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Mapping constructional spaces: A contrastive analysis of English and Dutch analytic causatives[1]

Abstract: The paper demonstrates how verb and noun classes can be used as a common interface in contrastive Construction Grammar. It presents an innovative approach to the contrastive analysis of constructional spaces (sets of constructions covering a certain semantic domain). We compare English and Dutch analytic causatives by using the statistical technique of multiple correspondence analysis applied to data from large monolingual corpora. The method allows us to explore the common conceptual space of the constructions, in particular the salient semantic dimensions and causation types, which emerge on the basis of co-occurring semantic classes of the nominal and verbal slot fillers in constructional exemplars. The formal patterns of the constructions at different levels of specificity are projected onto this space. Our analyses show that an average Dutch analytic causative refers to more indirect and abstract causation with fewer animate than its English counterpart. We have also found that the languages "cut" the common conceptual space in unique ways, although the semantic areas of many English and Dutch constructions overlap substantially. Nevertheless, the form-meaning mapping in the two languages displays commonalities. Both English and Dutch constructions with prepositionally marked or implicit causees are strongly associated with animate causees. We have also observed a correlation between the directness of causation and the crosslinguistic hierarchy of affectedness marking proposed by Kemmer and Verhagen (1994).

Keywords: contrastive analysis, causative constructions, correspondence analysis, semantic classes.

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1 Introduction

One of the fundamental assumptions of Cognitive/Construction Grammar (Langacker 1987; Goldberg 1995) is that constructions are form-meaning pairings. In this regard, they are not fundamentally different from lexemes. This idea inspired us to introduce the notion of a constructional space, which is an extension of the lexical field (a set of semantically related lexical items which provide conceptual structure for a certain domain of reality). A constructional space, which may incorporate both grammatical and lexical units at any level of schematicity, is a non-discrete set of categorization choices available for a specific conceptual domain.

The notion of the lexical field was very popular in structuralist linguistics (see Geeraerts 2010: 53–70 for an overview). Nowadays, the non-reductionist constructionist perspective on language (e.g., Langacker 1987; Goldberg 1995; Croft 2001) has brought to light the problem of semantic relationships between the constructions organized in a network (e.g., Goldberg 1995). In this regard, a spatial representation of these semantic relationships, like lexical fields, might provide an attractive solution. However, a modern linguist cannot import the notion of a lexical field from the past in its original form. First, various statistical approaches to onomasiological semantics (e.g., Gries 2003; Gries and Stefanowitsch 2004; Bresnan et al. 2007; Glynn 2007) strongly challenge the categorical distinctions posited by structuralists. The multivariate probabilistic effects, which reflect various salience phenomena, cannot be captured by semantic maps like Hjelmslev's (1959) [1957] or, more recently, Haspelmath's (2003). Another problem is an objective analysis and empirical justification of the semantic distinctions between the related words or categories. The extension of the analysis to constructions, which are represented in the speaker's grammar as a hierarchical network with different levels of specificity, poses an additional challenge.

In this study we propose a corpus-based probabilistic bottom-up approach that can solve these problems. It is illustrated with a contrastive study of the English and Dutch analytic causatives (also referred to as causative constructions).

The method is based on multiple correspondence analysis, which is applied to two large monolingual corpora. The common multidimensional conceptual space with salient semantic distinctions and "senses" emerges on the basis of co-occurrence of semantic features in constructional exemplars.[2] The features are the semantic classes of the nominal and verbal fillers of the constructional slots. The formal constructional patterns are mapped onto the semantic space to determine the semantic areas occupied by the constructions. We use two representations of the constructional semantics, plotting both the specific exemplars of each construction and their average positions. The latter can be interpreted as abstract "prototypes". We also compare the semantic distribution of the constructions at different levels of specificity.

The rest of the article is organized in the following way. First, we introduce the English and Dutch analytic causatives. Second, we describe our data and method. Third, we report the results of our quantitative analyses of the common constructional space. We conclude with a summary of the main findings and suggestions for future research.

2 English and Dutch analytic causatives

2.1 Form and function of analytic causatives

Causation is a basic concept in human cognition and language (e.g., Talmy 2000), so it would not be possible to cover all causative events and linguistic ways of expressing them in one article. In this study we restrict ourselves to analytic causatives, which refer to a specific kind of causation.

According to Talmy (2000: Ch. 7), causation is a force-dynamic pattern that involves two main participants: the antagonist (which is usually labeled as the

2 In this sense, our conceptual spaces and semantic maps are different from the ones developed in typological studies (e.g., Haspelmath 2003 and Croft and Poole 2008). Our conceptual spaces do not deal with *a priori* categorical distinctions (whether a feature exists in the language or not) but with gradable dimensions which emerge in a bottom-up fashion from analysis of observations. This allows us to model salience effects, which have not been captured by previous approaches. There is also a terminological difference. Croft and Poole (2008) distinguish between conceptual spaces (the universal set of possible distinctions that human beings can recognize and grammaticalize) and semantic maps (a distribution of actual distinctions made across the parameters of the conceptual space). In this article we use the term "conceptual space" to refer to the entire multidimensional space of co-occurring semantic features, and the term "map" to speak about its low-dimensional graphical representation.

"causer" in the constructions that we examine in this study) and the agonist (the "causee"). The causer instigates a causing event or state, which affects the causee, who brings about the caused event. In prototypical causation, the causer succeeds in overriding the causee's natural tendency towards rest or action (Talmy 2000: 418). The constructions that are studied here all refer to this causation type, although they may have other meaning extensions.

The stages of the force-dynamic interaction can be integrated and fore- or backgrounded in different ways. In many languages there is a division of labor between the lexical, morphological and analytic causatives, which reflect the integration and separability of the components of the causative event (Shibatani and Pardeshi 2002). The maximum autonomy of the causing and caused events is represented by causal connectives (cf. Stukker 2005).

We focus here on the situations when the causing and the caused events or states are joined into one chain but are still distinguishable. In many languages, this type of causation is represented by analytical causatives, which consist of a causative auxiliary, representing the (unspecified) causing event, and an effected predicate – a non-finite verb form, designating the caused event. We should emphasize that we treat analytical causatives across different languages as semantically similar but not equivalent. As we shall see, the roles of the causer and the causee can be blended with a number of semantic roles, which may differ across the languages.[3]

2.2 English analytic causatives

The English analytic causatives have received much attention in the literature (e.g., Wierzbicka 1998; Stefanowitsch 2001; Gilquin 2006, 2010). The constructions that we address in this study contain the causative auxiliaries *make*, *have*, *get* and *cause*. In addition, there are constructions with causative verbs *force* (*to* V) and *set* (V*ing*), which refer to a more specific force-dynamic pattern than the rest (overriding the causee's resistance and inchoative causation, respectively).

Consider examples (1)–(4):

(1) a. *She made him leave.*
b. *They made their presence felt (to everybody).*
c. *He was made to resign (by the opposition).*

3 This sometimes makes the labels like the "causer" and the "causee" problematic. We use these causation-related labels for the sake of convenience, and also to emphasize the prototypical organization of the category.

(2) a. *They had a draughtsman prepare the plans*.
b. *He had his hair cut (by a hairdresser)*.
c. *The band will have you rocking in your seat*.

(3) a. *She got the minister to sign the papers*.
b. *They tried to get their plan accepted (by the community)*.
c. *The new government got the economy going*.

(4) *The interest rates caused the currency to collapse*.

As the examples demonstrate, the auxiliaries *make*, *have* and *get* combine with different forms of the effected predicates. *Make* can take the infinitive (1a) or the past participle (1b); *have* and *get* can be followed by the infinitive, as in (2a) and (3a), the past participle, as in (2b) and (3b) and the present participle, as in (2c) and (3c). Although the meaning of constructions cannot be entirely predicted by their components (Goldberg 1995), there are still conspicuous semantic tendencies connected with the forms of the effected predicates. On the one hand, the different forms of the effected predicate reflect different degrees of integration of the causing and caused events. For example, if the non-finite component is a present participle, then the caused event can continue for some time after the impingement stops; but if the verb is a bare infinitive, then the two events are linked more tightly from the causative and the spatiotemporal perspectives (Stefanowitsch 2001). On the other hand, the constructions with the past participle background the causee, in the way that passive constructions do.

Prepositional marking of the causee in English is normally possible only in constructions with the past participle. The examples are (1b), (2b) and (3b). Again, there is some compositionality involved. The preposition *to* makes an animate causee appear as a recipient or addressee, whereas *by* marks an agentive causee. At the same time, prepositional marking is a sign of peripherality of the causee (cf. Kemmer and Verhagen 1994), which reaches its maximum when the causee is implicit.

Finally, *make* has a passive counterpart *be made*, as in (1c). Using the passive causative construction can be interpreted as a way of backgrounding the causer. The passive *be made* can also be combined with the past participle, leaving both the causer and the causee implicit, as (5) shows:

(5) *Their presence was made felt*.

We should note that constructional spaces, like lexical fields, are never discrete (see Geeraerts 2010: 66–70). Linguistic categories tend to have a prototypical organization with a core and periphery distinction, fuzzy boundaries and a family

resemblance structure. This non-discreteness is evident in the case of the constructions with *have* and *get* because they allow for a range of ambiguous and even non-causative readings. Compare (6a–d):

(6) a. *The minister finally gets the Treaty ratified by the Parliament.*
b. *I got my eyes tested.*
c. *It is easy to get your head blown off.*
d. *She got caught by the police.*

Although these *get*-constructions are semantically and historically related (Givón 1993: 65–66), there is a cline of availability of a causative interpretation of these contexts. The degree of the causer's energy input and responsibility decreases from (6a) to (6d), and the causer's role becomes blended with or even replaced by the role of a beneficiary (6b), an undergoer (6c) or a patient (6d). At the same time, integration of the causing and caused events increases until it is impossible to distinguish between the two (6d). We preserved the observations with the blended force-dynamic roles if it was possible to give the situation a causative interpretation and at least to some extent discern the distinct causing and caused events. As a consequence, we did not include contexts like (6d) in our analysis.

2.3 Dutch analytic causatives

Dutch analytic causatives are less diverse than the English ones. In fact, there are only two causative auxiliaries with schematic meaning: *doen* 'make' and *laten* 'make, let'. Compare (7) and (8):

(7) a. *Hij deed me denken aan mijn vader.*
He did me think about my father
'He reminded me of my father.'
b. *Griekse crisis doet denken aan Lehman.*
Greek crisis does think about Lehman
'Greek crisis reminds of Lehman.'

(8) a. *Ik liet hem mijn huis ontwerpen.*
I let him my house design
'I had my house designed by him.'
b. *Ik liet mijn huis ontwerpen.*
I let my house design
'I had my house designed.'

c. *Hij liet zijn boek lezen aan de studenten.*
He let his book read to the students
'He had(let) the students read his book.'
d. *Ik liet mijn huis ontwerpen door hem.*
I let my house design by him
'I had my house designed by him.'

A number of studies (Kemmer and Verhagen 1994; Verhagen and Kemmer 1997; Stukker 2005) suggest that the difference between *doen* and *laten* can be explained in terms of the contrast between direct and indirect causation. Direct causation means that "there is no intervening energy source 'downstream' from the initiator: if the energy is put in, the effect is the inevitable result" (Verhagen and Kemmer 1997: 70). Indirect causation, which also includes the situations of enablement and permission, emerges when the situation "can be conceptualized in such a way that it is recognized that some other force besides the initiator is the most immediate source of energy in the effected event" (Verhagen and Kemmer 1997: 67). According to Stukker (2005), this immediate source is most frequently the causee (at least more frequently than the affectee, the direct object of the effected predicate). Indirect causation includes both cases of permission and indirect coercion. In fact, the semantics of *laten* can range from coercive to enabling/permissive meanings, with a number of ambiguous cases in between. Compare (9a), (9b) and (9c):

(9) a. *De trainer liet de spelers loopoefeningen doen.*
The coach let the players run-exercises do
'The coach made the players do running exercises.'
b. *Hij liet iedereen zijn roman lezen.*
He let everyone his novel read
'He made/had/let everyone read his novel.'
c. *De politie liet de dader ontsnappen.*
The police let the criminal escape
'The police let the criminal escape.'

In our analysis we preserved not only the ambiguous contexts like (9b), but also the clear cases of letting like (9c) because their subject can be considered responsible for the event, albeit indirectly. In fact, letting represents the extreme case of indirect causation.

Another important difference between the two languages is that the Dutch causatives do not exhibit variation in the form of the effected predicate: only infinitives can fill this slot. At the same time, the *laten*-construction allows for vari-

ation in the case marking of the causee by prepositions *aan* and *door*, in addition to a zero-marked nominal phrase. Generally speaking, *aan*, like *to* in English, combines the "caused motion" meaning with a range of "dative" functions (cf. Colleman and De Clerck 2009). In the causative contexts like (8c), *aan* marks the animate causee in the role of the recipient. The preposition *door* in (8d) is a marker of instrumentality and agentivity, similar to the English preposition *by* (see Kemmer and Verhagen 1994). Both *doen* and *laten* allow for the implicit causee. As in the case of the English causatives (see above), implicitness and prepositional marking can be regarded as ways of backgrounding the causee.

3 Data and method

3.1 Data

The English corpus that we used is the newspaper component of the BNC (approximately 10 million words). We extracted the instances of the above-mentioned constructions automatically, with the help of the part-of-speech tags. The observations were checked manually to avoid errors and irrelevant observations (see the previous section) and coded for the variables listed below. After this procedure we had 1925 English observations representing various formal patterns (see Table 1).

We used an equally large sample of the Dutch causative constructions, extracted from the Twente News Corpus (Ordelman et al. 2007) and the Leuven News Corpus,[4] two large corpora of Dutch and Belgian quality newspapers. The observations were retrieved automatically, on the basis of syntactic parsing information. Table 2 displays the structures found in the Dutch data and their frequencies.

4 The Leuven News Corpus is an approximately 1.3 bln. word corpus of Flemish quality newspapers, which was compiled by the Quantitative Lexicology and Variational Linguistics research unit at K.U. Leuven.

Table 1: English analytic causatives in the BNC data.

Auxiliary	Structures	Example	Frequency
make	X MAKE Y inf	*She made him leave.*	867
	X MAKE Z past part.	*They made their presence felt.*	31
	X MAKE Z past part. *by* Y	*They made their presence felt by everyone.*	1
	X MAKE Z past part. *to* Y	*They made their presence known to everyone.*	8
	Y BE MADE to-inf	*He was made to resign.*	109
	X MAKE inf	*She made believe not to hear him.*[5]	1
	Z BE MADE past part.	*Their presence was made known.*	9
cause	X CAUSE Y to-inf	*The interest rates caused the currency to collapse.*	132
have	X HAVE Y pres. part.	*They had a draughtsman prepare the plans.*	46
	X HAVE Z past part.	*He had his hair cut.*	272
	X HAVE Z past part. *by* Y	*He had his hair cut by a hairdresser.*	29
	X HAVE Y pres. part.	*The band will have you rocking in your seat.*	64
get	X GET Y to-inf	*She got the minister to sign the papers.*	150
	X GET Z past part.	*They tried to get their plan accepted.*	103
	X GET Z past part. *by* Y	*They tried to get their plan accepted by the committee.*	5
	X GET Y pres. part.	*The new government got the economy moving.*	98

Table 2: Dutch analytic causatives in the Twente News Corpus and Leuven News Corpus data.

Auxiliary	Structure	Example	Frequency
doen	X DOEN Y (Z) inf	*Hij deed me denken aan mijn vader.* "He made me think of my father"	242
	X DOEN (Z) inf	*Het doet denken aan Lehman .* "It makes think of Lehman"	112
laten	X LATEN Y (Z) inf	*De trainer liet de spelers oefeningen doen.* "The coach made the players do exercises"	747
	X LATEN *aan* Y Z inf	*Hij liet dat aan mij lezen.* "He let/had/made me read it"	7
	X LATEN *door* Y Z inf	*Hij liet zijn huis bouwen door een architect.* "He had his house built by an architect"	136
	X LATEN Z inf	*Hij liet zijn huis bouwen.* "He had his house built"	681

5 This fossilized structure was kept in the analyses because it could still be analyzed as an instance of the construction with *make* (cf. Gilquin 2010: 76–77). To what extent constructions at different levels of fossilization contribute to the semantics of their "parent" constructions remains an open question.

3.2 Semantic features

Representation of constructional semantics is a difficult task. Abstract senses like "caused motion" (Goldberg 1995) are a challenge for those who work with empirical models of semantics. Normally, in large-scale corpus-based studies (e.g., Gries 2003; Bresnan et al. 2007; Speelman and Geeraerts 2009) a set of indirect surface clues is used to quantify the traces of meaning. Especially important are the lexemes that fill the main constructional slots (cf. Stefanowitsch and Gries 2003, Gries and Stefanowitsch 2004).

In this study we focus on the main slots: the causer, the causee and the effected predicate. More specifically, the observations were coded for the following features:

- the semantic class of the Causer: animate (*Cr.Anim*), e.g., *He made me laugh*; material object (*Cr.MatObj*), e.g., *His funny face made me laugh*; and abstract entity (*Cr.Abstr*), e.g., *His remark made me laugh*. In some situations, especially when the relevant participant was implicit, we had to rely on indirect evidence (the linguistic context and encyclopedic knowledge) to code the semantic class. Several observations where this was impossible were discarded.
- the semantic class of the Causee: animate (*Ce.Anim*), e.g., *Heavy rains made tourists stay in their hotels*; material objects (*Ce.MatObj*), e.g., *Heavy rains caused the river to break its banks*; and abstract entities (*Ce.Abstr*), e.g., *Heavy rains made the prices plummet*.
- *V*: the semantic class of the effected predicate. We chose for a middle-grained classification with 15 classes (see Table 3) because a very fine-grained classification like Levin's (1993) would result in low-frequency classes, which can become dangerous outliers in correspondence analysis, whereas a too coarse-grained classification would not be particularly informative. Also, we classified the predicates on the basis of purely semantic criteria because such classes provide a safer ground for crosslinguistic semantic comparisons than those based on syntactic distribution (as in Levin 1993).

Table 3: Semantic classes of the effected predicates.

Label	Meaning	Examples
V.Aspect	aspectual verbs	*start, finish* *beginnen* 'begin', *stopzetten* 'stop'
V.Body	verbs related to body: physiological processes and states, physical expression of emotions, etc.	*beat* (about a heart), *bleed* *lachen* 'laugh', *fronsen* 'frown'
V.ChPoss	verbs related to change of possession	*give*, *provide* *stelen* 'steal', *betalen* 'pay'
V.ChState	verbs related to change of state (qualitative and quantitative)	*fade*, *grow up* *toenemen* 'increase', *veranderen* 'change'
V.Create	verbs related to creation, transformation and destruction of objects by an agent	*build, paint* *bakken* 'bake', *vernielen* 'destroy'
V.Exist	verbs of existence, location, maintaining a position, etc.	*be*, *stay* *wonen* 'live', *staan* 'stand'
V.Intel	verbs related to intellectual processes and states, such as thinking, memory, beliefs, intentions	*know*, *remember* *geloven* 'believe', *besluiten* 'decide'
V.PhysManip	verbs related to exerting force to an object, without transforming it	*throw*, *touch* *brengen* 'bring', *zetten* 'put'
V.Motion	verbs of motion (change of location, manner of motion, using a vehicle, etc.)	*run*, *fly* *draaien* 'turn round', *fietsen* 'ride a bicycle'
V.GetInfo	verbs related to obtaining information from the outside world (perception, learning and searching)	*listen*, *look for* *zien* 'see', *kennismaken* 'make acquaintance'
V.Phenom	verbs related to appearance, occurrence and other perceived phenomena	*seem*, *shine* *rinkelen* 'ring', *uitzien* 'look'
V.Psych	verbs related to emotions and desires experienced by the subject	*wish*, *despair* *haten* 'hate', *verlangen* 'long (for)'
V.MentInfl[6]	verbs related to influencing someone's mind intentionally or unintentionally	*inspireren* 'inspire', *verleiden* 'seduce'
V.SocInter	verbs of social interaction and verbal communication, including performative verbs	*vote*, *promise* *trouwen* 'marry', *spreken* 'speak'
V.Oth	other predicates, including light verbs and other abstract predicates	*make* (e.g., a mistake), *have a go* *werken* 'work'

[6]

6 This class was present only in the Dutch data and constituted 65 observations.

3.3 Method

The statistical method that we employed in this study is multiple correspondence analysis (MCA), which is geared towards examining relationships between several categorical variables. In linguistics it has been used in content analysis of text (Murtagh 2005), studies of sociolinguistic variation (Plevoets 2008) and semantic analysis of near-synonymous lexemes (Glynn 2007).

MCA can be viewed as an analogue of principal component analysis for many categorical (non-numeric) variables like the ones listed in Section 3.2. The original data is usually a matrix with individual observations as rows and categorical variables as columns. MCA is an exploratory dimensionality-reduction technique, which helps understand the structure of the data by reducing them to a relatively small number of dimensions. These dimensions are expected to explain the variance (inertia), which is measured on the basis of the chi-square statistic. The latter reflects the difference between the real and expected co-occurrence frequencies of the categories in the observations. The first dimension of the solution explains the most variance, the second and subsequent ones less. The method is also widely used to represent the data in low-dimensional maps. MCA plots usually show the relationships between the variables, although the individual cases can be plotted, too. To carry out our analyses, we used the `ca` package developed by Greenacre and Nenadić (2010) for the statistical software R, version 2.12.0 (R Development Core Team 2010). We chose the adjusted version of MCA, which is reported to provide the best fit (Greenacre 2007).

Our first step was to construct the conceptual space of the English and Dutch causative constructions by applying MCA to model the distribution of the variables (semantic classes) in the observations. Next, we projected the formal constructional patterns as supplementary points onto the previously computed maps. These points are passive, in the sense that they do not influence the position of the other points, and their position is computed as the average of the positions of all the observations that contain the given construction.[7]

7 This allows us to include even the low-frequency constructions without distorting the general picture.

4 Results

4.1 The conceptual space of the analytic causatives

The core of our analyses is a multiple correspondence analysis of the semantic classes of slot fillers in the English and Dutch causative constructions taken together. This analysis enables us to explore the common conceptual space of the causatives in the two languages. This conceptual space is based on the co-occurrence of the semantic classes in the observations. It reflects how different properties of the initiator, the performer and the resulting event of causation co-occur in the part of human experience conveyed with the help of the causative constructions. The clusters of the co-occurring features reveal discontinuities in this experience and can be interpreted as some typical causative situations. The dimensions of the MCA highlight the most important distinctions between these situations.

The main results of the MCA are shown in Appendix 1. The three first dimensions together explain 76.5% of the variation, which is a good approximation of the data. The three-dimensional solution, according to the scree plot, is optimal. The first and the most important semantic dimension explains 52.3% of the variance. The table of contributions in Appendix 2 shows that the features that contribute the most to the dimension (in other words, which determine its orientation) are the features related to the semantics of the causee. As one can see from Figure 1, the dimension opposes the animate causees to the inanimate ones (abstract and material). The second dimension, which accounts for 19.3% of the variance, corresponds to the distinction between the animate and inanimate causers.

The first two dimensions taken together reproduce, in fact, the typology of causative situations in Verhagen and Kemmer (1997), based on Talmy (1976) and Croft (1991). The authors distinguish four main types of causation, which are the four possible combinations of the animate (sentient) and inanimate initiator and endpoint (following Stukker [2005], we will interpret the initiator as the causer and the end point as the causee):

– Affective causation with an inanimate causer and a sentient (animate) causee. This causation type usually involves a stimulus invoking some mental state in a cognizer, as in (10). The causer and the causee are in bold:

(10) *But **all the criticism** only makes **us** want to prove ourselves even more.*

– Physical causation with an inanimate causer and a non-sentient (inanimate) causee. Example (11) illustrates this causation type:

(11) *Did **the cotton wool** on my apple tree twigs cause **the fruit** to rot?*

– Inducive causation, which involves an animate causer and an animate causee. This configuration can be observed, for example, in the contexts evoking the service frame, as in (12). Note that the human causee (a hairdresser) is implicit:

(12) ***Ik*** *zal* *mij* *haar* *niet* *kort* *laten* *knippen.*
I shall my hair not short let cut
'**I** won't have my hair cut short.'

– Volitional causation with an animate causer and an inanimate causee:

(13) *But **we** always try to get **the car** going.*

These causation types roughly correspond to the four quadrants of the semantic map shown in Figure 1. The orientation of the labels is based on the coordinates of their typical exemplars such as (10)–(13).

The third dimension, which explains only 4.9% of the variance, contrasts the material causers and causees, on the one hand, and the non-material participants, on the other hand, as shown in Figure 2. Albeit this distinction is not very strong, it shows that the four causation types are probably insufficient and it may

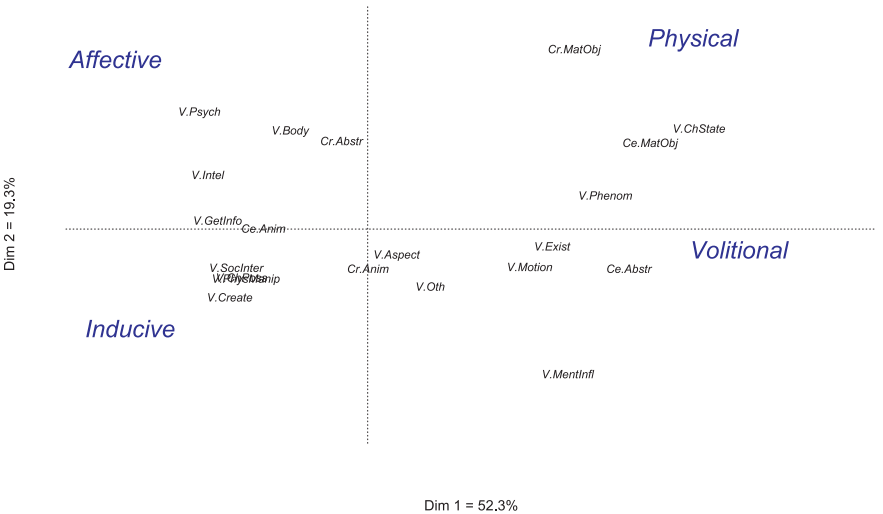

Fig. 1: The conceptual space of the English and Dutch causatives: Dimension 1 and 2.

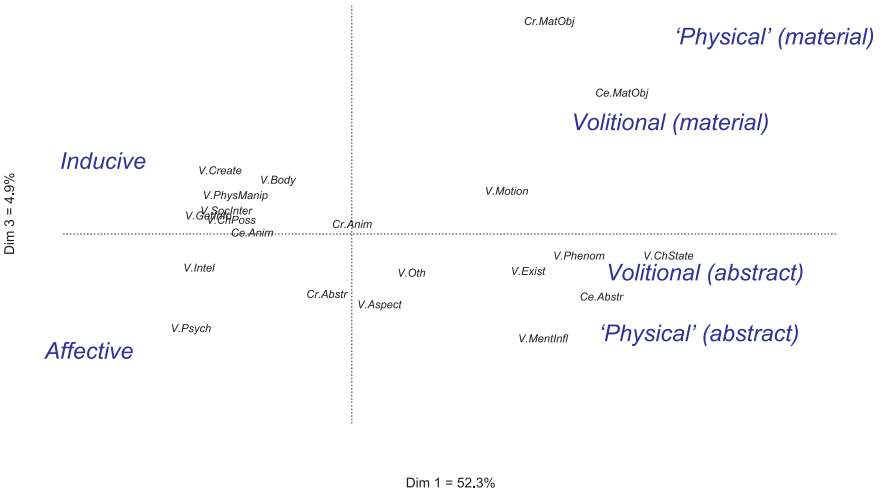

Fig. 2: The conceptual space of the English and Dutch causatives: Dimensions 1 and 3.

be useful to distinguish between the material and abstract subtypes of physical and volitional causation. This also implies that that the label "physical" in this typology is somewhat misleading. Examples of the abstract "physical" and volitional causation are given in (14) and (15), respectively. Note that the distance between the two instantiations of "physical" causation in Figure 2 is especially large. This means that the abstract/material distinction is highly relevant for this causation type.

(14) ***De turbulentie*** *op de aandelenmarkten deed* ***de verkoop*** *van*
the turbulence on the stock-markets did the sale of
beleggingsproducten (. . .) krimpen tot 1 miljard pond.
investment-products (. . .) shrink to 1 billion pound
'**The turbulence** on the stock markets caused **the sales** of investment products to decrease (. . .) to 1 billion pounds.'

(15) ***Byrne*** *was simply superb, making* ***everything*** *happen for Bangor and setting up their winner.*

In addition, the plots suggest that the causation types are not discrete. If we take a closer look at the distribution of the verb classes along the first dimension, we can see a continuum of the causee's animateness, with the verbs related to various mental processes on the extreme left (*V.Psych*, *V.Intel* and *V.GetInfo*), accompanied by the verbs related to various kinds of interaction between people

(*V.SocInter*, *V.ChPoss*) and the ones that normally require an agentive subject (*V.Create*, *V.PhysManip*). The aspectual effected predicates are almost neutral with regard to the first dimension. On the right are the verbs of motion and existence, and verbs related to various perceptible phenomena. The verbs of change of state are found on the extreme right. This continuum may reflect the general associations between animate or inanimate entities and the actions and states expressed by the related verbs, but we do not exclude that these associations in the causative constructions may be different from other constructions.

The distribution of the verb classes along the second dimension, which reflects the distinction between the animate causers (see the lower part of Figure 1) and the inanimate ones (found at the top), reveals another hidden opposition, which, somewhat paradoxically, has to do with the role of the causee as the affected or affecting participant. The *Psych* verbs at the top of Figure 1 describe emotions and desires, which are normally perceived as uncontrollable in the folk model of mind (D'Andrade 1987) and involve a passive causee. On the non-mental side of the map, the predicates of change of state also suggest that the causee should be affected.[8] In the lower part of the map, one can find such classes as the verbs of motion, which imply a great autonomy of the cause, and the highly agentive verbs of creation. Consider (16) and (17):

(16) *De Pool liet de bal bewust* ***lopen*** *en zag tot zijn*
the Pole let the ball consciously **run** and saw to his
verbijstering dat de bal in het doel belandde, 1–1.
amazement that the ball in the goal ended, 1–1
'The Pole consciously let the ball **go** and saw to his amazement that it ended up in the goal, 1–1.'

(17) *. . . I had my hair* ***styled*** *and my make-up done, and then tried on lots of different outfits.*

8 Note the intermediate position of the verbs related to getting information. The most frequent examples of the class are perception verbs. The folk theory of mind treats perception as uncontrollable (D'Andrade 1987). However, this does not immediately make the perceiver a passive affected entity. On the contrary, he/she can take active steps in obtaining the information, as in the following example:

Help ons om versie 1.3.12 te testen en laat ons weten als u
help us CONJ version 1.3.12 to test and let us know if you
problemen vindt.
problems find
'Help us test version 1.3.12 and let us know if you find problems.'

At the very bottom of Figure 1 are the verbs of mental influence. This is the area where causation *per se* gives way to enablement and permission. More specifically, this area contains predominantly Dutch exemplars with reflexive causatives, for example (18):

(18) *Theatergezelschap Froe Froe liet zich* ***inspireren*** *door de*
Theatre-company Froe Froe let itself **inspire** by the
cultfilm Freaks van Todd Browning (. . .) .
cult-film Freaks by Todd Browning
'The theatre company Froe Froe was **inspired** by the cult film Freaks by Todd Browning.'

Affectedness of the causee is a sign of directness of causation (Verhagen and Kemmer 1997). The second dimension is therefore associated not only with (in) animateness of the causer, but also with (in)directness of causation. To a certain extent, this association can be explained by Talmy's force-dynamic theory (e.g., Talmy 2000): for causation to take place, the causer should be stronger than the causee. Therefore, the strength (animateness) of the causee should correlate with the strength (animateness) of the causer. On the other hand, it has been pointed out that inanimate causers act on the world directly (Verhagen and Kemmer 1997: 71, Gilquin 2010: 121), whereas human beings have a variety of ways (language, tools, social institutions) to influence the environment without spending the precious energy. Indirect causation thus can be viewed as a distinctive feature of our species.

So far we have examined the common conceptual space without discussing its actual status. Is it a reliable representation of the separate English and Dutch conceptual spaces of analytic causatives or a mere abstraction? To answer this question, we carried out two separate correspondence analyses of the English and Dutch data. Next, we calculated the correlations (Pearson product-moment correlation coefficients) between the coordinates of the semantic features in the common space and those in the separate spaces. The results, presented in Table 4, show that the three dimensions have strong correlations, all of them statistically significant at $\alpha = 0.01$.[9] The other results of the analyses (optimal dimensionality and variance explained by them) are similar, too.

9 As our additional analyses show, the relatively low correlation values for Dimension 2 can be to a large extent explained by the different positions of the abstract and material causees in the English and Dutch spaces with regard to Dimension 2. The English abstract causees are located in the area of animate causers, whereas the Dutch ones are associated with both animate and inanimate causers. The English material causees are mapped close to the material causers, and

Table 4: Correlations between the coordinates of the semantic features in the common and language-specific correspondence analyses.

Dimension of common model	Correlation with English model	Correlation with Dutch model
Dimension 1	0.914	0.932
Dimension 2	0.563	0.630
Dimension 3	0.738	0.700

4.2 The constructional space of the English and Dutch analytic causatives

We begin this subsection with a general panorama of the exemplars of the English and Dutch constructions plotted onto the semantic maps according to their semantic features (Figures 3 and 4). The size of the symbols correlates with the number of exemplars sharing a particular configuration of semantic features. The text labels stand for the causation types associated predominantly with the given quadrant of the semantic space. One can see that the distributions are very similar. The exemplars of the English and Dutch constructions are highly concentrated in the left part of the map with the animate causees. The "physical" causation part (especially the material subtype) is the least populated (cf. Gilquin 2010: Ch.6 on the prototype of the English periphrastic causatives).

One can observe subtle differences in the distribution of the English and Dutch constructions over the conceptual space. For example, the Dutch constructions seem to be slightly more numerous in the right part of the plots than their English counterparts. To test whether there are statistically significant differences between the English and Dutch constructions in general, we carried out a logistic regression analysis with the language as the response variable and the standard coordinates of the exemplars in the three dimensions as the predictors. By doing so, we test whether there is an association between the language and the position of its exemplars in the conceptual space. The estimates, shown in Table 5, are the log-odds ratios of Dutch against English. If the estimate is equal to 0, there is no association between the dimension and the language. If it is positive, then Dutch has higher scores on this dimension. If it is negative, then English scores higher. The results show that the Dutch constructions have higher scores on Dimension 1

also to the predicates of change of state. Their Dutch counterparts are in the sphere of control of the animate causers. In fact, the material causers and causees, and the verbs of change of state form a very stable cluster in English with regard to all three dimensions. This suggests that material physical causation in English is a more distinct type than in Dutch.

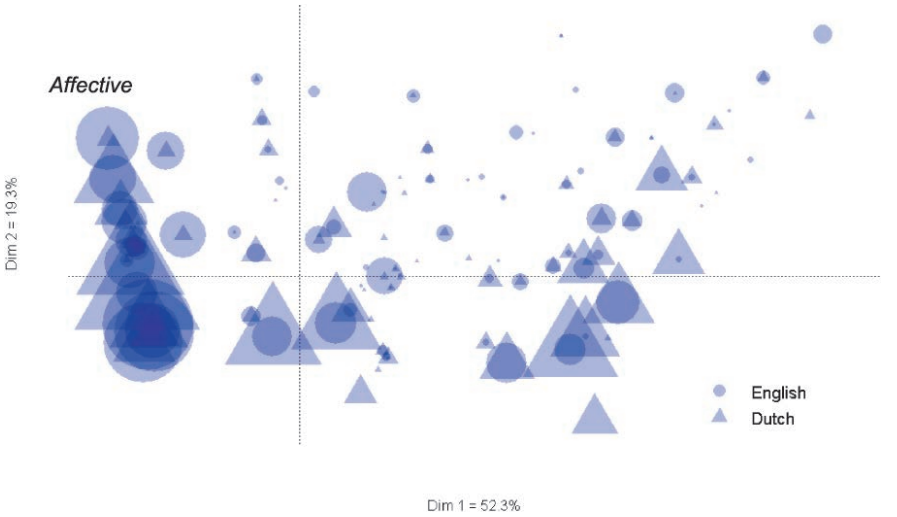

Fig. 3: Exemplars of English and Dutch causative constructions in the semantic space: Dimensions 1 and 2.

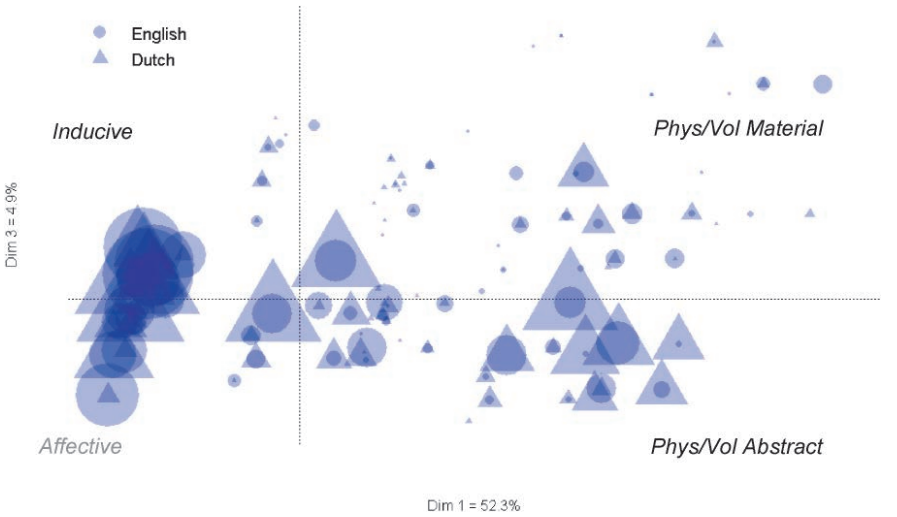

Fig. 4: Exemplars of English and Dutch causative constructions in the semantic space: Dimensions 1 and 3.

Table 5: Results of the regression analysis with the language as the response and the coordinates of the observations as the predictors.

	Estimate	*p*-value
(Intercept)	0.01	<0.001
Dimension 1	0.41	<0.001
Dimension 2	−0.33	<0.001
Dimension 3	−0.14	<0.001

(i.e., they less often have animate causees) and lower scores on Dimension 2 (they are less direct). The Dutch constructions are also lower on Dimension 3 and therefore denote more abstract causation. The very low *p*-values show that these differences are statistically significant.

However, these results should be put into the right perspective. In fact, the predictive power of the regression model is small, with the concordance index $C = 0.63$ (ranging from 0.5, when prediction is random, to 1, which indicates a perfect prediction). Another measure, Nagelkerke R^2, is only 0.09 (with a range from 0 to 1). Thus, the differences that we found are statistically significant, but do not account for all crosslinguistic variation.

After this general overview, we zoomed in on the constructions with the specific causative auxiliaries. For the English data, we plotted all exemplars with *cause*, *get*, *have* and *make* in the conceptual space (see Figures 5 and 6). One can see that *make* is not only the most frequent auxiliary, but it is also very broad semantically, although it is especially frequent in the area of affective causation. It also yields somewhat to *have* and *get* in the inducive causation area, and to *cause* in the physical causation area. This general picture corroborates to a large extent the findings in Stefanowitsch (2001). Interestingly, *have* and *get* overlap in the inducive area but have different semantic extensions: *have* appears also in the affective area, whereas *get* extends mainly in the direction of volitional causation with the inanimate causee.

A similar analysis was carried out for the Dutch *doen* and *laten*. Figures 7 and 8 display the exemplars of the constructions with the two auxiliaries. As it was suggested in previous research, the main distinction between the two lies in the directness or indirectness of causation captured by Dimension 2. Although the areas occupied by *doen* and *laten* substantially overlap, the top area in Figure 7 (affective and physical causation) is populated mainly by the exemplars of *doen*, while *laten* dominates in the lower part with inducive and volitional causation.

From these maps (and also a few additional crosslinguistic maps) we conclude that the semantic areas occupied by the Dutch and English causative auxiliaries are unique. The closest correspondence is found between *doen* and *cause*,

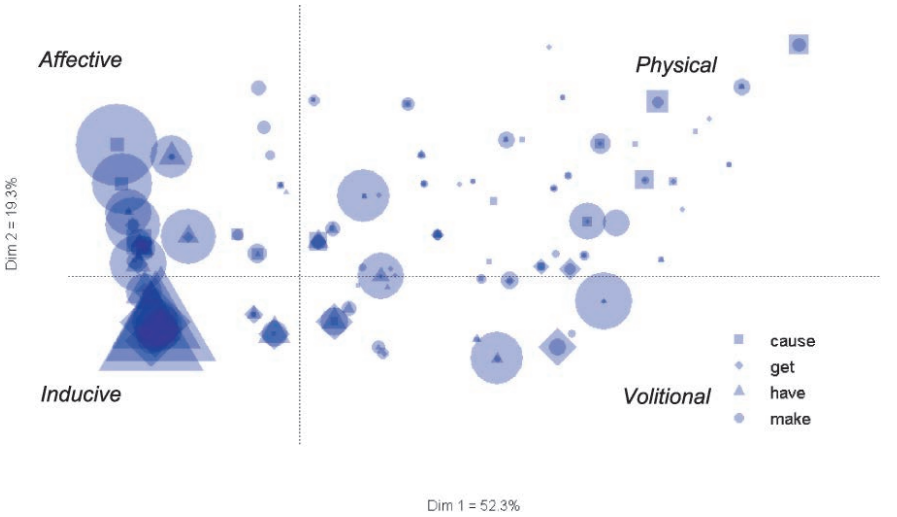

Fig. 5: Exemplars of English *cause*, *get*, *have* and *make*: Dimensions 1 and 2.

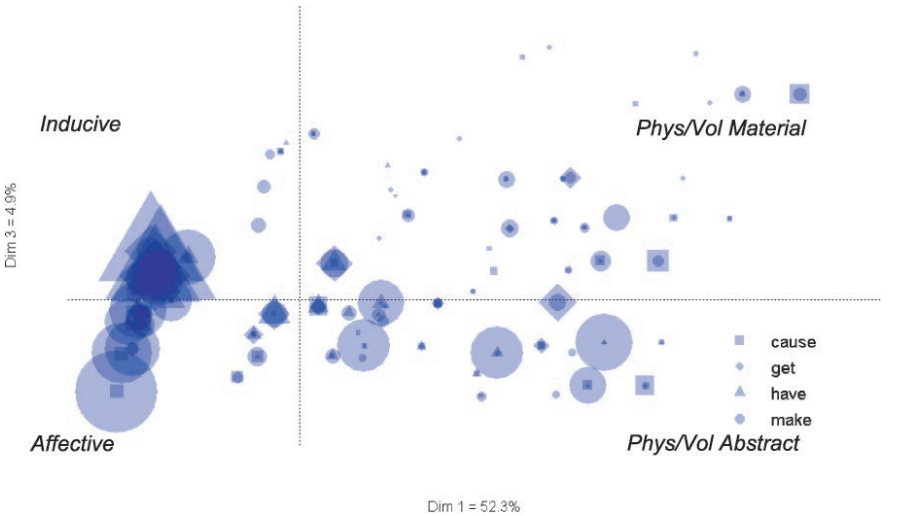

Fig. 6: Exemplars of English *cause*, *get*, *have* and *make*: Dimensions 1 and 3.

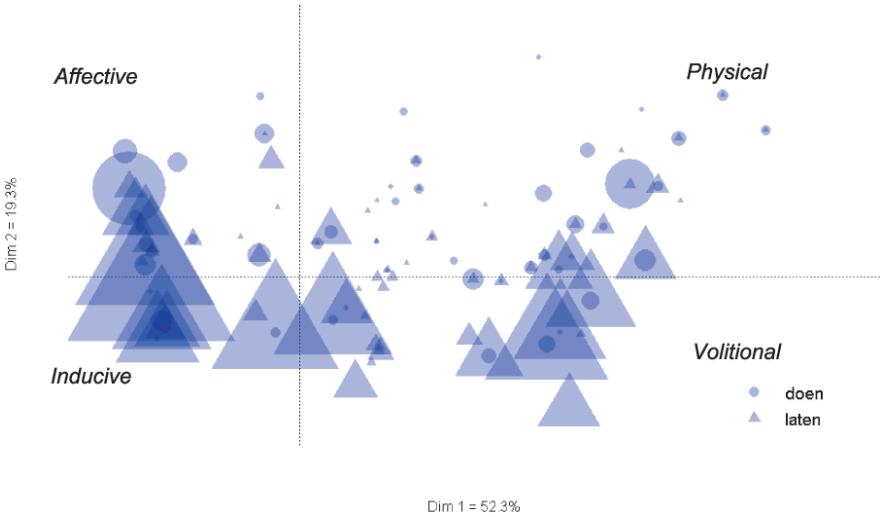

Fig. 7: Exemplars of Dutch *doen* and *laten*. Dimensions 1 and 2.

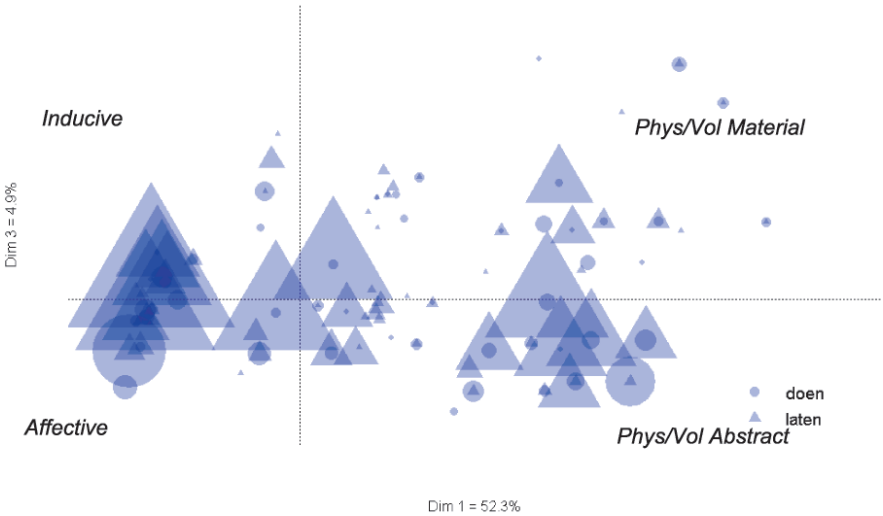

Fig. 8: Exemplars of Dutch *doen* and *laten*. Dimensions 1 and 3.

but the strong attraction of *doen* towards affective causation is not shared by *cause*. These two constructions have a similar range of referential application but different weights of specific meanings.

At the most fine-grained level of our analyses, we studied the less schematic constructions – combinations of a specific auxiliary, a syntactic type of the causee, and (for the English causatives only) a form of the effected predicate. Figures 9 and 10 show the average positions of the constructions alongside their "parents", the auxiliary-specific constructions. Their coordinates were predicted on the basis of the positions of their exemplars. These average positions can be regarded as a kind of an abstract prototype of each construction. The size of the labels reflects the frequencies of the constructions in the data set.

The plots in Figures 9 and 10 suggest that the semantic features of the Dutch subconstructions are more predictable than those of their English counterparts. The "children" of *doen* and *laten* with the implicit and explicit NP-causees are nicely aligned along the dimensions. The English subconstructions, especially the ones with *have* and *get*, behave in quite idiosyncratic ways. It also seems that the syntactic expression of the causee – implicit, explicit NP or PP – plays a smaller role in English than the form of the effected predicate. This leads us to conclude that the English constructions are not only less integrated in the simple clause structure (Verhagen 2007), but are also more idiomatic and less predictable from their components than their Dutch counterparts. How this fact is related to the greater diversity and lower individual frequencies of the English constructions requires further investigation.

We were able to observe some crosslinguistic correspondences at the level of constructions, albeit not strict ones. Figures 9 and 10 allow us to compare only the average positions of the subconstructions, so we had to build a few more maps with their exemplars, which are not presented here due to space limitations. One of such correspondences is between *laten_Impl_V* and the passive constructions with *have* and *get*. However, the correspondence is not perfect, because *laten_Impl_V* is also widely used in the situations related to human communication, as in (19):

(19) *De minister liet weten dat hij ontslag neemt.*
the minister let know that he resignation takes
'The minister informed that he resigns.'

Another pair of similar constructions is *get_NP_Ving* and *laten_NP_V,* although the latter is much broader. The rare and semantically specific constructions *make_Impl_Ved* and *laten_aan_V* occupy very similar regions. However, *make_*

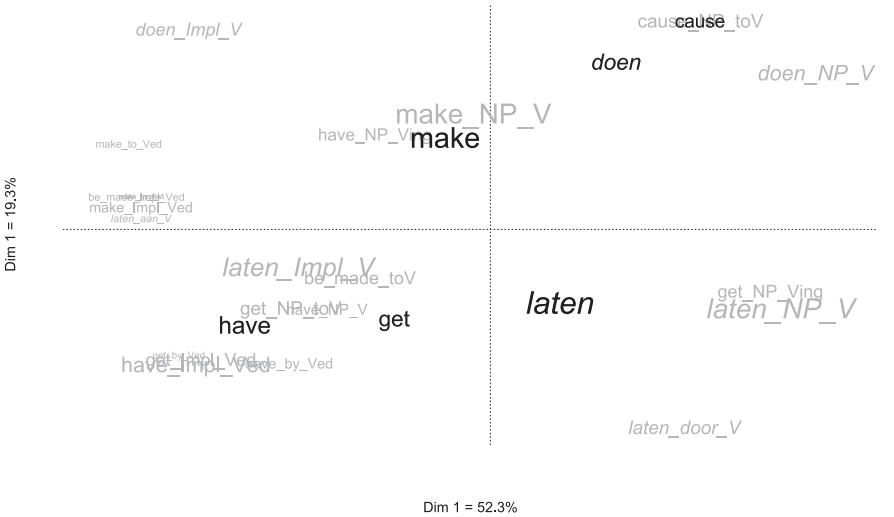

Fig. 9: Average positions of English and Dutch causative constructions in the semantic space: Dimensions 1 and 2.

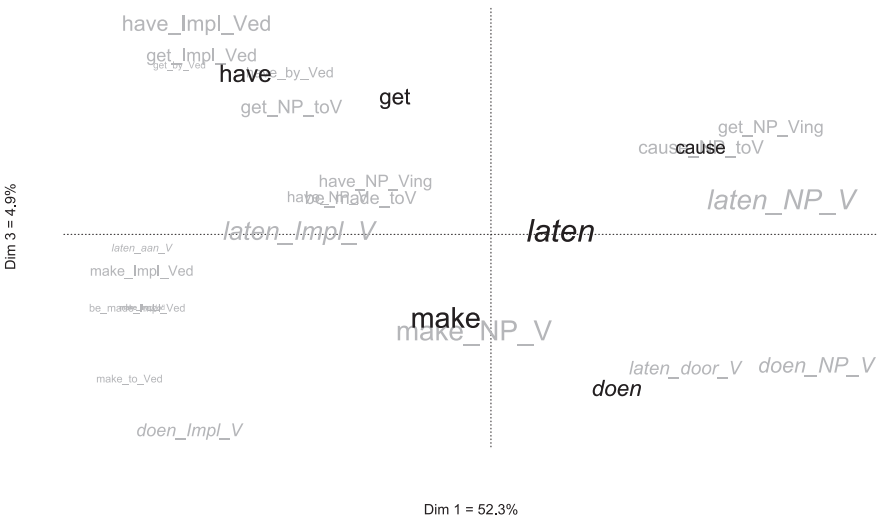

Fig. 10: Average positions of English and Dutch causative constructions in the semantic space: Dimensions 1 and 3.

Impl_Ved construes the situation from a different perspective from *laten_aan_V*, backgrounding both the causer and the causee.

Thus, the English and Dutch constructions at different levels of specificity "cut" the conceptual space in very different ways. At the same time, there are striking crosslinguistic commonalities in the form-meaning mapping. First, one can observe that animate causees in both languages have a higher chance of being left implicit or marked with a preposition (see the left part of the maps) than inanimate ones (the right part). A possible reason for the implicitness of animate causees can be the familiarity of the cultural scenarios with animate participants, which allows for backgrounding many details of human-to-human interaction (cf. Gilquin 2010: 75). A vivid example is a situation evoking the service frame:

(17) . . . *I had my hair styled and my make-up done, and then tried on lots of different outfits.*

As for the prepositional marking of animate causees, it can be motivated by the specific roles of the addressee or agent played by human beings in affective and inducive causation, respectively.

Dimension 2 mainly opposes the more direct causation expressed by *cause*, *make* and *doen* and auxiliaries that are associated with less direct causation: *have*, *get* and *laten*. All their constructional "children" with the prepositions *by* and *door* are located at the bottom of the plot in Figure 9. The constructions marked with the dative *to* and *aan* have middle positions according to Dimension 2. This corresponds to Kemmer and Verhagen's (1994) crosslinguistic hierarchy of the causee's affectedness (and, consequently, of directness of causation) expressed in syntactic marking. According to this hierarchy, the least affected causees may have an instrumental marker, the more affected causees tend to have dative markers, and the most affected causees have zero marking (or default direct object marking).

5 Conclusions

In this paper we have demonstrated a usage-based probabilistic method of creating a common conceptual space of semantically related constructions in different languages. This conceptual space can serve as a basis for studying the crosslinguistic correspondences between the constructions and for examining the similarities and differences in the form-meaning mapping in the contrasted languages. We have shown that such a conceptual space can be formed by co-occurring semantic classes of verbal and nominal slot fillers in constructional exemplars.

These classes were also used as the semantic features of the exemplars, according to which the latter were mapped onto the conceptual space.

The analysis of the conceptual space of the English and Dutch causatives has shown that three main dimensions explain a large proportion of the variance. The semantic distinctions associated with the dimensions are those between animate and inanimate causees, animate and inanimate causers and abstract and material causation. The distinction between the animate and inanimate causers also correlates with the distinction between indirectness and directness of causation expressed as the active or passive role of the causee in bringing about the caused event. This abstract force-dynamic distinction was pinpointed with the help of the semantic classes of effected predicates. The two first dimensions form the space that corresponds to the four types of causation (affective, physical, inducive and volitional) found in the literature (e.g., Verhagen and Kemmer 1997). However, the importance of the third dimension shows that these four types may not be sufficient. We have observed a contrast between the material and abstract subtypes of "physical" causation. In addition, the causation types are not discrete areas on the map: they form a continuum. All this demonstrates that empirical probabilistic approaches like the one presented here should be used more extensively in Cognitive Semantics.

Mapping the exemplars of the English and Dutch constructions on the semantic maps has revealed that the semantic areas and their salience (evaluated as density of the exemplars on the maps) are very similar in the two languages. At the same time, there are subtle yet significant differences. On average, the Dutch analytic causatives refer to more indirect and abstract causation with fewer animate causees than their English counterparts. The question whether these effects hold for the entire language or are typical of the newspaper register only, is left for future research.

The semantic maps with specific constructions reveal that the languages "cut" the conceptual space in unique ways. This means that there are no strict crosslinguistic equivalents, although many constructions do overlap substantially. There seems to be a tendency towards more equivalence as we move from the most general causatives (the ones specified at the level of the auxiliaries only, e.g., all causative constructions with *make*) to the more specific level (e.g., *make_NP_Vinf*). Our hypothesis is that the chances of finding equivalents increase with the level of constructional specificity.

In spite of the lack of strict correspondences between the English and Dutch constructions, we have found some commonalities and regularities in the form-meaning mapping in the two languages, although the Dutch constructions seem to be more predictable than the English ones (the greater diversity and lower frequencies of the latter may suggest their higher idiomaticity). In both lan-

guages, the constructions with prepositionally marked and implicit causees (e.g., *have_Ved* and *have_Ved_by*) are strongly associated with animate causees. This can be explained by a variety of non-patient roles played by the human causees (most notably, the roles of the addressee or agent), as well as by a higher entrenchment of the scenarios with human participants in our culture. The second conceptual dimension, which relates to the opposition between directness and indirectness, corresponds to the crosslinguistic hierarchy of affectedness marking (Zero > Dative > Instrumental) proposed in Kemmer and Verhagen (1994). All this demonstrates that the form of constructions in different languages is motivated, even though it cannot be fully predicted. In this sense, our results support the constructional approach to language.

Needless to say, our analyses provide only a bird-eye view of the vast and intricately organized constructional spaces. A study of the constructions at the finer levels of granularity could yield interesting results and make the picture more complete. The same can be said about additional semantic and contextual variables, which could help in discovering other dimensions of constructional variation. Yet, we hope that our approach has brought to light some new facts about the analytic causatives in English and Dutch, and charted a path to the quantitative corpus-based analysis of constructional spaces.

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Appendix 1. Dimensions of the multiple correspondence analysis.

dim	value	%	cum%	scree plot
1	0.110412	52.3	52.3	************************
2	0.040648	19.3	71.6	*********
3	0.010276	4.9	76.5	**
4	0.000285	0.1	76.6	
5	00000000	0.0	76.6	
6	00000000	0.0	76.6	
7	00000000	0.0	76.6	
8	00000000	0.0	76.6	
9	00000000	0.0	76.6	
10	00000000	0.0	76.6	
11	00000000	0.0	76.6	
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Total:	0.210933			

Appendix 2. Contributions of the semantic features to the first three dimensions of the multiple correspondence analysis.

Sem Feature	Contribution to Dim 1	Contribution to Dim 2	Contribution to Dim 3
Cr.Abstr	0.001	0.047	0.013
Cr.Anim	<0.001	0.025	0.001
Cr.MatObj	0.007	0.023	0.021
Ce.Abstr	0.082	0.007	0.012
Ce.Anim	0.046	<0.001	<0.001
Ce.MatObj	0.034	0.013	0.023
V.Aspect	<0.001	<0.001	0.001
V.Body	0.001	0.010	0.002
V.ChPoss	0.003	0.002	<0.001
V.ChState	0.031	0.012	<0.001
V.Create	0.007	0.007	0.004
V.Exist	0.010	<0.001	0.001
V.Intel	0.016	0.008	0.002
V.MentInfl	0.004	0.008	0.003
V.Motion	0.019	0.004	0.004
V.Oth	0.002	0.007	0.002
V.GetInfo	0.013	<0.001	<0.001
V.Phenom	0.030	0.003	<0.001
V.PhysManip	0.006	0.004	0.002
V.Psych	0.009	0.018	0.007
V.SocInter	0.010	0.003	<0.001