Schermer-Vermeer, E. C. (2001). Grammatica, lexicon en de dubbel-objectsconstructie in het Nederlands en Engels [Grammar, lexicon and the double object construction in Dutch and English]. *Nederlandse Taalkunde*, 6, 22–37.

Stefanowitsch, Anatol. (2006). Negative evidence and the raw frequency fallacy. *Corpus Linguistics and Linguistic Theory*, 2, 61–77.

Strik Lievers, Francesca. (2011). Constructing judgments: The interaction between adjectives and clausal complements. In M. Kokopka et al. (Eds.), *Grammatik und Korpora 2009. Dritte Internationale Konferenz. Mannheim, 22.4.–24.9.2009* (pp. 287–304). Tübingen: Narr.

Trousdale, Graeme. (2008). Constructions in grammaticalization and lexicalization: Evidence from the history of a composite predicate construction in English. In G. Trousdale & N. Gisborne (Eds.), *Constructional approaches to English grammar* (pp. 33–67). Berlin/New York: Mouton de Gruyter.

Trueswell, John C., & Kim, Albert E. (1998). How to prune a garden path by nipping it in the bud: Fast priming of verb argument structure. *Journal of Memory and Language*, 39, 101–132. doi:10.1006/jmla.1998.2565

Van Belle, William, & Van Langendonck, W. (1996). The indirect object in Dutch. In W. Van Belle & W. Van Langendonck (Eds.), *The dative. Volume 1: Descriptive studies* (pp. 217–250). Amsterdam: John Benjamins. doi:10.1075/cagral.2.10van

Wiechmann, Daniël. (2008). Initial parsing decisions and lexical bias: Corpus evidence from local NP/S-ambiguities. *Cognitive Linguistics*, 19, 439–455. doi:10.1515/COGL.2008.017

Wierzbicka, Anna. (1986). The semantics of 'internal dative' in English. *Quaderni di Semantica*, 7, 121–35.

Wilson, Michael P., & Garnsey, Susan M. (2008). Making simple sentences hard: Verb bias effects in simple direct object sentences. *Journal of Memory and Language*, 60, 368–392. doi:10.1016/j.jml.2008.09.005

Wulff, Stefanie. (2006). *Go–V* vs. *go–and–V* in English: a case of constructional synonymy? In S. Th. Gries & A. Stefanowitsch (Eds.), *Corpora in cognitive linguistics* (pp. 101–125). Berlin/New York: Mouton de Gruyter.