

# Metaphorical Heads and Literal Dependents: Syntactic Properties of Metaphors in German

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## Abstract

In this paper we examine the way metaphors are expressed in language. Our starting hypothesis is that the two expressions that are central to metaphor – namely the metaphorical expression and the expression that represents the target of the metaphorical transfer – typically stand in a syntactic dependency relation: metaphorical heads govern literal dependents. An analysis of German sermons with 30k words confirms that the hypothesis applies in 67% of the cases. 10% show the reverse relationship and in 23% there is a common ancestor.

## 1 Introduction

According to Lakoff and Johnson (1980), metaphor is a basic cognitive phenomenon in which a (simpler) concept is used to make another (more complex) concept comprehensible. The two concepts come from different domains, typically the simpler concept is more concrete, more physical, and the more complex concept is more abstract. In our work, we are interested in the way metaphors are expressed in language (and we refer to metaphorically-used expressions also as “metaphors”).

The transfer from one domain to another results in a semantic “clash” typical of metaphors, in which semantically (actually) incompatible expressions collide. (1) and (2) are examples of this: *Völker* ‘peoples’ is normally not a possible attribute of *Meer* ‘sea’ (see the highlighted expressions in the English translation). Similarly, an (abstract) soul cannot be nourished.

- (1) *jedes Gesicht im Meer der Völker wird uns erfreuen wie das Gesicht eines Freundes* (P4150, s48)<sup>1</sup>

<sup>1</sup>Source: sermon ID = P4150; sentence ID = s48 from <https://gitlab.ruhr-uni-bochum.de/comphist/predigtenkorpus>, (Dipper and Roussel, 2024).

‘every face in the sea of peoples will delight us like the face of a friend’

- (2) *wie uns Gottes Güte ganz nah kommt und unsere Seele satt wird* (P5714, s80)  
‘how God’s goodness comes very close to us and our soul is full (nourished)’

Following the terminology of Lakoff and Johnson (1980), we refer to the semantic domain of the metaphorical, transferred expression (*sea; full*) as the source domain and the semantic domain into which it is transferred (i.e. the domains of *peoples; soul*) as the target domain. We call the corresponding expressions source-domain and target-domain expressions, or source and target expressions for short.

If a source expression is transferred, this means that suitable properties of it are transferred to the target expression. For example, in (1) this could be the property of the sea to be composed of countless individual parts (the waves) that are difficult to distinguish. ‘Every face in the sea of peoples’ could then mean: ‘Every face in the anonymous, indistinguishable mass of peoples’.

The transferred property is called *tertium comparationis*, which is sometimes explicitly mentioned in the text, but often has to be inferred by the listener. (1) could be reformulated as follows to make the tertium comparationis explicit: The peoples are like the sea, insofar as individual faces are as indistinguishable as individual waves.

This paper examines the syntactic properties of metaphors in German. The focus is on the expressions that cause the semantic clash and thus trigger the metaphorical interpretation. Our hypothesis is that these expressions typically stand in specific syntactic relations: typically, the source-domain expression is the syntactic head of the target-domain expression, which functions as the dependent.

This paper investigates this hypothesis using German data from sermons that has been automatically

enriched with Universal Dependencies and additionally manually annotated for metaphors.

## 2 Related work

In the framework of Construction Grammar (CxG), Croft (1993) and especially Sullivan (2009) investigated relations between source and target expressions. The generalization here is that source expressions tend to be conceptually-dependent elements, while the target expressions are conceptually-autonomous elements – i.e. the dependencies would be exactly the opposite of what I claim. However, “dependency” is defined semantically in this framework and thus differently than in syntax: Autonomous elements are those that can be conceptualized on their own. The meaning of dependent elements, on the other hand, depends on the conceptualization of another element. Thus, for example, verbs are typically (semantically) dependent on their subject, which plays the role of an (obligatory) agent or actor, as in (3) (from Sullivan, 2009). In any syntactic analysis, however, the relationship would be reversed: the verb would be the head and the subject the dependent.

(3) *The cinema beckoned.*

In the CxG framework, one and the same syntactic construction can come with different semantic dependencies. For instance, adjective–noun constructions can be instances of “predicating modifier constructions” (as in (4a)) or “domain constructions” (as in (4b)). In (4a) the adjective is considered dependent (and metaphorical), in (4b) the adjective is considered autonomous (and literal).

(4) a. *bitter thoughts*  
b. *political game*

To our knowledge, the question of the *syntactic* relation between the source and the target expression has not yet been systematically investigated. However, it is noticeable that many works on the analysis of metaphors focus on typical head–dependent relations, in particular verb–subject (V+S), verb–object (V+O), adjective–noun (A+N) and subject–predicative (S+Pred) pairs (i.e. copula constructions). (5) shows examples of these relations (from Krishnakumaran and Zhu, 2007). Table 1 lists a number of relevant works and the metaphor structures examined in them.

(5) a. V+O: *He planted good ideas in their minds.*

b. A+N: *He has a fertile imagination.*

c. S+Pred: *He is a brave lion.*

Table 1 also shows that some studies are limited to pre-selected lemmas. For example, Turney et al. (2011) selected a total of five adjectives for the A+N pairs (*dark, deep, hard, sweet, warm*), which were combined with typical nouns, such as *dark glasses* or *dark mood*.

In pairings with verbs, it is the verb which is potentially metaphorical in general and the subject or object is literal. In the A+N pairs, the adjective is usually the metaphor candidate and the noun is literal (as in example (4a)). This is probably due to the fact that the adjectives were often carefully selected to be concrete, perceptible qualities and, hence, to have clear metaphorical potential.

## 3 Corpus

### 3.1 Data

For this study, we use 15 randomly-selected Protestant German-language sermons with almost 30k tokens. The sermons come from a corpus compiled by Dipper and Roussel (2024). They are based on different Bible texts and some of the sermons have been created for special occasions such as baptisms or golden confirmations.

We automatically enriched the sermons with lemmas, word types (STTS and UPOS) and dependencies according to UD (see Section 3.2 for details).<sup>2</sup>

We also manually annotated the sermons with information on metaphors (see Section 3.3 for details of the annotations). The curated versions form the basis for the analysis in this paper.<sup>3</sup>

Table 2 lists the basic statistics for the analyzed data. The sermons differ greatly in terms of overall length (1,249–3,121 tokens). This is partly due to the fact that the Bible text discussed in the sermon is only sometimes included in the sermon itself. But the length of the sentences also varies greatly, from 1–105. A typical sentence of length 1 is the word “Amen” at the end of the sermon.

### 3.2 Universal Dependencies

Universal Dependencies (UD, de Marneffe et al., 2021) is a universally applicable framework for

<sup>2</sup>Lemma, STTS, UPOS: Stanza with model `de_gsd_charlm` from Qi et al. (2020); dependency relations: `3_mhg_modg` from Haiber (2024).

<sup>3</sup>The data is made freely available at [https://gitlab.ruhr-uni-bochum.de/comphist/syntaxfest2025\\_metaphors](https://gitlab.ruhr-uni-bochum.de/comphist/syntaxfest2025_metaphors).

Study	Structures considered	Lemmas considered
Krishnakumaran and Zhu (2007)	S+Pred; V+O; A+N	all
Turney et al. (2011)	V; A+N	A, V: selection
Shutova et al. (2013)	V+S; V+O	all
Gandy et al. (2013)	S+Pred; V+O; A+N	N: selection
Tsvetkov et al. (2014)	V; A+N	V: selection (EN data)
Bizzoni et al. (2017)	A+N	A: selection

Table 1: Syntactic structures of metaphors examined in the respective studies (V: verb; S: subject; O: object; Pred: predicative; A: adjective; N: noun). The “Lemmas considered” column indicates whether only a selection of predefined lemmas were taken into account.

Statistics	Mean	SD	Min	Max
#tok/doc	1,989.7	450.9	1,249	3,121
#sent/doc	114.3	26.7	83	188
#tok/sent	17.4	12.6	1	105

Table 2: Basic statistics about the corpus: mean, standard deviation, minimum and maximum of different measures. The total number of tokens is 29,846.

syntax analysis in the form of dependency relations. These relations exist between two words, one of which is the head and the other the dependent. The relations are labeled with the syntactic function of the dependent in relation to the head, e.g. a noun can act as the subject (nsubj) of a verb head or an adjective acts as the modifier (amod) of a noun head. A special feature of UD is that content words (and not function words) are the heads, as function words are less universal than content words and depend rather heavily on the individual language.

The UD principles are spelled out on a language-specific basis. For our analysis, we use the scheme for German presented in Dipper et al. (2024a).

For many relations (such as verb–argument relations, head–modifier relations), the hierarchical structure of the dependencies is undisputed. An exception are copula(-like) constructions of the form *A is B* – which is the canonical form of stating conceptual metaphors, such as ARGUMENT IS WAR (Lakoff and Johnson, 1980). According to the official UD guidelines, only certain lemmas (e.g. English *be* or German *sein* ‘be’) may function as the verb in a copula construction, and the predicative is analyzed as the head of the construction. Constructions with the lemma *become* (as in *A becomes B*)

are analyzed differently: here the verb is the head and the predicative is an argument of it. In Dipper et al. (2024a), however, German *werden* ‘become’ is also analyzed as a copula verb, since copula *sein* and *werden* share many grammatical properties.

Since we follow Dipper et al. (2024a) in our data, we analyze the adjective *satt* ‘full’ as a predicative and head in example (2), which of course influences the evaluation of head–dependency relations.

### 3.3 Annotations

The majority of metaphors in language are conventionalized and typically do not stand out at all. We are particularly interested in a subset of metaphors: *deliberate metaphors* in the sense of Steen (2008). These are metaphors which are used *as* metaphors and of which speakers and listeners are likely aware.

In Dipper et al. (2024b), guidelines for the annotation of deliberate metaphors are presented.<sup>4</sup> We use a slightly modified version of these guidelines, which are briefly described below.

Deliberate metaphors are a rather common phenomenon in sermons. This is one of the reasons why we annotate sermons.

**Deliberate metaphor** We annotate all deliberate metaphors in the complete sermon. For this purpose, all metaphorical expressions are labeled and all expressions within a clause that belong to the same metaphorical image are additionally linked to each other so that they form a chain. The labels distinguish between expressions that are central to the metaphorical image (labeled as center) and those that are less central (MRW for “metaphor-related

<sup>4</sup>These guidelines were evaluated on four German TEDx talks, using the  $\gamma$  agreement measure (Mathet et al., 2015), with  $\gamma$  scores of 0.35, 0.43, 0.49 and 0.56. For details, see Dipper et al. (2024b).

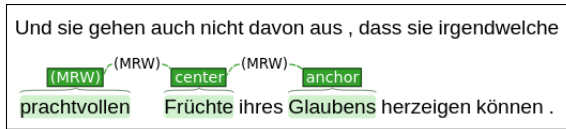


Figure 1: Annotation of a metaphor, with center, MRW and anchor, see example (6) (screenshot of INCEPTION).

word”, after Steen et al., 2010). The chain also includes expressions of the target level to which the metaphorical transfer takes place and which participate centrally in the semantic clash between source and target expressions. The target expressions are annotated with the label anchor.

Figure 1 shows the annotation of (6) as an example. The annotation was created with the tool INCEPTION (Klie et al., 2018). The corresponding biblical text is the parable of the vine, which is often referred to in that sermon. In the example, *Früchte* ‘fruits’ is annotated as the center, as they are meant metaphorically as a positive yield of faith. The adjective *prachtvoll* ‘gorgeous’ belongs to the image of fruit and is therefore annotated as MRW. The semantic clash occurs between *Früchte* ‘fruits’ and *Glauben* ‘faith’, since the abstract faith cannot produce real fruits.<sup>5</sup> The edges of the chain are labeled with MRW to distinguish them from other chain types.<sup>6</sup>

- (6) *Und sie gehen auch nicht davon aus, dass sie irgendwelche prachtvollen Früchte ihres Glaubens herzeigen können.* (P5634, s101)  
 ‘Nor do they [= certain Christians] assume that they can show off any magnificent fruits of their faith.’

An important difference between the annotation of source and target expressions is that we annotate all source expressions, while from the target domain we only annotate those expressions that are directly affected by the metaphor, e.g. because they are the target of the metaphorical transfer. Of these target expressions, we only annotate the

<sup>5</sup>It would also be conceivable to include the verb *herzeigen* ‘show off’ in the chain as MRW. The annotators have decided against this, possibly because the base verb *zeigen* ‘show’ can be regarded as semantically faded.

<sup>6</sup>We use default labels both for the non-central MRW expressions and for the edge labels. Such default labels are displayed in brackets in INCEPTION: (MRW).

head.<sup>7</sup> This means that the number of expressions annotated as metaphorical cannot be meaningfully compared directly with the number of anchor expressions.

The chains are usually restricted to a clause, since we are interested in syntactic relations and these are restricted to clauses.<sup>8</sup> However, metaphorical images often extend over several subordinate clauses. In many cases, though, the link between the clause-internal chains is established in the text itself by anaphoric reference, as in (7), see Figure 2 for the annotations. We encode anaphoric relations by means of coreference links. In Figure 2, the first chain is <opens-up, understanding> (marked in brown), the second chain is <that [= understanding] + us + carry> (in green). The coreference link connects the antecedent *Verstehen* ‘understanding’ with the relative pronoun *das* ‘that’ and is also marked in green, with the labels (Coref); this label is also used for the chain edges.

- (7) *In manchen Momenten öffnet sich ein tiefes Verstehen, das uns tragen kann und eine Hoffnung gibt, über die Stunde und über den Tag hinaus.* (P5151, s53)  
 ‘In some moments, a deep understanding opens up that can carry us and gives us hope beyond the hour and beyond the day.’

Note that the part *und eine Hoffnung gibt* ‘and gives us hope’ is not annotated in Figure (2). The reason for this is that *geben* ‘give’ is a semantically faded verb and the metaphor of giving is strongly conventionalized if not lexicalized here.

**Comparisons** In addition to canonical metaphors, there are also comparisons in which properties of one expression are transferred to another expression in a similar way to metaphors. However, comparisons are signaled overtly, usually by the expression *wie* ‘as’.

As a consequence, the syntactic structure changes so that the semantic clash no longer occurs between verb and object or adjective and noun, but between a target expression and the *as*-phrase.

<sup>7</sup>By default, all expressions that are not annotated as metaphorical belong to the target domain. Therefore, we restrict the annotation of target expressions to those expressions that trigger the semantic clash.

<sup>8</sup>There are of course syntactic relations between whole clauses and a head, e.g. between a relative clause and its antecedent or between an adverbial clause and the governing verb. The point here is that there are usually no syntactic relations between a word in an embedded clause and a word in the superordinate clause.



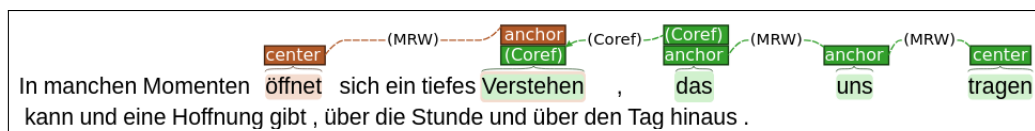


Figure 2: Annotation of a metaphor involving a coreference link, see example (7).

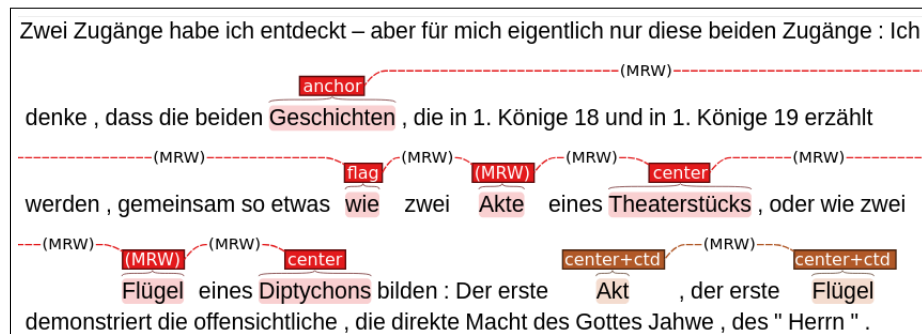


Figure 3: Annotation of a comparison, see example (8).

This phrase can be of varying complexity, either a simple prepositional phrase or a complex comparison phrase. The relation between target and source expression is typically less close in such cases.

For an example, see (8), which is about two consecutive biblical stories, both of which are about the prophet Elijah and are very different. These two stories are compared to two acts of a play or two wings of a diptych. Figure 3 shows the annotation for the example. The expression signaling the comparison is annotated as *flag*.

- (8) *Zwei Zugänge habe ich entdeckt – aber für mich eigentlich nur diese beiden Zugänge: Ich denke, dass die beiden Geschichten, die in 1. Könige 18 und in 1. Könige 19 erzählt werden, gemeinsam so etwas wie zwei Akte eines Theaterstücks, oder wie zwei Flügel eines Diptychons bilden: Der erste Akt, der erste Flügel demonstriert die offensichtliche, die direkte Macht des Gottes Jahwe, des "Herrn".* (P5157, s17)

‘I have discovered two approaches – but for me actually only these two approaches: I think that the two stories told in 1 Kings 18 and 1 Kings 19 together form something like two acts of a play, or like two wings of a diptych: The first act, the first wing demonstrates the obvious, the direct power of Yahweh God, the “Lord.”’

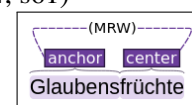
In addition to the metaphorical labels already mentioned, there are further labels for special cases.

If a metaphorical image is continued over several clauses, it can happen that there are clauses without semantic incongruities. There is a separate label *center+ctd* for this (for ‘continued’) to indicate that the chain does not contain an anchor. Figure 3 shows an example in the second part of the sentence).

Another special case is when an actually conventionalized metaphor is taken up and expanded and thus “revived”. For this we use the label *center+rvt* (for ‘revitalized’). Cases of doubt that lie between conventionalized and metaphorical use are annotated with *grey\_area*.

Finally, in German compounds the semantic clash can take place within a word, cf. example (9). The source-domain part of the compound is its head *Früchte* ‘fruits’, which is modified by the target-domain expression *Glauben* ‘faith’.

- (9) *Glaubensfrüchte* (P5634, s61)  
faith-fruits  
‘fruits of faith’



Even if chains are usually restricted to simple clauses, longer chains often result, e.g. through coordination. In the example (8) (Figure 3) there is such a coordination: ‘two acts of a play’ is coordinated with ‘two wings of a diptych’. Such cases are annotated in a common chain.

The annotation in Figure 3 also shows that it is not always possible to make a strict distinction between the different subtypes of metaphorical labels. For example, in the figure, ‘play’ and ‘diptych’

are annotated as center. One could just as well have chosen ‘acts’ and ‘wings’ as center if one considers these terms to be more central or more descriptive for the metaphorical image.

In the following analysis, we use the labels MRW for all metaphorical labels, CNT for all center labels, and ANC for the anchor labels.<sup>9</sup> The analysis differentiates between “real” metaphors, which we simply call ‘metaphors’, and explicit comparisons, which we call ‘comparisons’.

## 4 Results

The difference between (“real”) metaphors and (explicit) comparisons described in Section 3.3 allows us to examine the syntactic properties of both types separately. That is, the comparisons can be treated as a kind of control group for which we expect different syntactic relations than for the metaphors. However, there are also instances in the corpus where both forms have been annotated within the same chain – such annotations are problematic for our analysis. A clear distinction between the two variants is only possible on the basis of the label flag. Mixed chains are then incorrectly assigned to the comparison variant.

However, comparisons are much rarer in the sermons than metaphors. One reason for this is that in longer passages of comparisons we have only marked the whole block as a comparison, without further internal analysis because in such extended comparisons, the metaphorical transfer applies to discourse units rather than at the sentence level, and syntactic relations do not play a role.

We nevertheless include the rare (short) chains with explicit comparisons in the analysis of syntactic properties and dependencies.

We start with an overview of the distribution of the metaphor labels. Then we take a closer look at the parts of speech and grammatical functions involved. Finally, we look at the dependency paths between source and target expressions.

**Metaphor labels** In total, there are 1,029 annotations (374 chains) for metaphors and 80 annotations (27 chains) for comparisons in the 15 sermons. Table 3 shows the distribution averaged across the individual documents. The standard deviation is

<sup>9</sup>We consider the following labels as CNT: center, center+rvt, grey\_area, anchor|center\* (i.e. center and its variants in compounds). The label ANC subsumes the labels anchor and center\*|anchor (in compounds). The label MRW subsumes CNT plus the default label (MRW).

	Mean	SD	Min	Max
<b>#Annotations</b>				
Metaphors	68.6	41.1	13	142
Comparisons	7.3	4.3	3	17
Metaphors (%)	3.5	1.9	0.6	7.7
Comparisons (%)	0.3	0.1	0.1	0.6
<b>#Chains</b>				
Metaphors	24.9	14.4	5	51
Comparisons	2.5	1.5	1	6
<b>Chain length</b>				
Metaphors	2.8	1.0	1	7
Comparisons	3.0	1.1	1	6

Table 3: Average number of annotations and chains and average chain lengths of metaphors and comparisons in all documents. The target expressions (anchors) are included in the counts.

very high, one sermon contains a total of only 13 metaphor annotations, another 142. The differences are of course (partly) dependent on the length of the sermons. The table therefore also shows the statistics on the percentage distributions, calculated against the total number of tokens in a document. Here, too, there is a large discrepancy between the extremes: a sermon with 0.6% metaphor annotations vs. one with 7.7%. Comparisons occur very rarely overall. This skewed distribution is also reflected in the number of chains. The chain lengths (in number of chain members) mainly range between 2 and 4. Comparison chains are somewhat longer than metaphor chains.

Figure 4 visualizes the (percentage) distribution of MRW and ANC labels (i.e. source vs. target expressions) in the individual documents, sorted according to the percentage frequency of MRW labels.

For the most part, the number of MRW vs. ANC is roughly comparable. However, the sermons P5634 and P5354 have a significantly higher proportion of metaphors. In P5634, for example, this is due to the fact that the image of the vine is treated and developed very prominently in the sermon (cf. example (6)), e.g. the lemma *Weinstock* ‘vine’ appears a total of 4 times and *Frucht* ‘fruit’ 3 times as a metaphor.

Conversely, anchors predominate in other sermons. Typical target expressions in the sermons are

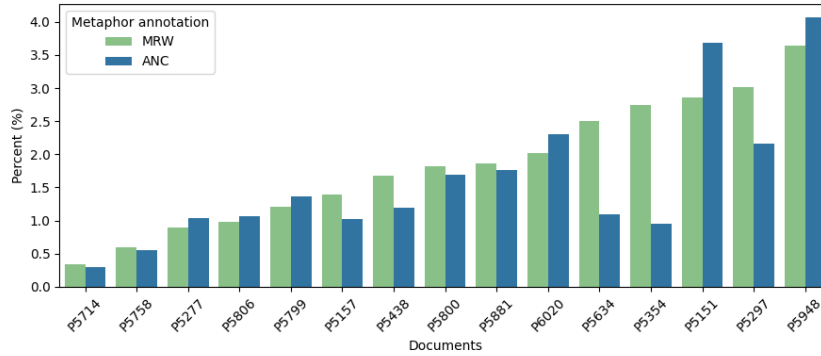


Figure 4: Metaphor (MRW) vs. anchor (ANC) annotations of all documents, sorted according to MRW percentages (“real” metaphors only, ignoring comparisons).

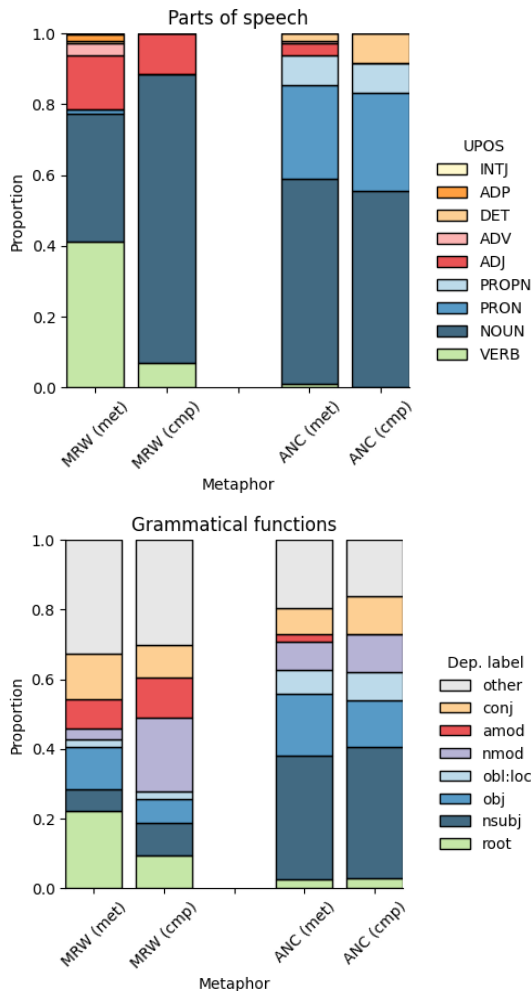


Figure 5: Part-of-speech tags (top) and grammatical functions (bottom) of MRW vs. ANC (left vs. right pairs) among metaphors (‘met’, first bar) and comparisons (‘cmp’, second bar). The bars show the proportions of the UPOS and the most frequent dependency labels.

religious expressions such as *Gott* ‘god’ or *Glaube* ‘faith’. Sermon P5151, for example, where anchors clearly predominate, is about the search for God. In a total of 8 metaphorical chains, *Gott* is the target expression.

### Parts of speech and grammatical functions

The top part of Figure 5 compares the distribution of parts of speech (according to the UPOS tagset), on the one hand between MRW and ANC, and on the other between metaphors and comparisons. One can clearly see that the anchors (right pair of bars) of both types are very similar: in both cases, the bluish noun-like tags (nouns, pronouns, proper names) clearly predominate, whereas verbs are virtually absent.

The situation is clearly different for metaphors (left pair of bars): here, verbs form the largest group with 41.2%, followed by nouns (36.1%) and adjectives (15.4%). However, the (few) comparisons – there are only 43 instances of MRW in comparisons in total – show a distribution that is rather similar to that of the anchors in that nominal categories predominate. Interestingly, there are virtually no pronouns among the metaphors.

This distribution is reflected at the level of grammatical functions (i.e. dependency labels): Figure 5 (bottom part) shows the distribution of labels that were among the 5 most frequent labels of an MRW or ANC. The anchors show typical nominal functions (nsubj, obj, obl:loc, nmod), whereas the metaphors also show verbal functions (root) in addition to nominal functions. The function amod, which is also quite frequent, marks attributive adjectives. Conjuncts (conj, within coordinations) are also found quite frequently in all distributions.

Of course, the two distributions – parts of speech

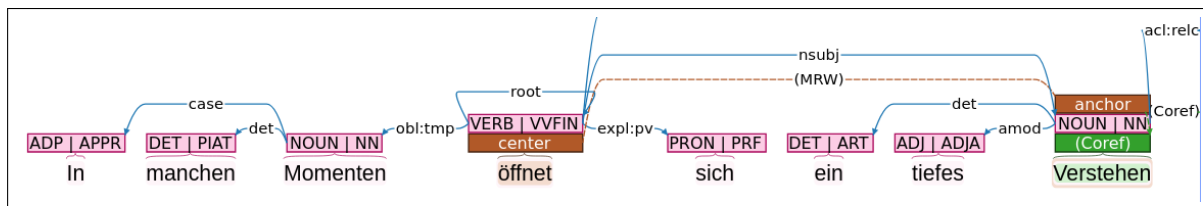


Figure 6: The dependency path CNT > nsubj > ANC between the center *öffnet* ‘opens’ and the anchor *Verstehen* ‘understanding’, see example (7) and also Figure 2.

and functions – are not independent of each other: a verb, for example, cannot function as nsubj.

Nevertheless, these findings provide initial support for the hypothesis that the metaphor is typically the syntactic head of its anchor: root is the function of the root of a sentence, i.e. the highest node of all. Functions like nsubj, obj, obl:loc, nmod are functions that depend on other words (nsubj on verbs or predicatives; obj and obl:loc on verbs; nmod on nouns).

**Dependency paths** Next, we examine what kind of dependency path exists between a center and its anchor. To do this, we only look at relations within one chain. The algorithm for determining the path between two words in a chain is as follows:

1. First calculate the paths to the root for both words. In these paths, skip conj relations (as they are only technically required in UD in order to connect several conjuncts).
2. If one of these paths is empty, this word is the root and dominates the other word. The dependency path consists of the non-empty path.
3. If both paths are not empty, but one of the paths is a real sub-path of the other, the sub-path is subtracted from the longer path. The word with the shorter path dominates the other via the remaining dependency path.
4. If both paths are not empty and neither is a true sub-path of the other, the system searches for overlaps between the two paths (i.e. nodes that dominate both words and can therefore be ignored). Intersections are deleted, the concatenated remaining paths form the dependency path between the two words. None of the words dominates the other.

Since there can be several CNT and ANC within a chain, we first calculate all paths pairwise between

all centers and all anchors of a chain, and choose the shortest of these paths as the final path. If several equally short paths exist, we extract all of them.

In total, we extracted 481 dependency paths for metaphors and 26 paths for comparisons.<sup>10</sup> Table 4 shows the paths that occur most frequently. The paths are read as follows: a path starts at a center (CNT) and leads to the anchor (ANC). ‘>’ means a dominance relation (from the head to the dependent), ‘<’ an inverse relation. Between the ‘>’ and ‘<’ operators are the labels of this relation. If the dominance operators meet like this: ‘< >’, then there is a common ancestor node (at this position in the path) that dominates both the center and the anchor (see the paths at ranks 5a and 9).

The most common path is CNT > nsubj > ANC, i.e., the anchor (a noun) functions as the subject of the center (a verb or predicative). An instance of this path is example (7), whose dependency annotation is shown in Figure 6.

Similar relations can be found on ranks 2, 5b, 7, 10a, where the anchor (a noun) is an argument or modifier of the verbal center. Or the anchor modifies a nominal center (rank 3).

The path CNT > ANC (rank 8) does not contain a function specification. These are cases of compound-internal relations as in example (9).

In the majority of these paths, the center dominates the anchor, confirming our hypothesis. An exception to our hypothesis is the path CNT < amod < ANC (rank 4), i.e. a metaphorical attributive adjective modifies an anchor noun – this configuration is frequently investigated in the literature (see Section 2). However, the reverse case, CNT > amod > ANC, also occurs (rank 10b), as also observed by Sullivan (2009) (see her examples in (4)).

<sup>10</sup>Note that some of the metaphor chains have no anchor because they are continued metaphors with the label center+ctd. Some others have no local anchor because an anchor was marked in an adjacent clause or sentence. In both cases no dependency paths could be extracted.



	Path	Freq	Perc
<b>Metaphors</b>			
1	CNT > nsubj > ANC	114	23.7
2	CNT > obj > ANC	73	15.2
3	CNT > nmod > ANC	28	5.8
4	CNT < amod < ANC	23	4.8
5a	CNT < obj < > nsubj > ANC	19	4.0
5b	CNT > obl:loc > ANC	19	4.0
7	CNT > obl:mod > ANC	17	3.5
8	CNT > ANC	12	2.5
9	CNT < obl:dir < > nsubj > ANC	9	1.9
10a	CNT > obl:arg > ANC	8	1.7
10b	CNT > amod > ANC	8	1.7
<b>Comparisons</b>			
1a	CNT < obl:mod < > nsubj > ANC	2	7.7
1b	CNT < obl:mod < > obj > ANC	2	7.7
1c	CNT < obj < > nsubj > ANC	2	7.7

Table 4: Top: The 10 most frequent dependency paths between a center (CNT) and its anchor (ANC) in metaphors, ranked according to frequency. Bottom: For comparisons, the 3 top frequent path are displayed; all other paths occur only once.

Path length	Mean	SD	Min	Max
Metaphors	1.3	0.6	0	4
Comparisons	2.3	1.0	1	5

Table 5: Average length of the dependency paths in all documents, measured as the number of edges between the center and the anchor. A length of 0 indicates compounds.

Other exceptions are the paths on ranks 5a and 9, in which the center and the anchor have a common ancestor.

In the comparisons, there are only three paths that occur more than once. In general, the paths in the comparisons are heterogeneous and tend to be longer than in the metaphors, see Table 5.

Overall, the paths in which the center dominates the anchor clearly predominate, see Table 6: in 2/3 of the metaphors, the center is the syntactic head of the anchor. In the control group, the comparisons, the largest group is the mixed group.

Metaphor type	C>A	A>C	Mixed
Metaphors (%)	66.5	10.4	23.1
Comparisons (%)	19.2	3.8	77.0

Table 6: Proportions of the different path types in metaphors and comparisons. ‘C>A’: center dominates anchor; ‘A>C’: anchor dominates center; ‘Mixed’: center and anchor have common ancestors.

## 5 Conclusion

The annotations in the sermons have confirmed the hypothesis that centers are typically the syntactic head of anchors. Counterexamples concern attributive adjectives, which, however, occur in both constellations. The result for the adjectives corresponds to the study by Sullivan (2009). A semantic analysis according to Construction Grammar would show whether the lemmas involved are instances of dependent vs. autonomous elements, as illustrated in example (4). In contrast to the study by Sullivan (2009), however, many of the (syntactic) dependency paths between source and target expressions are considerably more complex than the rather simple CxG construction types. This indicates that the dependency relations cannot be easily mapped to the constructions investigated by Sullivan (2009). It must therefore remain an open question whether an explanation in terms of CxG based on semantic properties (dependent vs. autonomous) could explain the syntactic properties.

A possible purely syntactic explanation could be that a syntactic head is more prominent than a dependent and, therefore, a (deliberate) metaphorical expression, which possibly requires more processing efforts than literal expressions, can be processed more easily in such a salient position.

Irrespective of this, the observations from this study may be useful for the automatic recognition of metaphors, by restricting the search space.

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