WORD-MEANING AND SENTENCE-INTERNAL PRESUPPOSITION*

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Abstract

The German causal preposition *durch* ('by', 'through') poses a challenge to formal-semantic analyses applying strict compositionality. To deal with this challenge, a formalism which builds on recent important developments in Discourse Representation Theory is developed, including a more elaborate analysis of presuppositional phenomena as well as the integration into the theory of unification as a mode of composition. It is argued that that the observed unificational phenomena belong in the realm of pragmatics, providing an argument for presuppositional phenomena at a sentence- and word-internal level.

1 Introduction

There is a growing insight in the formal-semantic literature that not all linguistic phenomena can or should be expected to adhere to principles of strict compositionality (cf. e.g. Sailer 2004). In this paper, I will try to add further substance to such a view. The argument is supported by data involving causative and inchoative predicates used in combination with the German causal preposition *durch* ('durch'). The discussion centres around the status of the abstract element CAUSE. I will focus on what is the origin of CAUSE in identical complex semantic structures which can be argued to be differently composed.

Many of the formalisms introduced to handle phenomena which are taken to be problematic for strict compositionality, involve some sort of unification (Bouma 2006). Here, unification will also be of some importance. The data discussed in this article has, however, to my knowledge hardly been looked at from a unification perspective. Another contribution of the paper concerns the mechanisms argued to provide the means for an adequate analysis of the phenomena in question. These are argued to be of a pragmatic nature in the case of *durch*, involving presuppositional phenomena at a sentence- and word-internal level.

The paper is structured as follows: first, I present the intuitions behind the challenge of trying to build a compositional semantics for the combination of causal-instrumental *durch*-phrases with both causative and inchoative predicates (section 2). Second, after a brief discussion of some proposed solutions (section 3), I turn to my own analysis (section 4), which is held in a Discourse Representation Theory bottom-up formalism (Kamp 2001), applying unification as a mode of composition (Bende-Farkas and Kamp 2001, Sæbø to appear). Then, I turn to a discussion of how the unificational analysis can be restated in terms of presupposition verification and accommodation (section 5). The paper concludes with a brief outlook on further applications of the formalism presented here (section 6).

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2 The variant problem

Certain kinds of adverbials do not only modify a predicate, they may also (radically) alter its properties. In this paper, I will mainly look at adverbials headed by the German causal-instrumental preposition *durch*, which have both these properties.[1] This twofold behaviour is seen as a challenge to strict compositionality and alternative ways of formalising the semantics of *durch* will be considered. In this section, the data concerning *durch* will be discussed. I will refer to *durch*'s syntactic complement as its semantic internal argument, and the modified phrase as *durch*'s semantic external argument. Syntactically, the *durch*-phrase can be adjoined to verbal, adjectival and nominal phrases. Only the two former syntactic configurations will appear here.

The function of causal-instrumental *durch* is to specify the causing event in a causal relation between events, as exemplified in (1)-(2).

(1) *Ein Polizist wurde durch einen Schuss aus der eigenen Dienstwaffe getötet.*
(A policeman was through a shot from the own service weapon killed.)
'A policeman was killed by a shot from his own service weapon.'

(2) *Durch bloßes Handauflegen versetzte sie den Sowjetmenschen in Glückseligkeit.*
(Through mere laying-on-of-hands transferred she the Soviet individual in blessedness)
'By a mere laying-on-of-hands she could induce a state of bliss in the Soviet individual.'

In (1), the causative predicate *töten* ('kill') is used. I will assume that the semantics of *töten* involves a causal relation between two events, one of which is the caused event, a transition of an individual to a state of being dead, and one of which is the causing event of this transition. The causing event is not specified in any way, concerning e.g. how the transition was brought about. I will thus refer to such causatives as *manner-neutral* causatives.

In (1), it can be seen in what way the contribution of the *durch*-phrase specifies the causing event: it is stated that the policeman was killed by *a shot from his own service weapon*. Thus, the *durch*-phrase specifies the manner of the causing event. A simplified semantic representation for *einen Polizisten töten* ('to kill a policeman'), could be as in (3), p representing the policeman, e_2 the caused transition and e_1 the causing event:

(3) $\lambda e_1 \exists e_2 [\text{BECOME}(tot(p))(e_2) \wedge \text{CAUSE}(e_2)(e_1)]$

Analysing a causative this way means that the *durch*-phrase only specifies e_1 in (3), contributing nothing else to the formula. Thus, a preliminary semantics of *durch* only needs to involve an identity relation between events, where the event of the *durch*-phrase is identified with the unspecified causing event of the causative predicate.

Common to the occurences of *durch*-phrases with causative predicates is that the adverbial *durch*-phrase only seems to modify the predicate it is adjoined to, adding some conditions or restrictions (cf. Chung and Ladusaw 2004) to it (cf. (7) on page 319).

However, in addition to occuring with causative predicates, *durch* can also be used with inchoatives as illustrated in (4)-(5).

[1] In addition, *durch* has spatial, temporal and agentive uses.

(4) *Ohnesorg starb durch einen gezielten Schuss.*
(Ohnesorg died through an accurate shot)
'Ohnesorg died through an accurate shot.'

(5) *Der Verlust an Vielfalt und Eigeninitiative ist durch die Verstaatlichung*
(the loss of diversity and one's-own-initiative has through the nationalisation
gesellschaftlicher Bedürfnisse in Schweden entstanden.
social.GENITIVE needs in Sweden emerged)
'The loss of variety and initiative has resulted from the state taking over responsibility for social needs in Sweden.'

For inchoative predicates like *sterben* ('die') as in (4), I assume a semantics as in (6), i.e. without an underlying CAUSE:

(6) $\lambda y \lambda e_2 \, \text{BECOME}(tot(y))(e_2)$

However, in the case of an example like (4), it is desirable to postulate a semantics after composition with *durch* like in (3), including a CAUSE and adding a specification for the causing event e_1: An accurate shot is the cause of Ohnesorg's death. The examples in (1) and (4) could be given a common semantic representation as indicated in (7):

(7) $\lambda e_1 \exists e_2 [\text{BECOME}(tot(p))(e_2) \wedge \text{CAUSE}(e_2)(e_1) \wedge \text{SHOOT}(e_1)]$

This means that the semantics of an inchoative predicate like *sterben*, which is not specified for a cause, and involves no agent, can be included in an expression where the resultant state expressed in *sterben* is caused to occur by some event, as with *töten*. If the event included in the *durch*-phrase is modified such that it is obvious that it is a deliberately performed event (e.g. by an adjective such as *accurate*), a CAUSE analysis seems as justified for (4) as for (1). In fact, sentence (4) makes stronger claims about agentivity and intentionality than (1). It is in the sense of adding a CAUSE-relation and the implication of an agent that the *durch*-adverbial is claimed to radically alter the predicate *sterben*.

However, the CAUSE element in the semantic representations for (1) and (4) must have different sources on the semantic representations assumed for causatives and inchoatives here. In (1) it originates in the predicate, whereas in (4) its source cannot be the predicate. But this would seem to enforce an assumption that, in the latter case, *durch* may introduce a CAUSE element of its own, it being the most plausible other candidate for such an introduction (see also section 3). After all, if the semantic representation of a sentence which contains a non-causative predicate is assumed to contain a CAUSE element, the source of this CAUSE cannot be the predicate itself. Under the assumption that we are not dealing with two CAUSE elements when *durch* is combined with a causative predicate, potentially yielding an interpretation of indirect causation in a CAUSE-TO-CAUSE-relation, this would seem to force us to postulate the existence of two different lexical items *durch*: one of which is used in combination with causatives, and one of which is used with inchoatives and other non-causative predicates, which do not include a CAUSE element on their own. I will refer to this as the *variant problem*.

But handling two different lexical items *durch* is clearly counterintuitive. The contribution of *durch* is much the same in the two cases, it specifies the causing event in a causal relation. To assume two lexical items *durch* to be able to represent both (1) and (4) as in (7) is not very desirable. The main motivation of the assumption of such an ambiguity would seem to lie in the restrictions of the formalism. It is thus preferable to look for ways to give a unified analysis of the two combinations in question.

3 Alternative approaches

There exist approaches which could be seen as avoiding the variant problem. I will briefly dicuss two of these. It should be added that in these approaches, the semantics of *durch* is not discussed. A first alternative would be to assume a principle of *temporal coherence* as in Wunderlich (1997, p. 36). This way a CAUSE can enter into semantic composition whenever there is a constellation where a process (immediately) precedes a resultant state, where the predicate BECOME occurs. This way, the CAUSE element occurs as a result of the combination of a BECOME element in the representation for inchoatives like *sterben* in (6) and the event of the shot, introduced by the *durch*-phrase. This means that *durch* itself does not need to contain a CAUSE element for sentences with either inchoative or causative matrix verbs to come out much the same when combined with *durch*.

Another alternative would be to, somewhat simplified, assume that every change involves a CAUSE at some level, under the assumption that "even if no specific causing entity or action is expressed, something must be responsible for the change of state in the affected entity" (Härtl 2003, p. 899 ff.). Härtl assumes that the presence of a CHANGE relation may motivate the introduction of a CAUSE relation whereever relevant.

However, I think there are some facts concerning *durch* which render these approaches less attractive for the current purposes. In addition to the combinatorial possibilities of casual-instrumental *durch* briefly discussed in section 2, *durch* may also be combined with stative predicates, as in (8):

(8) *Auch der durch diese Haltung hohe Luftwiderstand kann auf längeren Strecken*
(Also the through this posture high air resistance may on longer distances
ganz schön schlauchen.
quite much scrounge)
'The high air resistance due to this posture may put you through the mill over longer distances.'

In cases like (8), one gets an interpretation where the state expressed in the lexical anchor, *hoch* ('high'), is the resultant state of the eventuality expressed in the internal argument of *durch*, *Haltung* ('posture').[2] If the *durch*-phrase is left out, as illustrated in (9), the stative *hoch* should not be interpreted as a resultant state as such – though this could be achieved by focussing *hoch*, introducing a set of alternatives which are related to *high* through scales or negation:

(9) *der hohe Luftwiderstand*
(the high air resistance)
'the high air resistance'

It can be concluded that *durch* has a similar effect here as with inchoatives. A CAUSE can be assumed to be present in examples such as (8), and *durch*'s internal argument expresses the causing event in the causing relation.

If one were to follow the above approaches, one would be left in a situation where the reinterpretation needed to achieve a plausible semantic representation (including a change of state and a cause relation), would be without any obvious triggers, since no change is present in the first hand.

I think an intuitively more plausible analysis can be achieved if we allow *durch* to introduce

[2] *Haltung* is an abstract noun, which has both a stative and an eventive reading. It has an eventive, intergressive (Egg 1995) reading in contexts where the position has to be upheld deliberately, as in (8).

the CAUSE element. This CAUSE element would be the driving force of reinterpretation. If a CAUSE relation is present, one would expect a stative predicate to be reinterpreted as being a resultant state (Kratzer 2006). The reinterpretation of the stative predicate would thus follow automatically from the presence of the CAUSE element in *durch*, as in standard counterfactual analyses.[3]

In light of examples such as (8) and the reinterpretational effects of *durch* in general, it seems reasonable to assume a CAUSE-predicate to be included in the semantics of *durch*.[4] In the next section, I will turn to a possible solution of the variant problem described in section 2, i.e. how this quality of *durch* can be retained for all its causal and instrumental uses, in such a way that one can deal in a compositional manner with the fact that *durch* includes a CAUSE-predicate which is not always needed or wanted, as with causatives.

4 A unificational analysis

In what follows, I will present a compositional analysis of *durch*-adjuncts within Discourse Representation Theory (DRT) which avoids the assumption of lexical ambiguity between one *durch* variant including a CAUSE element and another without it.

I think it is fairly obvious that on standard strict compositional analyses, it is a considerable challenge to provide a general semantic analysis for *durch* in combination with all the above predicate types: causatives, inchoatives and statives. One is left in a situation where one either has to explain how the CAUSE of *durch* and the CAUSE of a causative are combined into one, or how a CAUSE element emerges with an inchoative or a stative predicate.

4.1 DRT bottom-up unification-based construction

The analysis I base my own approach on is in some respects based on Sæbø (to appear), where *by*-adjuncts in English are analysed. However, my approach differs from the one in Sæbø's paper in several points, starting from the fact that my analysis of causation is based on events, and not propositions. This is partly due to another difference between *durch* and *by*. Whereas the internal argument of *durch* is an event noun, the one of the *by*-phrases in Sæbø's paper is a VP: *He killed him by shooting him in the back.*

I should add that in the formal analysis to be presented in this section, I will not consider tense or aspect and only to a limited degree voice, i.e. the details I discuss will mostly be limited to the VP level, assuming a Kratzer (1996) analysis of Voice. This means that a sentence like (10) will be assigned the simplified syntactic structure indicated in figure 1 on page 322. I assume that the *durch*-phrase is adjoined at VP level, below any possible agents.

(10) *Der Polizist tötete einen Verbrecher durch einen Schuss.*
(the policeman killed a criminal through a shot)
'The policeman killed a criminal with a shot.'

Sæbø uses unification as a mode of composition within DRT to get a compositionally sound analysis of *by*-adjuncts in English. This is a fairly recent development within DRT, Bende-Farkas and Kamp (2001) being the first to my knowledge to advocate such an approach, although it is a such no radical shift within DRT.

[3] A further argument in favour of including a CAUSE-relation in *durch* is the fact that any internal arguments of *durch* of the semantic type of entities have to be reinterpreted as being an event, which would be expected since CAUSE is a relation between two events.

[4] A similar argument may be made with respect to anticausatives, cf. Solstad (forthcoming).

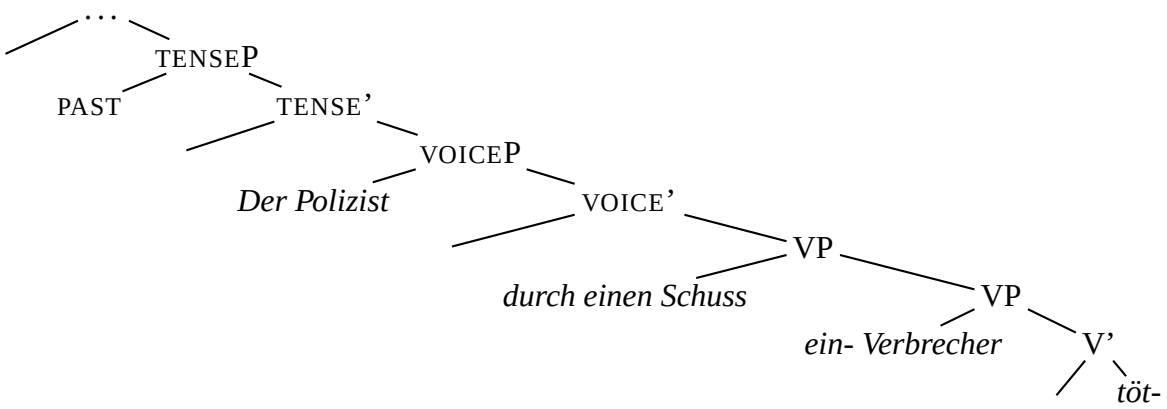


Figure 1: Simplified syntactic structure for the sentence *Der Polizist tötete einen Verbrecher durch einen Schuss*

Intuitively, the idea of formalising what is going on when combining *durch* with causatives or inchoatives in terms of unification, makes sense: the causative predicate and the *durch*-phrase describe one and the same event. The information they contribute should somehow be unified. If *durch* includes a CAUSE, unification might be used to formalise the fact that this CAUSE isn't added to the CAUSE of a causative.

There is as yet no coherent formalisation of all aspects relevant to the analysis promoted here, and many details will be left out. Though the derivation for two example sentences will be shown, the exact construction principles will only be discussed informally, but hopefully precisely enough to give a rough idea of the framework. As in Kamp (2001), a bottom-up compositional DRT analysis is applied, where Sæbø (to appear) was concerned only with the more general unificational principles of *by*-phrases with the gerunds they modify. The reader is referred to Kamp (2001, especially pp. 221-231) for more details concerning the formalisation.

The following general format, called a *semantic node representation*, is used for the semantic information attached to the tree nodes:[5]

(11) $\left\langle \overbrace{\left\{ \left\langle \text{Variable}, \boxed{\text{Constraint}}, \text{Binding condition} \right\rangle \right\}}^{\text{STORE}}, \boxed{\text{CONTENT}} \right\rangle$

The semantic node representation is a pair consisting of a CONTENT and a STORE element. The content representation is always a Discourse Representation Structure (DRS), whereas the STORE contains a set of one or more elements, each consisting of a triple of a variable, a constraint and a binding condition. The binding condition provides information on the possible bindings of a variable, and the constraint adds to this, often by stating the semantic content of the variable, e.g. as gender features necessary for the correct binding of pronouns. The motivation for dividing a semantic representation in STORE and CONTENT, as opposed to just having a main DRS, is that many of the variables which are introduced in (bottom-up) composition cannot be bound right away. A storage mechanism is needed.

I turn next to the composition of the semantics of (10), repeated as (12) for convenience:

[5] As will be obvious from the division in a STORE and a CONTENT part of the representation, Kamp's (2001) paper relies strongly on the seminal paper by van der Sandt (1992), dealing with presuppositional phenomena in DRT. Some aspects of van der Sandt's paper will be briefly discussed in section 5.

(12) Der Polizist tötete einen Verbrecher durch einen Schuss.
'The policeman killed a criminal with a shot.'

The representation of the lexical head of the VP, the causative predicate *töten*, is as follows:

(13)
$$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\begin{array}{l}\text{CAUSE}(e_2)(e_1)\\ e_1 \subseteq t_{loc}\end{array}}, \text{indef.}\rangle,\\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle,\\ \langle t_{loc}, \qquad\qquad\qquad \text{loc.t.}\rangle \end{array}\right\}, \begin{array}{|l|}\hline \\ \hline \text{CAUSE}(e_2)(e_1)\\ \text{BECOME}(dead(y))(e_2)\\ \text{PATIENT}(y)(e_2)\\ \hline\end{array} \right\rangle$$

The CONTENT part to the right belongs to the invariant part of the semantics of the item in question, i.e. the information which will be part of the main DRS at the end of the update process. Following Kamp and Rossdeutscher (1994), it is referred to as the *lexical anchor* since it is the matrix verb of the sentence. Concerning the nominal arguments of the verb, only the semantic role of PATIENT is included in the representation, under the assumption that the AGENT appears outside the VP in a VOICE phrase projection, cf. the structure given in figure 1 on page 322. The predicate introduces three variables in the store, one for each of the two events, and one for temporal location. The variable for temporal location will be ignored in the following, with the exception of the final DRS.

The binding condition INDEF provides the information that the variables can, but need not enter binding relations with other variables. Importantly, when binding occurs, it is assumed that variables and constraints are unified. A variable with a INDEF binding condition will eventually be existentially bound at the relevant level.[6] As in the case of the location time variable, the binding condition of this variable will not be of any concern here. More binding conditions will be discussed below.

As was mentioned above, the constraints in the STORE part include information which is necessary for the correct binding of the variables. Thus, $\text{CAUSE}(e_2)(e_1)$ occuring in both STORE and CONTENT does not mean that the semantics of the verb includes two CAUSE relation, but simply reflects the fact that this information is needed to be able to tell the two variables apart, since the relate differently to the CAUSE predicate. Technically, it would be possible to leave out the CAUSE relation in the content part, under the assumption that all information in the store will enter the content at some stage in the derivation. However, I include it there to indicate that it is an invariable part of the semantics of the verb. In the end, only constraint conditions for STORE variables which are not already present in the CONTENT part will enter it. Thus, no multiplication of conditions should occur.

Durch is represented as in (14) on page 323. Kamp (2001) has nothing to say about prepositional adjuncts, but I think it is rather uncontroversial to assume that *durch* on its own has no content, since it is not a lexical anchor:

(14)
$$\left\langle \left\{ \begin{array}{l} \langle e_3, \boxed{\text{CAUSE}(e_4)(e_3)}, \lambda_1\rangle,\\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)}, \lambda_2\rangle, \end{array}\right\}, \begin{array}{|c|}\hline \qquad\quad \\ \hline \\ \\ \hline\end{array} \right\rangle$$

[6]For indefinite noun phrases, this level seems to be the topmost, CP-level of the sentence. Exactly where the binding of eventuality variables takes place, is not a settled matter (Kamp 2001, p. 288, fn. 20). It is reasonable to assume that eventuality variables are existentially bound no later than at the level of aspectual projections, though. This issue does, however, not affect the underlying principles of the present analysis.

(14) basically states that *durch* itself adds no content to the DRS, but that it involves a causal relation between two events. Here, a third binding condition, λ, is introduced. The binding condition λ indicates that the variable needs to enter a binding relation. In this paper, variables with λ binding conditions will be bound by variables with INDEF binding conditions, resulting in a variable with another INDEF condition. Variables with INDEF binding conditions will eventually be existentially bound, as discussed briefly above. I have opted for using λ to illustrate the fact that these variables need to be bound, as opposed to the INDEF variables, although abstraction as such is not involved. The subscripted numbers on λ_1 and λ_2 indicate the binding order of the two variables involved in *durch*. They are included to ensure the right binding order of the event variables in the CAUSE relation. This has its motivation in the fact that what modifies a predicate such as *töten* in example (12) on page 323, is a *durch*-**phrase**. Thus, the internal argument of *durch*, corresponding to the syntactic complement of the preposition, will be bound first, since this will already be present in the *durch*-phrase before it is adjoined to a VP.

For the internal argument of *durch*, the event noun *ein- Schuss*, the following representation is assumed:

(15)
$$\left\langle \left\{ \begin{array}{l} \langle e_5 \,, \boxed{\text{SHOOT}(e_5)} \,, \text{indef.} \rangle, \\ \langle w \,, \boxed{\text{AGENT}(w)(e_5)} \,, \text{indef.} \rangle, \end{array} \right\}, \begin{array}{|c|}\hline \\ \hline \\ \\ \hline \end{array} \right\rangle$$

The nominalisation derived from the predicate *schießen* ('shoot') is assumed to include the semantic role of an agent, but not that of a patient, since shooting events without patients are easily imaginable. The event expressed in *ein- Schuss* also needs to include a location time, but this will be ignored in the following.

The representation in (16) is the result of combining the representations for *durch* and *ein-Schuss*. The variable e_5 will bind e_3, resulting in a INDEF binding condition for the unified variable from the representations in (14) and (15). It is as such of no importance whether the variable e_5 in the representation of *ein- Schuss* or e_3 of *durch* is retained for the causing event:

(16)
$$\left\langle \left\{ \begin{array}{l} \langle e_3 \,, \boxed{\begin{array}{l}\text{CAUSE}(e_4)(e_3) \\ \text{SHOOT}(e_3)\end{array}} \,, \text{indef.} \rangle, \\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)} \,, \lambda_2 \rangle, \\ \langle w \,, \boxed{\text{AGENT}(w)(e_3)} \,, \text{indef.} \rangle, \end{array} \right\}, \begin{array}{|c|}\hline \\ \hline \\ \\ \hline \end{array} \right\rangle$$

The representation of the two noun phrases, *der Polizist* ('the policeman') and *ein Verbrecher* ('a criminal') is as illustrated for *ein Verbrecher* in (17). They only differ in their binding condition, which is DEF in the case of the definite noun phrase, *der Polizist*.[7]

(17)
$$\left\langle \left\{ \langle u \,, \boxed{\text{CRIMINAL}(u)} \,, \text{indef.} \rangle \right\}, \begin{array}{|c|}\hline \\ \hline \\ \\ \hline \end{array} \right\rangle$$

The VP *einen Verbrecher töten* ('kill a criminal'), which is modified by the *durch*-phrase, is

[7] In order to keep representations as simple as possible, the agent argument, *der Polizist*, will only occur in the final representation of sentence (12), cf. (21) on page 326.

represented as:

(18) $$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle v, \boxed{\text{CRIMINAL}(v)}, \text{indef.}\rangle, \end{array} \right\}, \boxed{\begin{array}{|l} \hline \text{CAUSE}(e_2)(e_1) \\ \text{BECOME}(\textit{dead}(v))(e_2) \end{array}} \right\rangle$$

The internal argument of *töten* gets a 'placeholder' inserted in the CONTENT DRS, whereas the content of the variable inserted in the DRS is specified along with the variable's binding conditions in the STORE part. Combining the VP with the *durch*-phrase, *einen Verbrecher durch einen Schuss töten,* the following representation emerges before binding applies:

(19) $$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle e_3, \boxed{\begin{array}{l} \text{CAUSE}(e_4)(e_3) \\ \text{SHOOT}(e_3) \end{array}}, \text{indef.}\rangle, \\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)}, \lambda\rangle, \\ \langle v, \boxed{\text{CRIMINAL}(v)}, \text{indef.}\rangle, \end{array} \right\}, \boxed{\begin{array}{|l} \hline \text{CAUSE}(e_2)(e_1) \\ \text{BECOME}(\textit{dead}(v))(e_2) \end{array}} \right\rangle$$

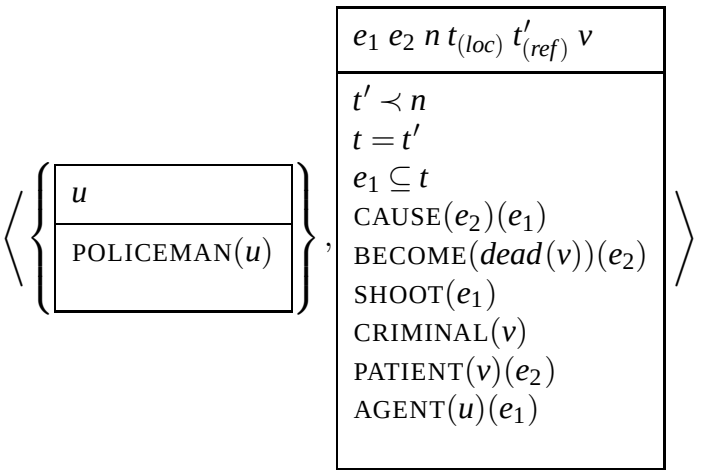
Next, e_2 will bind e_4. Needless to say, the variable types have to correspond for a binding to take place. Taking the constraints into consideration, which also have to match, e_4 cannot be bound by e_1 which could be a possible match, looking only at the binding conditions: they are simply not in the same argument positions for CAUSE. The variable e_4 represents a caused event, whereas e_1 represents a causing event.

Next e_1 and e_3 will be unified. This is not a binding in the sense of the binding which takes place between e_4 and e_2, which is a necessary binding, where e_4 not being bound would lead to an unresolved DRS. The variables e_1 and e_3 will be unified under the assumption that one should unify all variables which are a possible match. This soultion might overgenerate, but I will not go into this here.

In addition, the constraints of the variables entering into binding relations will be merged, resulting in the preliminary representation in (20), before indefinites are existentially bound and enter the content part:

(20) $$\left\langle \left\{ \begin{array}{l} \langle e_1, \boxed{\begin{array}{l} \text{CAUSE}(e_2)(e_1) \\ \text{SHOOT}(e_1) \end{array}}, \text{indef.}\rangle, \\ \langle e_2, \boxed{\text{CAUSE}(e_2)(e_1)}, \text{indef.}\rangle, \\ \langle v, \boxed{\text{CRIMINAL}(v)}, \text{indef.}\rangle \end{array} \right\}, \boxed{\begin{array}{|l} \hline \text{CAUSE}(e_2)(e_1) \\ \text{BECOME}(\textit{dead}(v))(e_2) \end{array}} \right\rangle$$

The indefinites enter the DRS in accordance with the binding condition for indefinites. The result after existential binding of variables with INDEF binding conditions can be seen in (21):

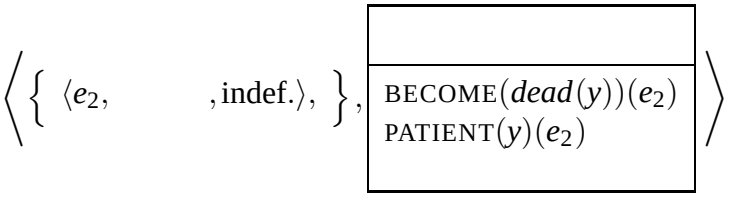
(21) 

The left part of the representation, consisting of $\{< \{u\}, \{\text{policeman}(u)\} >\}$ is a presupposition, the noun phrase *Der Polizist* being definite. It has to be verified in a broader context or accommodated.

I will now turn to the analysis of inchoative predicates such as in (4), repeated as (22) for convenience. I will only look at the steps of the derivation differing from the previous example:

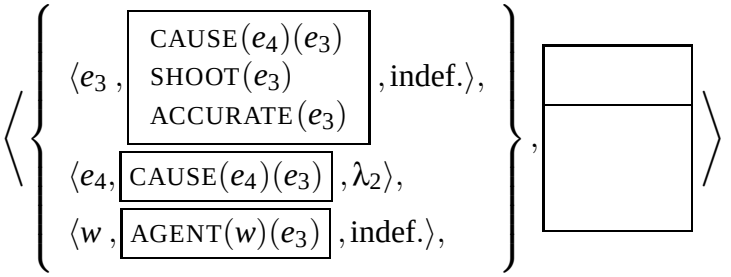
(22) *Ohnesorg starb durch einen gezielten Schuss.*
'Ohnesorg died through an accurate shot.'

Sterben is represented as in (23):

(23) 

The representation of *sterben* differs from that of *töten* in (13) in two respects: First, *sterben* includes only one event. Second, *sterben* is not specified for any causal relation, and thus has no constraint for e_2 (although it could be specified as involving a resulant state).

Durch einen gezielten Schuss ('through an accurate shot') is represented in (24), simplifying the semantics of *gezielt* ('accurate'):

(24) 

When combining the representation in (23) (with the addition of the proper name *Ohnesorg*) with (24), the result is the representation in (25), before binding applies:[8]

[8]The binding condition of the variable *o*, PROPER NAME, has similar properties to the DEF condition.

(25)
$$\left\langle \left\{ \begin{array}{l} \langle e_2, \quad\quad , \text{indef.}\rangle, \\ \langle e_3 , \boxed{\begin{array}{l}\text{CAUSE}(e_4)(e_3)\\ \text{SHOOT}(e_3)\\ \text{ACCURATE}(e_3)\end{array}} , \text{indef.}\rangle, \\ \langle e_4, \boxed{\text{CAUSE}(e_4)(e_3)} , \lambda_2\rangle, \\ \langle o, \boxed{\text{OHNESORG}(o)} , \text{prop.name}\rangle, \\ \langle w , \boxed{\text{AGENT}(w)(e_3)} , \text{indef.}\rangle, \end{array} \right\}, \boxed{\begin{array}{|l} \\ \hline \text{BECOME}(\textit{dead}(o))(e_2)\\ \text{PATIENT}(o)(e_2)\end{array}} \right\rangle$$

The variable e_2 will bind e_4, adding the constraint $\text{CAUSE}(e_2)(e_3)$ to the variable e_2. Binding will be able to take place because there is nothing preventing it from taking place. Finally, the indefinites enter the DRS, resulting in the following representation for sentence (22), which should be compared to the one in (21) on page 326.

(26)
$$\left\langle \left\{ \boxed{\begin{array}{|l} o \\ \hline \text{OHNESORG}(o) \end{array}} \right\}, \boxed{\begin{array}{|l} e_2\ e_3\ w\ n\ t_{(loc)}\ t'_{(ref)} \\ \hline t' \prec n \\ t = t' \\ e_3 \subseteq t \\ \text{CAUSE}(e_2)(e_3) \\ \text{BECOME}(\textit{dead}(o))(e_2) \\ \text{SHOOT}(e_3) \\ \text{ACCURATE}(e_3) \\ \text{PATIENT}(o)(e_2) \\ \text{AGENT}(w)(e_3) \end{array}} \right\rangle$$

These two derivations give the same result for the semantic composition for *töten* and *sterben* in combination with *durch*, cf. the representation in (21) on page 326. The event nominal *Schuss* introduces an agent of its own, and *durch* contributes the causal relation. This is all added in a compositonal fashion to the semantics of *sterben*.

5 The semantics of *durch* as presupposition verification and accommodation

In the above analysis, the semantics of *durch* was claimed to be characterised by an empty CONTENT part. *Durch* was said to *involve* a causal relation, however. In this section, I will attempt to specify how this involvement may be understood. Given the fact that the formalism which is applied here was introduced by van der Sandt (1992) and further developed by Kamp (2001) to handle presuppositional phenomena, an obvious question is: Could the causal relation in *durch* be described as a presupposition? And what would the implications for presupposition theory be? I will only be able to give a partial answer to the latter question here.

I would like to argue that the treatment of *durch* presented abouve does indeed amount to analysing the implicit CAUSE element of *durch* as an *intrasentential* presupposition. A *durch*-phrase can be said to *assert* the event included therein and *presuppose* that this event is a cause of some other event. The common basis for generally assumed mechanisms for presuppositional behaviour and the compositional unification-based analysis of *durch* is as follows: When combined with causatives, *durch* seems to lack a meaning of its own. This is due to the unification of the CAUSE of *durch* with the CAUSE of the predicate, which is parallel to presupposition

verification. In combination with inchoatives, however, *durch* does seem to make a greater contribution, where a CAUSE predicate is introduced by the causal preposition itself. Here, a parallel to context accommodation can be observed. And finally, with statives, the contribution of the *durch*-phrase to the complex semantic formula seems to be even greater, leading to a reinterpretation of the state as being a resultant state.

Importantly, a pragmatic account of the combinatorial potential of *durch* can capture some further properties of the preposition which have previously been ignored or not correctly identified. Two additional pragmatic mechanisms involved are *bridging* and *acceptability*. In (8), repeated here for convenience as (27), bridging (in the wider sense of Bittner (2001) can be argued to take place, where the CAUSE associated with the preposition forces a reinterpretation of the state described in the predicate *hoch* ('high') as being a caused resultant state:[9]

(27) *Auch der durch diese Haltung hohe Luftwiderstand kann auf längeren Strecken ganz schön schlauchen.*
'The high air resistance due to this posture may put you through the mill over longer distances.'

In (28), it can be seen that claims made in the literature that *durch* generally cannot be combined with manner-specific causatives (Härtl 2001) are not correct:

(28) a. ??*Er wurde durch einen Schuss erschossen.*
(He was through a shot shot dead)
'He was shot dead by a shot'
b. *Er wurde durch einen Genickschuss erschossen.*
(He was through a shot-to-the-neck shot dead)
'He was shot dead with a shot to the neck.'

The well-formedness of such combinations should not be explained by reference to the semantics of *durch*. A more general account of the distribution in (28) is achieved by assuming that composition is restrained by a general pragmatic mechanism of acceptability as described by van der Sandt (1992, pp. 367 ff.). The verb *erschießen* ('shoot dead') is a *manner-specific* causative predicate, where the causing event is specified as being a shooting event. Modifying a predicate such as *erschießen* ('shoot dead') by an adjunct like *durch einen Schuss* ('with a shot') as in (28a) is uninformative and thus unacceptable. The adjunct contains no information which is not included in the predicate. However, a specification such as *durch einen* ***Genick****schuss* ('with a shot to the neck') as in (28b) renders the adjunct more specific than the shooting event described in the predicate, adding to the content. A shot to the neck describes not only a shooting event, but also specifies the direction of the shot. Thus, the distribution of *durch*-phrases in combination with manner-specific causatives does not have to be accounted for by reference to the semantics of durch itself, but can be seen as fully determined by acceptability restrictions.

It should be emphasised that in the above examples, all pragmatic mechanisms assumed to account for the compositional behaviour of *durch* apply purely sentence-internally. What is more, the presupposition resolution which has been argued for here, occurs at a word-internal level, involving a decomposition of the semantics of lexical items by means of the predicates CAUSE and BECOME. Thus, the above approach can be said to truly involve lexical pragmatics (Blutner 2004), where not only the pragmatic aspects of some lexical items are discussed, but lexical composition itself is viewed as being pragmatic in nature.

It might be questioned whether this is really a kind of presupposition. At this point, I have

[9] This is standardly described as *coercion* in the semantic literature on aspect.

nothing much to say in my defence, this part of the article indeed being work in progress. It is however, not straightforward to establish this relation, since many of the normally applied tests for presuppositions are not applicable in the case of *durch*. The pragmatic mechanisms which are argued to be relevant here, apply at word-level, whereas most presuppositional phenomena which have been treated in the literature, belong to the sentence-level. They can only be evaluated at the top-most CP-level and often only apply intersententially. But the resolution of the CAUSE-presupposition of *durch* can be argued to occur at VP-level, before the topmost eventuality is existentially closed. Thus, traditional tests involving e.g. embeddedness do not make much sense in the case of word-internal pragmatics.

Also of relevance to this point, since the presupposition justification of durch applies at a word-internal level, effects involving global, local or intermediate accommodation (Beaver and Zeevat to appear) are not expected, either.

One test which does seem to be more or less straightforwardly applicable, though, is the negation test, which involves a non-entailing context, in which a presupposition should still be true:

(29) *Er starb nicht durch einen gezielten Schuss.*
(He died not through an accurate shot)
'He did not die through an accurate shot.'

It does not make sense to consider the truth of CAUSE alone, but it can be observed that the CAUSE of *durch* does seem to survive negation: The most obvious interpretation of (29) is one where the person in question dies, but where the cause of his death is not an accurate shot, i.e. the negation has narrow scope over the *durch*-adjunct. Importantly, (29) is interpreted as claiming that there was a cause for the person's death, but that the reason was not an accurate shot.[10]

Summing up, the above arguments indicate that a presuppositional analysis of *durch* is plausible and that the consequence of this is an extension of the phenomena and linguistic levels for which presuppositions seem to be relevant. In the next section, I will briefly discuss the generality of the above approach discussing some further data.

6 Outlook

An approach as sketched above has applications beyond the analysis of *durch*. First, unification as a mode of composition has been applied in an analysis of the semantics of *by* in English (Sæbø to appear). Second, there are causal prepositions in other languages which show a similar behaviour to *durch*. In English, *through* can also be combined with both causative and inchoative predicates. More interestingly, given the close relationship between English *through* and German *durch*, a language more remotely related to German such as Bulgarian also has a preposition which combines with causatives and inchoatives, *ot* ('from'):

(30) a. *Toj be ubit ot tri kurshuma.*
(He was killed from three bullets)
'He was killed with three shots.'
b. *Toj sagina ot tri kurshuma.*
(He died from three bullets)
'He died from three shots.'

[10] It is possible to get a sentential negation reading of *nicht* ('not') in (29), but it is rather dispreffered in (29). The reason for this could be that it does not make sense to add a causal adjunct like *by a shot* if one wants to express that a person did not die (cf. Solstad forthcoming).

Third, there are other types of adverbial modification, where the above analysis can be applied plausibly, as illustrated in (31):[11]

(31) a. *Sie ging in das Haus hinein.*
(She went in the house inside)
'She went into the house.'
b. *Sie ging in das Haus.*
'She went into the house.'
c. *Sie ging hinein.*
'She went inside.'

In (31a) the adverbials *in das Haus* ('into the house') and *hinein* ('inside' in addition to viewpoint information) specify a single path of movement. They are not interpreted as describing two paths which are combined. There is a double specification of an *in* movement (i.e. *into* as opposed to *out of*), both in the preposition *in* and in the *hinein* element. In addition, directionality is specified twice: in the combination of the preposition with accusative case, as well as in the *hinein* element. As can be seen from (31b)-(31c), either of the advberbials in (31a) can occur without the other. In the spirit of the analysis presented here, the *hinein* element would be assumed to carry the presupposition that there is an object into which movement takes place. In (31a) this presupposition is sentence-internally verified, whereas it will have to be verified in a wider context or accommodated in (31c). The information on directionality and inwards movement of the two adverbials is unified whenever they both occur.

In sum, these data suggest that the presuppositional analyses of Kamp (2001) and van der Sandt (1992) in combination with unification-based composition can be suitably applied in analysing lexical items other than e.g. particles and factive verbs, which are often analysed in terms of presuppositions.

7 Conclusion

In this paper, it was argued that an analysis applying strict compositionality is not always a viable option. The varying compositional impact of German adverbials headed by the causal-instrumental preposition *durch* was argued to be better rendered in a unificational framework. It was further argued that pragmatic mechanisms are important in describing the combinatorial distribution of some lexical items, and that what seems to be unification may be argued to be rather word-internal presuppositional phenomena.

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[11] Thanks are due to Christopher Habel for pointing my attention to this example.

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