FROM CONNECTIVES TO COHERENCE RELATIONS: A CASE STUDY OF GERMAN CONTRASTIVE CONNECTIVES

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Abstract. The notion of *coherence relations* is quite widely accepted in general, but concrete proposals differ considerably on the questions of how they should be motivated, which relations are to be assumed, and how they should be defined. This paper takes a "bottom-up" perspective by assessing the contribution made by linguistic signals (connectives), using insights from the relevant literature as well as verification by practical text annotation. We work primarily with the German language here and focus on the realm of *contrast*. Thus, we suggest a new inventory of contrastive connective functions and discuss their relationship to contrastive coherence relations that have been proposed in earlier work.

Keywords: coherence relation, connective, contrast, concession, corpus analysis.

1. INTRODUCTION

Coherence, as a property of a text (or, from a cognitive viewpoint, the result of a reader's interpreting a text), is often divided into the complementary notions of *global* and *local* coherence. The former denotes the unity of the text as a whole, which achieves a certain purpose and adheres to the conventions of its genre, while the latter refers to the connectivity of adjacent sentences. This, in turn, is for the most part determined, on the one hand, by cohesion (which we define as the grammatical and lexical means of signalling the "hanging together" on the text surface) and, on the other hand, by an underlying semantic or pragmatic connection, which is called a *discourse relation* or, henceforth, *coherence relation*. These relations, which have been studied extensively in pragmatics and also in computational linguistics, will concern us in this paper. Consider the following pair of examples from Hobbs (1979):

(1) Tom bought a ticket to Istanbul. He has family there.
(2) Tom bought a ticket to Istanbul. He likes spinach.

In example (2), while readers might be able to come up with an explanation as to why the two sentences make sense together (Istanbul might be well-known for its annual big spinach festivity, or something similar), it is considerably more difficult than in (1). Still, readers will usually actively work out some likely relationship, because they assume

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RRL, **LXV**, *3*, p. 213–233, Bucureşti, 2020

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by default that two adjacent sentences cohere. So, the difference here is gradual: while (1) suggests immediately an 'Explanation' relation, in (2) this relation is harder to establish.

As we will show in Section 2, there is, however, little agreement among researchers on what a precise inventory of such coherence relations should look like. The goal of this paper is to contribute to determining the reasons for some discrepancies, and to sketch a possible way forward by starting with describing the meanings of the linguistic signals of coherence relations. To impose a limit on this task, we address only the realm of *contrast*, which in much work on coherence relations is regarded as one among a few broad groups (*i.e.*, causal, temporal, additive, contrastive). The signals of interest here are *connectives*, a notion that we will introduce in Section 3, placing a certain focus on the German language. Due to different kinds of both ambiguity and vagueness, the relationship between connectives and coherence relations is often complicated, though. In Section 4, we show how some influential accounts of coherence relations address the realm of contrast, and which contrastive connectives the German language offers to its speakers. Against this background, Section 5 studies in detail the mapping between connectives and coherence relations. Following an investigation of the relevant literature, we propose an inventory of connective *functions* and report on its practical application by means of a corpus annotation study. Thereafter, also using the same corpus, we discuss the step from connective functions to coherence relations, and Section 6 provides conclusions.

2. COHERENCE RELATIONS

The idea of modelling text coherence by means of a set of relations that may hold between adjacent segments (clauses, sentences, or longer spans) has gained particular popularity in computational linguistics, where accounts of text structure are helpful for applications such as automatic text summarization; but they are also relevant for linguistic explanations, notably for constraining the range of possible antecedents for anaphoric pronouns (see, *e.g.*, the 'right frontier constraint'; Polanyi 1988). One of the most influential accounts in this regard is the Rhetorical Structure Theory (RST; Mann and Thompson 1988). It posits that:

- a text can be divided into its 'elementary discourse units' (clauses, sentences);
- a coherence relation, chosen from a set of about 25 types, can be assigned to neighbouring elementary units in that text; and
- the same relation types are used to also combine the resulting larger text spans recursively, until a structure that spans the complete text has been constructed.

RST divides the relation types into two groups: the majority link a unit that is most important for the author's purposes (the 'nucleus') to one that is less important and plays a supportive role (the 'satellite'). For instance, in the relation Evidence, the nucleus is the claim or thesis posited by the author, while the satellite is the material cited to support the claim:

(3) [There are dark clouds on the horizon.]$_{sat}$ [It will be raining soon.]$_{nuc}$

The second group of relations links two nuclei, *i.e.* both units are of equal importance. This is the case for Sequence (where two subsequent events are being reported) or for Contrast, which will be illustrated with examples in Section 4.

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While for most relations, the linear order of the two units can vary, some have strong tendencies: for Elaboration, the satellite (the elaborating detail) usually follows the nucleus; for Background, the background satellite (which eases the understanding of the nucleus) most often precedes the nucleus.

Another central characteristic of RST is that relations are defined by describing the author's intentions. The above-mentioned Evidence relation, for example, is characterized by the overall goal to increase the reader's readiness to accept the claim. For other relations, the intention is less pronounced; causal relations, for instance, are being employed to make the reader merely "recognize" the causal relation between two eventualities that are being reported.

This way of defining relations is in contrast to some alternative approaches, such as Segmented Discourse Representation Theory (SDRT; Asher and Lascarides 2003). The structures built for a text are formally a little different from those in RST, and the relations are defined primarily by semantic features. A more recent approach that was quite influential is the Penn Discourse Treebank (PDTB; Prasad *et al.* 2008). From the outset, it was conceived as a corpus annotation project, which by definition puts the proposals to the empirical test. The text material is from the Wall Street Journal, and annotators have labelled so-called explicit coherence relations (which are signalled in the text by a connective) as well as implicit ones (no lexical signal) and those signalled by lexical material other than a connective. In the latest version, the relations are organized in a 3-level hierarchy; the top-level consists of the four types Temporal, Contingency, Comparison and Expansion. These are differentiated into 17 relations on the second level, and the third level makes additional distinctions motivated by the respective roles of the two segments combined. Importantly, only local relations between text spans are being labelled; there is no account of an overall text structure, and hence no commitments as to its form are being made. PDTB, RST and SDRT alike have been influential in Computational Linguistics: annotated corpora are available, and many experiments with automatic analysis have been made. (For a general overview, see Stede (2011).)

Finally, we mention here the approach of the Prague Discourse Treebank (PDiT; Zirkánová *et al.* 2015), which is inspired by the PDTB and is also primarily motivated by the demands of annotating authentic texts. It is part of a large corpus framework that stacks multiple layers of annotation, with the discourse level being the topmost one. The relation inventory inherits the four abstract types from the PDTB, but it uses only one additional level, with a total of 22 relations. There are some differences compared to the PDTB types, motivated by compatibility with semantic decisions in the tradition of the Praguvian approach to grammar, and by integrating the coherence relations with the lower-level morphosyntactic annotations.

3. CONNECTIVES

As mentioned above, in the English PDTB, and also in the Czech PDiT, connectives play a central role for defining the set of coherence relations that are being used, as well as for the annotation process. The underlying assumption is that the set of connectives available in a language represents by and large the range of semantic and pragmatic links that can be established – but the same types of links can also be conveyed implicitly, *i.e.* without a connective. This is a slightly different approach than that realized in RST, where

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connectives are also recognized as important signals, but the set of relations is defined not for mirroring connective use exactly, but with the abstract goal of enumerating ways of establishing coherence – which may or may not coincide with the meaning of connectives. For example, RST distinguishes the relations Volitional-Cause and Non-Volitional-Cause, which does not correspond to any difference in linguistic connectives.

To define 'connective', we turn to the *Handbook of German Connectives* by Pasch *et al.* (2003). They propose that a word X is a connective if:

- it is non-inflectable,
- it does not assign case to its syntactic environment,
- its meaning is a two-place relation,
- the meanings of the arguments of this relation are propositional structures,
- these structures are in principle expressible as sentences.

Syntactically, then, connectives belong to the categories of coordinating and subordinating conjunctions, and adverbials. Some research also includes certain prepositions (*e.g.*, *despite*), which – at least for some languages – would violate the second (and possibly the third and fourth) criterion established by Pasch *et al.* (2003).

For various languages, inventories of connectives have been compiled; in the database www.connective-lex.info (Stede *et al.* 2019), a number of such collections are freely available online. There, every connective is characterized by a minimal syntactic description (using abstract categories that can be applied across languages (*e.g.*, coordinating or subordinating conjunction; adverbial) and, as a semantic description, the PDTB relations it can commonly express. To illustrate, the German lexicon has 274 entries; the French one 324; while the English one with 142 entries is one of the smallest[2].

Although the definition cited above might indicate a relatively clear-cut distinction, the broader question of linguistic signals for coherence relations is far from settled. In their overview, Danlos *et al.* (2018), for example, distinguish between "primary" connectives (roughly corresponding to the Pasch *et al.* definition) and "secondary" connectives, which are phrases that occur frequently and allow for a small degree of inflection or modification; examples are *for this reason* or *in this regard*. A third category mentioned by Danlos *et al.* are "free connecting phrases" which are less frequent and restricted to particular contexts, such as *due to that feeling*. The PDTB uses a category named AltLex ("alternative lexicalization") for lexical signals that do not fall under the definition of connective, and annotators have to decide whether to mark such an expression or regard a relation as implicit. Borderline cases are expressions like *two days later*, which the PDTB treats as AltLex though they are highly productive.

4. CONTRAST IN TEXT COHERENCE

In order to make the previous two sections more concrete and to prepare for a detailed study in the next section, we now focus our attention on one particular realm of relations, *i.e.* that of Contrast. It can be generally characterized as a constellation of two text spans where the second is in some adversary relation to something that can be inferred from

[2] The other languages that are currently covered are Arabic, Bangla, Czech, Dutch, Italian, Portuguese, and Ukrainian.

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the first. Describing its semantics involves negation, which can operate on the propositional or on the presuppositional level (Breindl 2004: 226). Interpreting a text passage as contrastive can be triggered when the speaker uses a contrastive connective, but in any case, the intended relationship is to be inferred from the specific context, as illustrated by this minimal pair:

(4) The meal is expensive, but it tastes well.
=> S2 "compensates" for the evaluation in S1
(5) The meal is expensive, but it doesn't taste well.
=> S2 denies an expectation to be derived from S1

As is well-known, a connective can be omitted when the context suggests a contrastive interpretation by itself, for example, when a relation of lexical antonymy is present between S1 and S2.

Every account of coherence relations offers several contrastive relations, yet their number and their definitions can be fairly different. We begin with RST (Mann and Thompson 1988). Its inventory includes three relations that belong to the realm of contrast[3].

RST-Contrast is a multinuclear relation that is to be assigned when the situations in the nuclei are comprehended as the same in many respects, differing in a few respects, and compared with respect to one or more of these differences. The goal is for the reader to recognize both the compatibility and the differences.

(6) Max goes to university, whereas his brother is still attending school.

In a neutral context, neither statement is to be taken as more "important" than the other, which is the central characteristic of a multinuclear relation.

RST-Antithesis is to be assigned when nucleus (N) and satellite (S) are also in contrast, and when due to the incompatibility one cannot have positive regard for the situations in both N and S. The writer has positive regard for N, and aims at increasing the reader's positive regard for it by making her or him comprehend S and its incompatibility to N.

The RST annotation guidelines of the Potsdam Commentary Corpus (Stede and Neumann 2014), to be introduced below, point to the special case of "correction", which German lexicalises with the specific connective *sondern*, while English uses the general *but* (ex. 8). Also, the guidelines widen the notion of "positive regard" to include a difference in relative importance, as in example (7).

(7) I bought that violin two weeks ago. But I still haven't unpacked it!

(8) Today the lecture does not start at 8 but at 9.
'Heute beginnt die Vorlesung nicht um 8, sondern um 9.'

[3] We provide here slightly abbreviated variants of the definitions given on the RST website (www.sfu.ca/rst/01intro/definitions.html).

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RST-Concession also assigns more importance or positive regard to N, and furthermore conveys that the writer acknowledges a potential or apparent incompatibility between N and S; recognizing this incompatibility increases the reader's positive regard for N.

Turning to the Penn Discourse Treebank (Prasad *et al.* 2008), its inventory also includes three relevant relations, two of which are subsumed by the top-level group Comparison, which according to the guidelines (Webber *et al.* 2019) applies "when the relation between the two arguments [of the connective] highlights their differences or similarities, including differences between expected consequences and actual ones".

PDTB-Contrast is to be used when at least two differences hold between the arguments.[4]

(9) While [the earnings picture confuses,]$_{Arg2}$ [observers say the major forces expected to shape the industry in the coming year are clearer.]$_{Arg1}$

PDTB-Concession signifies that "an expected causal relation is cancelled or denied by the situation described in one of the arguments."

(10) [It's as if investors, the past few days, are betting that something is going to go wrong]$_{Arg1}$ – even if [they don't know what.]$_{Arg2}$

The annotation guidelines add that this relation is to be used when, in a given context, the relatively narrow conditions for Contrast do not apply.

Finally, the relation **PDTB-Substitution** is a subtype of the top-level group Expansion (the narration or exposition in the text is being carried forward). Here, Substitution covers the case where the two arguments are presented as exclusive alternatives, one of which is being rejected. (This is the *sondern*-case which we described as belonging to RST-Antithesis above.)

(11) Intervention, he added, is useful only [to smooth disorderly markets,]$_{Arg1}$ not [to fundamentally influence the dollar's value.]$_{Arg2}$

While the names of the relations in RST and PDTB seem in correspondence to a good extent, the definitions and instructions in the annotation guidelines differ, and invariably lead to different decisions when the approaches are applied to authentic texts. This can be seen in the Potsdam Commentary Corpus (PCC) (Stede and Neumann 2014, Bourgonje and Stede 2020), which is a collection of 176 German news editorials annotated on different layers, including both RST and PDTB. The labelling has been done on the basis of the respective instructions, by different annotators, and with the "other" annotation layer being invisible for the annotators. When we compare the mere frequencies of contrastive relations used in the corpus (Table 1), it is clear that the relationship between the two layers is not trivial, or more precisely, that both layers appear to be rather different models of text coherence (at least with respect to Contrast).

[4] The examples for the three relations are taken from the guidelines by Webber *et al.* (2019). In the PDTB vernacular, 'Arg2' is the argument in which the connective is syntactically integrated, while 'Arg1' is the external one.

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Table 1

Frequencies of RST and PDTB relations in the Potsdam Commentary Corpus (PCC)

Annotation scheme	Relation	Frequency in PCC
RST	Antithesis	123
	Contrast	49
	Concession	124
	SUM	**296**
PDTB	Substitution	44
	Concession	328
	Contrast	78
	SUM	**450**

The final relation set we mention here is that of the Prague Discourse Treebank (Zirkánová *et al.* 2015). It borrows the level-1 categories from the PDTB (but renames Comparison to Contrast), and then subsumes seven relations under this heading; this is the most fine-grained existing proposal for contrastive relations that we are aware of. As the annotation guidelines (Poláková *et al.* 2012) point out, the "main" relations Opposition, Confrontation and Concession have been inherited from the syntactic annotation of the corpus, while four others have been added. They are briefly characterized as follows and illustrated with English examples taken from Poláková *et al.* (2012: 41):

- **Opposition:** A1 is in unspecified opposition to A2
  He asked for postponement of exams, which was not allowed to him.
- **Confrontation:** A1 and A2 confront certain properties of two components
  While wages are falling, prices are increasing.
- **Concession:** A2 is in contradiction to A1 against the expectations about the validity of A1 retrospectively implied by A2
  He has been on the dole for two months. Yet, he is not looking for a job.
- **Restrictive opposition + exception:** The content of A2 restricts the validity or scope of the content of A1 (partial unfulfilled expectations)
  I will come. I only do not know when.
- **Correction + chosen alternative:** The content of A2 is replacement or substitution for an invalid content of A1, possibly the replacement is not valid either
  It was not freezing. On the contrary, the weather became nice.
- **Gradation:** A2 expresses a higher or lower degree of quality than A1
  Not only was he uneducated. He was even completely illiterate.
- **Pragmatic opposition:** A1 and A2 are formally in opposition but the semantics is usually unclear or vague
  It is going to rain this weekend. But Czechs will block the highways anyway.

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The different types are also illustrated with lists of possible Czech connectives; generally, in the PDiT, these are an important source of the decisions in defining the relation set. The mapping on the PDTB relations is as follows: Concession and Correction correspond to Concession and Substitution, respectively, while the remaining PDiT relations represent a subclassification of PDTB's Contrast.

In summary, while there are some obvious similarities between the sets of contrastive relations, there are also non-trivial differences resulting from different goals and perspectives, and sometimes identical names are actually "false friends" because the relations are not meant to be exactly parallel. A common "kernel" could be the Concession relation, but even there, the frequencies for the PCC indicate that RST and PDTB employ it in different ways. In the next section, we try to shed more light on these discrepancies.

5. LAYERS OF ANALYSIS: CONNECTIVE LEXICOGRAPHY AND COHERENCE RELATIONS

Languages differ in their dividing the field of contrast into different parts. Focusing on English and German, we note that the aforementioned database, connective-lex.info, yields the following number of entries for the relevant PDTB relations:

- English: Contrast: 36 / Concession: 25 / Substitution: 7 / total different entries: 47
- German: Contrast: 33 / Concession: 37 / Substitution: 7 / total different entries: 67

The total number is smaller than the sum of the relations due to ambiguities, and overall, the numbers indicate that German has a considerably richer inventory of contrastive connectives. Further, since the numbers for the individual relations do not differ that much, English appears to have more versatile (or polysemous) connectives, while German tends more toward specialization.

5.1. Substitution tests

Among the different motivations for demarcating a set of coherence relations, we now focus on a decidedly empirical proposal that was made by Knott and Dale (1994): the authors compiled a list of English "cue phrases" (a class that is broader than the connectives defined in Section 3), gathered example usages from corpora, and then undertook a systematic substitution test for determining groups of similar and different cues. A cue c1 was seen as substitutable by c2 if the resulting discourse "describes the same events and achieves the same goals" as the original. Adaptations in punctuation and positioning are allowed if c1 and c2 are not syntactically parallel.

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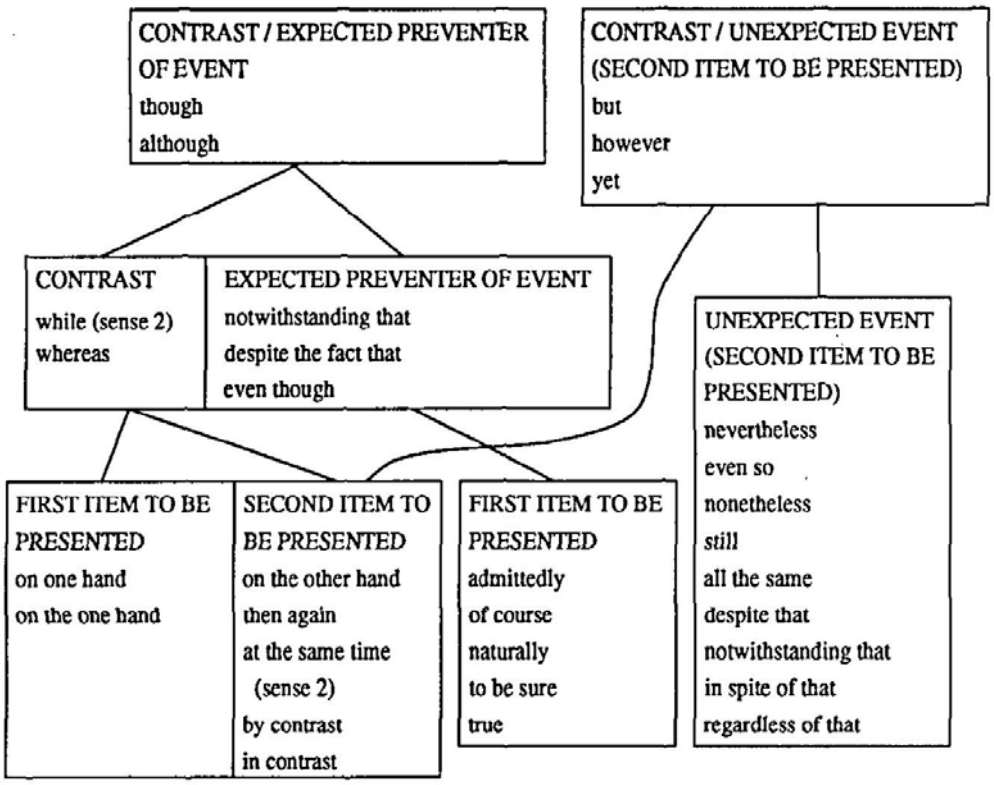


Fig. 1. Substitutability diagram for English contrastive cues (Knott and Dale 1994: 62).

The criterion for substitutability often leaves some room for interpretation, but nonetheless the approach is an elegant "bottom-up" procedure for determining the range of possible coherence relations (making the assumption that any coherence relation is expressible by an overt linguistic signal). Knott and Dale decided for every c1/c2 pair whether the latter can never or always or sometimes replace the former, and produced a series of diagrams representing the results: sets of cues and substitutability relations between them. For the realm of Contrast, the diagram is reproduced in Figure 1. Notice that the four boxes in the bottom row distinguish only between the order in which Arg1 and Arg2 are presented in the text; if we ignore this level, there remains a broad distinction between (i) the *though/although* class, which is divided into the subclasses *while/whereas* and *notwithstanding*…, and (ii) the *but/however/yet* class. We will relate this result to other observations below.

Focusing specifically on certain German contrastive adverbial connectives, in an early study we undertook the same kind of substitutability experiments on a corpus of newspaper text (Stede 2004). For six connectives, 50 samples were retrieved, and each of the 300 instances was checked for substitution by the other connectives. The outcome was a Venn diagram that is reproduced in Figure 2. Each of the five sets represents contexts, *viz.* those in which the given connective can be used; every intersection denotes contexts in

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which the connectives of the participating sets can be used. Notice that the only non-intersection is between *dennoch* (‘nonetheless’) and *hingegen* (‘in contrast’), which were argued to indeed represent incompatible subtypes of general Contrast. As the meaning of *dennoch* corresponds to the subordinator *obwohl/although*, this division seems to mirror the one described by Knott and Dale above. In Figure 2, importantly, *all* portions numbered from 1 to 11 have been filled with corpus instances, *i.e.*, all these combinations of context-equivalent connectives are claimed to be possible. This means for instance that the general *aber* can often, but not always, replace each of the three more specific adverbials; and conversely, there are contexts in which *aber* cannot be replaced by one of the specific adverbials.

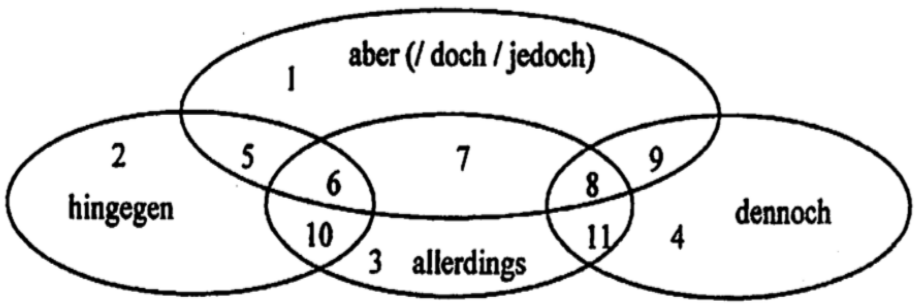


Fig. 2. Classes of contexts for substitutable German contrastive adverbials (Stede 2004: 269).

Both Knott and Dale (1994) and Stede (2004) emphasized the importance of studying representative samples of authentic text for achieving usage-based classifications. And both did not much further discuss the reasons, *i.e.*, the underlying features of contexts that are responsible for forming the classes. Here, studying corpora helps only to a certain extent, and this is where the theoretical literature on the semantics and pragmatics of connectives becomes relevant.

5.2. Semantic analyses

Of the vast linguistic literature on contrastive connectives, we consider here in particular the work that is oriented toward explaining their usage in authentic texts and contributes to answering these three questions:

- how many different readings or senses should be assigned to a connective?
- how are different connectives (or their readings) related to each other?
- can the “lexical field” of contrastive connectives be characterized exhaustively?

Aber/but. Lakoff (1971) proposed the two readings of a “semantic opposition *but*” and a “denial of expectation *but*”, and this analysis inspired much work on German *aber*. Eggs (1977) illustrated the two uses by combining *aber* with a disambiguating adverbial: *aber trotzdem* (‘but nonetheless’) for concessive, and *aber dagegen* (‘but in contrast / on the other hand’) for adversative. He then proceeds, however, to add a third reading, *viz.* an

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"evaluative" *aber dafür* (lit. 'but in compensation'). We illustrate it with an example from Abraham (1979):

(12) *Der Gelehrte ist freundlich, aber er ist ein Pedant.*

'The scholar is friendly, but he is a pedant.'

In this case, inserting *dagegen* in the German *aber/but*-sentence yields an overall odd utterance, as does adding *in contrast* to the English translation. Instead, *andererseits*/*on the other hand* seems quite possible, which therefore appears to be more versatile than Eggs' candidate marker *dagegen*. Clearly, the example also communicates evaluation (friendly: positive / pedant: negative), and Eggs's test of inserting *dafür* works well.

The observation that contrast can hold between a speaker's evaluation of propositions is nowadays undisputed, but studies differ on whether (following Eggs) three separate readings should be assumed (*e.g.*, Breindl 2004), or whether +/- evaluation should be treated as a feature that can be present in both of the other two readings (Braußе 1988). Moreover, there is some disagreement on the number of readings of *aber/but*. The parsimonious view is that there is only one core meaning, *viz.* the denial of an expectation, and all other uses are merely pragmatic extensions of the core (Foolen 1991). A more profligate view can add a reading for a "frustrated plan" *but* (Breindl 2004) for cases where an agent reports an intention that however could not be realized.

(13) Tom looked all over the store for cat food but he couldn't find any.

Adversative. In contrast to the manifold views on *aber/but*, the presence of a "semantic opposition" reading is generally agreed upon, even though terminology varies. We follow here that used by, amongst others, Breindl *et al.* (2015) and call the reading expressed by *hingegen / in contrast / on the other hand* 'adversative'. It is widely perceived as a symmetric relation where the linear order of presentation has little significance. This differentiates the connectives very clearly from *aber/but*, which is well-known to assign a larger argumentative weight to the second conjunct.

Concession. The second *but* variant studied by Lakoff is the denial of an expectation, often taken to be equivalent with the term "concession". We gave definitions already in Section 4. Many researchers regard the subordinating conjunction *although/obwohl* as its prototypical realization, as it provides a syntactic mirror (subordinate versus superordinate clause) of the intended asymmetric argumentative orientation.

(14) Although Mary wasn't feeling very well that day, she passed the exam without problems.

The linear order of the conjuncts can be switched, but the orientation remains the same, with Mary's passing the exam being the "main" message. "Although S1, S2" is generally regarded to (i) assert both S1 and S2, and (ii) communicate the assumption that "normally" S1 implies not-S2. For Breindl *et al.* (2015), (ii) is a presupposition that can also be triggered by the presence of monosemous concessive connectives (such as English *still, nonetheless* or German *trotzdem, dennoch*). The more general *but* does not carry the presupposition but needs to be "over-interpreted" by the reader for assuming a concessive

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reading. Thus, Breindl *et al.* see the most abstract interpretation of *aber/but* as interrupting the common flow of narration, description, exposition etc., and depending on the conjuncts (and possibly the wider context), this interruption can take place on different levels of interpretation.

Concession is a rather broad sub-field that some researchers have further divided. Consider these examples from Latos (2009):

(15) Although he is an excellent football player, no football team has offered him a contract.
=> normally, if one is an excellent football player, football teams offer him/her a contract

(16) Although he is an excellent football player, he costs too much.
=> ?? normally, if one is an excellent football player, his/her price is not so/too high

It follows that either *although* does not always trigger the normalcy presupposition, or that presupposition must work on some other level. Latos adopts the latter view and distinguishes a 'direct' concession (example 15) from an 'indirect' concession, where the conjuncts supply arguments for opposing conclusions r or not-r (example 16; see also Anscombre and Ducrot 1977):

He is an excellent football player => let's propose a contract to him
He costs too much => don't propose a contract to him.

The two subtypes have been recognized by many other researchers, including Spooren (1989), who called indirect concessions "concessive opposition", and Grote *et al.* (1997) who associate different speaker intentions: "convince the hearer" of a proposition (indirect concession, argumentative) versus "report a surprising correlation" (direct concession). For German, Karagjosova (2019) proposes a correlation with connectives: the split conjunction *zwar...aber* seems to have a tendency to encode indirect concession, while the subordinating conjunction *obwohl* prefers direct concession.

In a different analysis, Latos (2009) points out that certain connectives such as the German adverbial *trotzdem* or the English *in spite of (this)* can only encode direct concessions, whereas others (*e.g.*, *obwohl*, *although*) are more versatile. She furthermore proposes a third type of concession, which she calls "restrictive": it neither communicates the 'normalcy' presupposition nor does it have a clear argumentative function that would assign central weight to one of the conjuncts.

(17) Tim is a very nice person, although sometimes he comes out with weird ideas.

Again, for this type there is a distinct lexicalization in German, *viz. allerdings*, and Latos' category thus corresponds to the intersection *allerdings/dennoch* in Figure 2 above.

Allerdings. This German adverbial, whose function in English is fulfilled by *though* and *however*, is often characterized as restricting the scope of the statement made in the preceding sentence (*cf.* Example 17). In a study of six related adverbials, Braße (1988)

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finds *allerdings* to be the most versatile, and she emphasizes that from an argumentative perspective, it does not lend more weight to either S1 or S2 but plays rather a balancing role. Breindl (2004) adds that unlike *aber*, *allerdings* cannot be over-interpreted to concession – by which she is probably referring to what we have called 'direct' concession above. When we translate examples (14) or (15) above to German, *allerdings* seems not possible (or changing the meaning). For the indirect ones, however there is overlap, and this is, presumably, why Latos (2009) regards restriction as a subtype of concession. Once again, the decision where to locate restriction in the realm of Contrast (as a subtype of concession or as a sister) seems to depend to a good deal on the language that is used as primary inspiration: in English, as we pointed out, *though* is often a good translation of *allerdings*, and *though* can also be used in the same way as the "prototypical" *although*.

Sondern. This conjunction, which has counterparts in Spanish and in Romanian but not in English or French, presents a relatively clear-cut case: in S1 an overt negation has to be present, and S2 states that something is the case instead of the negated element of S1. In English, *but* can be used with an elided clause (still, in some cases there can be ambiguity as to the intended reading, especially since *but* can also mean *except*), or two full clauses without a connective. In German, none of the connectives we discussed can substitute for *sondern*. (Accordingly, if *sondern* had been part of the study summarized in Figure 2, it would form its own circle there.)

(18) *Ich habe mir kein Buch gekauft, sondern eine DVD.*
I didn't buy a book but a DVD.
I didn't buy a book; I bought a DVD.

Information Structure. Most semantic studies of connectives derive their results from solely analysing sentence pairs, but Breindl (2004) considers larger contexts. This is prerequisite for noticing that German *aber* can sometimes operate merely as a marker of topic switching, for instance when shifting a narration to another main protagonist (in which case *aber* often appears immediately following a – contrasting – referring noun phrase). This use may seem a little rhetorically loaded (it is quite frequent in the translations of the Bible) but can occasionally also be attested in newspaper editorials, as we will see below.

A more narrow use of 'information structure' is employed by Umbach (2005) who concentrates on sentence pairs and studies variants of prosodic marking. She proposes a fundamental difference between the realm of concession, which she sees as a semantic relation between propositions, and that of contrast, which is taken to be a matter of information structure in the sense of the focus/background dichotomy.

Domains of linking. When Sweetser (1990) proposed that connectives can operate on the three distinct levels *propositional, epistemic,* and *speech act*, she worked mainly with causal relations to make her point. However, she also discusses *but* and claims that it can be used in the epistemic as well as the speech act domain. Lang (2000) provides a critical discussion, using the example:

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(19) *Wir sind mit dem Manuskript in Verzug, aber welcher Autor hält schon Termine ein?*
'We are running late with the manuscript, but which author manages to keep the schedule?'

Here, after processing S1, the reader might expect a subsequent speech act of apology, but the actual S2 – conveniently formulated as a surface speech act of questioning – does quite the opposite, and hence a contrastive connective is in order.

Summary. In order to condense our journey through the facets of contrast in the literature, we provide a sketch of the main sub-relations and associated "prototypical" connectives in Figure 3. Assuming four subtypes of Contrast is presumably compatible with the accounts of, *e.g.*, Mauri (2008) or Izutsu (2007), who proposed a tripartite structure, without "restriction", which we regard as mediating between concession and adversative (*cf.* the position of *allerdings* in Figure 2).

We chose not to use the term "denial of expectation", because – as Foolen (1991) pointed out – in one way or another, any contrast can be regarded as an S2 violating an expectation triggered by S1; this also includes contrast like "the text will stay on topic – oops it does not" (topic switch *aber*), "the next thing will be similar to the current thing – oops it is not" (adversative comparison), or "this current statement will be valid in total – oops it is not" (restriction). After all, as we pointed out at the very beginning of Section 4, the semantics of contrast involves negation, and negation, in general, marks the unexpected.

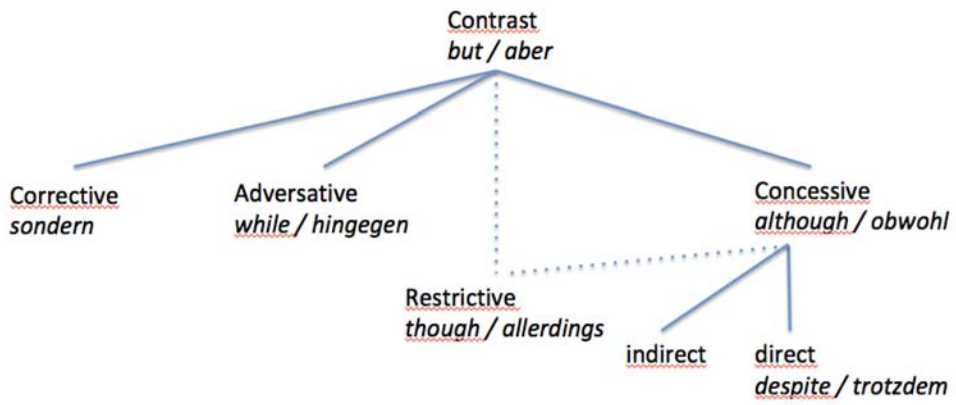


Fig. 3. A taxonomy of Contrast (Synthesis of literature review).

The features that have been used in the literature to distinguish uses of different connectives include the a/symmetry of the relation expressed; the presence or absence of evaluation and/or of argumentation; possible constraints on ordering the positive and the negative (or the "pro" and the "con"); the need (or not) to infer implied propositions from S1 and S2 for making the contrast; and more generally the domain of linking (Sweetser 1990).

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5.3. An inventory of connective functions

From the considerations presented above, we derived a list of connective functions. They incorporate and extend the earlier lists of Breindl (2004) (specifically for *aber*) and of Stede (2004) (for the connectives given in Figure 2), using observations cited in the previous section.

We (very) briefly characterize each function and provide a handcrafted example (sometimes taken from Section 5.2) in order to show a "prototypical" instance. By 'segment' we refer to a stretch of text of undetermined length, unless it is indicated in the characterization. Our goal is that the categories can be easily applied to essentially arbitrary text, and therefore we describe them not with linguistic concepts (such as implicature or presupposition) but with a more common language (as it can be used in annotation guidelines).

SU – Substitution

- The first segment states that something is not the case, and the second segment states what is the case in its stead.
  Andy didn't buy that car; he rented it.

CC – Contrastive Comparison

- A (usually short) passage compares two entities with respect to a distinguishing attribute; or points out two differing attributes of the same entity. Preference or weighting is not important.
  While Tom has blonde hair, his sister is dark.
  Jill doesn't like novels, but she is very fond of poems.

RE – Restriction

- The second segment restricts the scope of the meaning (or speech act) of the first segment.
  The entire family was dressed up for the event. Mike didn't wear his tie, though.

PF – Plan Failure

- The first segment describes a goal of an agent, and the second conveys that the goal was not accomplished.
  Tim had prepared himself very thoroughly for the interview, but they did not accept him.

CD – Direct concession

- In the context, the first segment triggers an expectation that X can be concluded, and the second segment states that X does not hold (the second segment, in the light of the first, brings surprise).
  (Did Paula enjoy the evening?) *Although the party was well-attended and entertaining, Paula felt bored most of the time.*

CI – Indirect concession

- In the context, the first segment implies a statement (st1); the second segment implies a statement (st2) that defies an expectation generated by st1 (an expected causal relation does not hold).
  (Shall we hire him?) *Although he passed our entrance exam, his criminal record is formidable.* (So, we do not hire him.)

SC – Speech act comment/correction

- One segment explains or comments on or cancels the speech act made in the other segment.

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Sorry if I am a little sarcastic here, but your performance won't earn you a Nobel prize.
Let's go to the movies, shall we? Then again, we don't really have any money with us.

TC – Change in Topic

- The text turns the readers' attention to a different entity (and none of the other functions applies clearly).
  Mary went to … She bought … Her sister, however, has always been …

OC – Change in Orientation

- The text switches the orientation of the argumentation or the narration into a different (possibly the opposite) direction.
  The city has changed a lot, for better or for worse. But maybe this is only the impression of someone who has been away for many years?

Some authors have observed that the contrast can hold on the level of positive or negative evaluation, and Breindl (2004) suggested this to be one of four readings of German *aber*. In our view, however, the presence of evaluation is possible with each of our functions. In our notation, we thus represent it with an appended "v" to the symbol for the function (for example, CIv = indirect concession on the 'valuation' level).

The OC category has not been mentioned in Section 5.2 and to our knowledge has not been explicitly suggested in the literature. A prototypical connective is *on the other hand* (or German *andererseits*). There is a similarity to function CC in that there need not be an argumentative weighting present, but OC applies typically to larger text segments (which might well be a reason for it not being mentioned in the research literature, which tends to focus on sentence pairs).

At this stage, the characterizations of the functions are not meant to be mutually exclusive. Though this may well be a distant goal, the presence of complex feature interactions in authentic corpus instances leads sometimes to unclear connective substitution tests, and correspondingly not to razor-sharp category definitions. Above, we have arranged the function definitions in an order from relatively specific to rather vague; in practical annotation, preference could be given to the specific ones.

In comparison to the inventory of the PDiT (see Section 4), our list includes a few extra functions and omits two PDiT relations: we do not cover gradation (but surmise that it can be seen as a special case of substitution), while 'Pragmatic Contrast' appears to be quite close to our OC function.

Our next step is to put the list of functions to an empirical test. As a text basis, we use the German 'Potsdam Commentary Corpus' (PCC; Stede and Neumann 2014), for which we already showed frequencies of coherence relations in Table 1. We determine the relevant corpus instances in two steps: since PDTB annotation applies directly to the connectives, we first identify all explicit contrastive relations (concession, contrast, substitution), which yields 313 hits. Next, we reduce this set to those that also use a contrastive connective (as determined with the online database connective-lex.info). In this way, we end up with 296 instances to be analysed. For annotating the functions, we decided to allow for assigning multiple labels in case more than one function seems to apply. In this way, we identify "interesting" cases whose analysis can point to future work on testing whether categories can be defined more rigidly so that overlap may be reduced.

The annotation procedure led to the frequencies reported in Table 2, omitting those labels that were used less than three times. All our nine functions are present, even the

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speech act commenting, which in the text genre of newspaper editorials could be expected to be rare. The second observation is the high proportion of "change in orientation", which likewise may be attributed to the genre: editorials in local newspapers quite often consider two viewpoints of some current event, without necessarily taking a clear stance or presenting a crisp argumentation. The third observation we want to point out here is that all instances with multiple labels also involve the change in orientation, hence presenting the subcases where also restrictions (with and without value), contrastive comparisons, and indirect concessions apply. We take this as indication that the OC category may indeed require a slightly more specific definition in a follow-up study.

An overview showing the trend of how the individual connectives map on the functions is shown in Figure 4.

Table 2

Frequencies of functions of contrastive connectives in the PCC

OC: 49	CD: 35	OC, RE: 24	RE: 18	SU: 18	CI: 18	PF: 17
TC: 16	CC: 11	OCv: 11	OC, CC: 9	OCv, REv: 9	REv: 9	SUv: 8
CCv: 8	OC, CI: 6	CIv: 5	CDv: 4	OCv, CIv: 4	SC: 3	

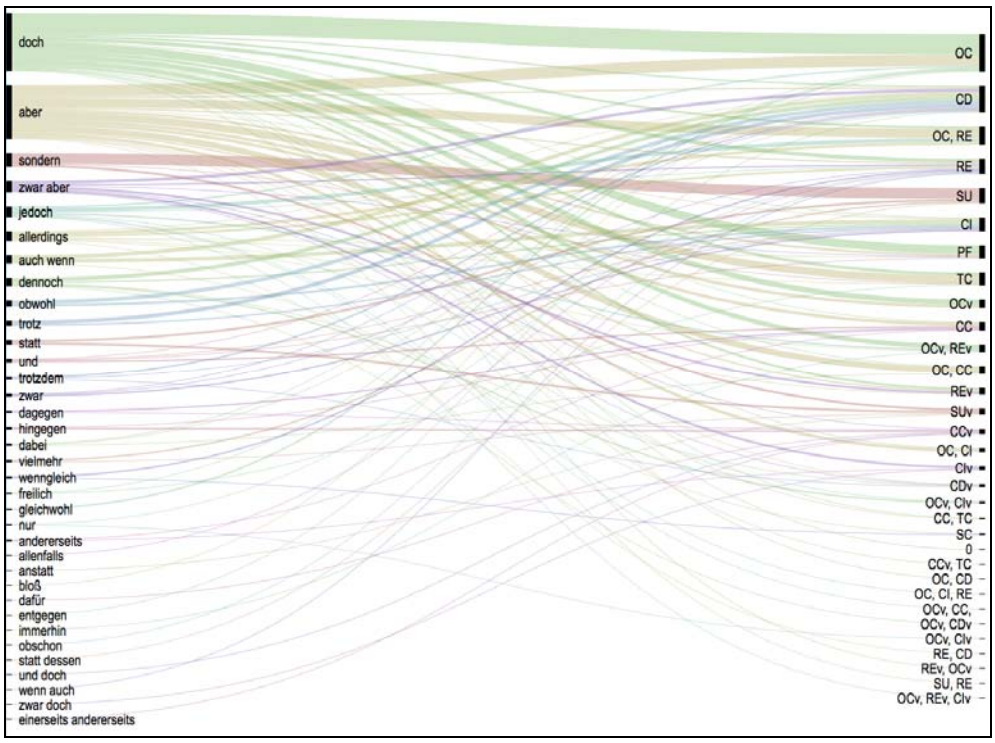


Fig. 4. Mapping between contrastive connectives and functions in the PCC.

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5.4. The step to coherence relations

Finally, we consider the relationship between the proposed connective functions and the notion of coherence relation as discussed in Sections 2 and 4. Since the connectives we annotated with functions in the corpus also have PDTB relations attached to them, in a first step we can inspect the mapping, shown in Figure 5. Not surprisingly, the Substitution relation quite clearly corresponds to the two associated functions and hence constitutes a well-demarcated subset (which, as pointed out earlier, coincides with specific connectives in some languages, and a syntactically-marked use of *but* in English). A significant portion of the Contrast instances are mapped on the two comparison functions, but the remaining instances are distributed across multiple other functions. Concession is associated essentially with all functions except for substitution, which indicates the wide applicability of the notion of denial of expectation as encoded in the PDTB definition of the relation.

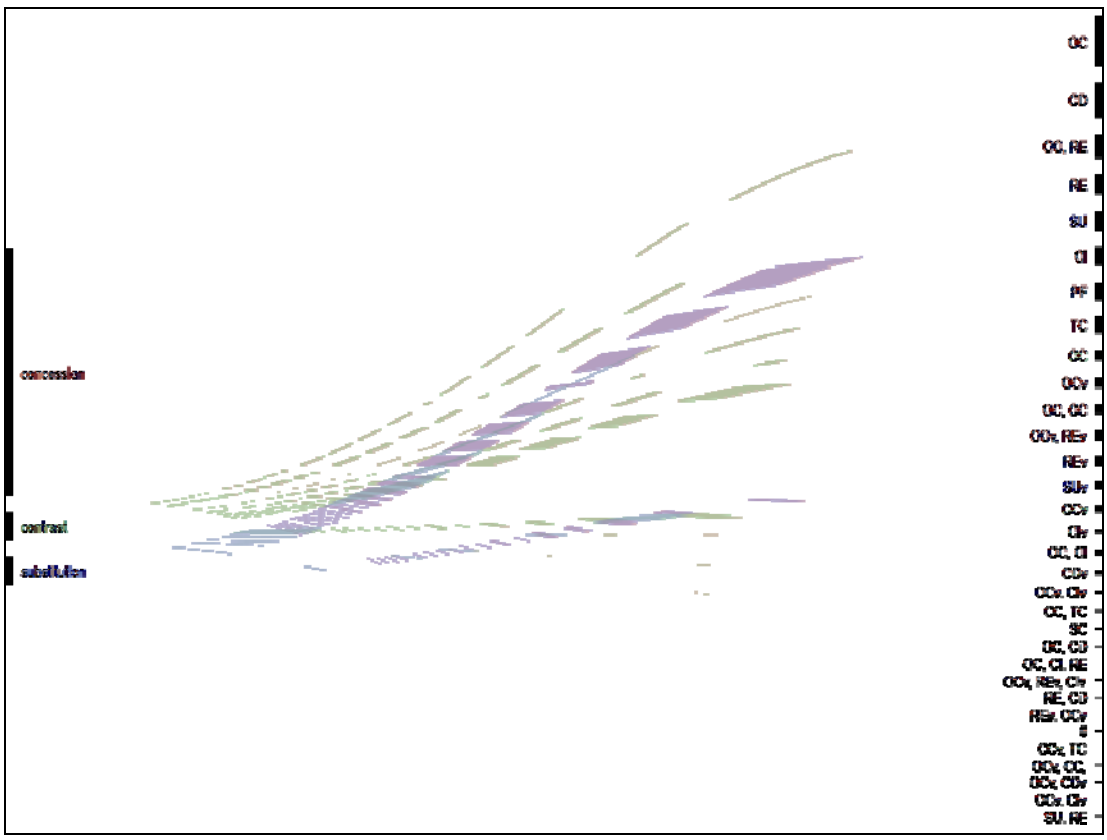


Fig. 5. Mapping between contrastive PDTB relations and connection functions in the PCC.

When thinking about the relation-function mapping, one should keep in mind that coherence relations are not meant to be generally tied to lexical signals; instead, they are often implicit. In the PCC, the explicit/implicit ratios for the three contrastive PDTB relations are: Concession 78% / 22%; Contrast 44% / 56%; Substitution 64% / 36%. Thus,

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in principle it is possible that some fine-grained contrastive functions outside our inventory could be realized without a connective. We regard this as unlikely, however; in line with Knott and Dale (1994) (*cf.* Section 5.1) we believe that the lexical signals provided by a language serve to map out the field of relations. Language names things, and "things" include relations between states of affairs, and it is hard to believe that for relevant relations language would not evolve a way of lexically denoting them (which is then diachronically subject to grammaticalization and creation of function words).

In RST, as we have seen, some relations are defined in terms of relative positive regard, which is absent in other frameworks of coherence relations, and therefore annotations across frameworks can be expected to be in a many-to-many correspondence. To some extent, this is not problematic, as coherence relation inventories and definitions can be specific to purposes and tailored to certain genres. We therefore refrain from suggesting a mapping between connective functions and a (possibly new) set of coherence relations here. However, in continuation of our "bottom-up" procedure, we point out two groupings that seem to reduce the grain size of the label set (if that is desired) without giving rise to complicated follow-up mappings. The first is – obviously – a possible fusion of the two concessive functions, in case the in/direct distinction is not needed on a more abstract level. In addition, the PF function could be regarded as a special case of concession, too. The second merge could be performed for TC and OC, as both apply to the larger textual level, and a change in topic (entity) seems to be compatible with a change in orientation (of states of affairs or argumentation or similar).

6. SUMMARY AND CONCLUSIONS

We observed that different proposals of coherence relation schemes use different ways of dividing the field of Contrast, and we argued that a step toward systematic comparison or possible revision of such schemes is a "bottom-up" analysis of the linguistic signals for coherence relations, *i.e.*, the connectives. In this vein, we combined corpus study with an analysis of the literature on those connectives, which led us to propose an inventory of nine connective functions, plus a parameter "v" indicating whether the contrast holds on the level of positive/negative evaluation. Applying the functions to the almost 300 contrastive connectives in the Potsdam Commentary Corpus demonstrated that they all occur, which we take as evidence for their relevance. (Conversely, we can of course not claim from the corpus study that some other function would have been more useful; in this regard we rely on the extensive literature review.)

We wish to emphasize the general utility of combining careful semantic analysis with studying authentic data. Often, semanticists looked at isolated (often fabricated) examples, which may very well be too narrow a perspective for practical purposes. For instance, Mauri (2008) disagreed with Malchukov (2004) on the example "Paul is rich but Mike is poor." While Malchukov saw it as semantic opposition (in our terminology CC), Mauri preferred to treat it as counterexpectation (CD). Within a context, which can be modelled using the 'Question under Discussion' (QuD) framework (Roberts 1996), one of these readings is likely to be preferred, depending on whether the QuD is "what about Paul and Mike?" or "are Paul and Mike rich?" (see also Umbach (2005) on the related notion of 'quaestio'). And generalizing further, corpus examples usually hold surprising instances that the researcher did not expect and that may give rise to modified proposals. Along these

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lines, in our annotation project we deliberately allowed multiple labels to be assigned; as we noted, this results in a quite systematic proliferation of OC combinations, which can now be further inspected for possible changes to category definitions and guidelines.

Other future work will concern a corpus study of combinations between contrastive conjunctions and adverbials in the same sentence. We mentioned this combining in passing when showing Eggs' proposal of three *aber* readings, but examining it across a larger corpus could yield interesting patterns that may sharpen the definitions. We point here to the work of Zieleke (*forthcoming*) who ran both corpus and experimental studies on contrastive connectives (and, *inter alia*, arrived at the same fundamental *hingegen/dennoch* dichotomy that we showed above in Figure 2).

Finally, we neglected here the question of the circumstances under which contrastive relations can be verbalized without any connective – or merely with an unspecific *and*. This will also be a matter of further study.

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