

German *wie*-complements: Manners, methods and events in progress

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Abstract

In German, complement clauses embedded by the *wh*-word *wie* ('how') have two different readings. The first is a manner reading expressing a manner or method of doing something. The second is called *eventive* in this paper because it expresses an event in progress instead of a manner. Ruling out ambiguity of *wie* the question arises of why a manner word is used to express an event in progress. The basic semantic hypothesis in this paper is that *wie* expresses similarity (as it does in, e.g., similes). The paper starts from the observation that in the manner reading *wie* has a base position next to the verb and is a modifier of the event type whereas in the eventive reading it is base-generated above VP and thus adds information about the event token. The analysis includes two components: First, manners are considered as sets of similar events (instead of primitive objects), and methods, in particular, are considered as sets of similar sequences of subevents. Secondly, events in progress are seen as initial sequences in sets of similar natural continuations. From this point of view, an event in progress is like a method comprising sequences of subevents that share the same initial part. This analysis provides a semantic interpretation explaining why the *wh*-word *wie* expresses both the regular manner reading and the eventive reading depending on whether it modifies the event type or the event token.

Keywords Manner, method, non-manner use of manner modifier, event in progress, imperfectivity, similarity

1 Introduction

German *wie* ('how') is, first of all, a question word asking for a manner or method. It occurs in many syntactic environments, most prominently in questions, as in (1). In this paper, we focus on clausal complements introduced by *wie*, which give rise to two types of readings. First, there is a manner reading, as shown in (2). This reading allows for clarification questions with *wie* to be answered by the manner (pure manner or method) in which the event was performed (answer 1, answer 2). Secondly, there is a reading which is not a manner reading but instead close to bare infinitives and *that*-clauses, and is preferably translated into English by progressives, see (3).¹ This reading does not allow for *wie* clarification questions, but only for questions addressing the reason or way the event came about. We name it the *eventive reading* of *wie*-complements.

- (1) Wie hat Berta ihre Tasche gepackt?
how has Berta her bag packed
'How did Berta pack her bag?'

¹ Another possibility of translation would be a progressive *how* clause – *Anna saw how Berta was packing her bag*. But since non-manner *how* clauses in English differ in various respects from those in German, we will stick to the gerund participle whenever possible.

- (2) Anna sah, wie Berta ihre Tasche packte. manner reading
 Anna saw how Berta her bag packed
 'Anna saw how Berta packed her bag.'
- clarification question: Und WIE hat sie ihre Tasche gepackt?
 and how has she her bag packed
 'And how did she do that?'
- answer 1: Sehr hastig. (pure manner)
 very hasty
 'Very hastily.'
- answer 2: Zuerst die Turnschuhe, dann ein T-shirt, dann ein Buch (method)
 first the running shoes then a T-shirt then a book
 und obendrauf einen Pulli.
 and on top a sweater
 'Running shoes first, then a T-shirt, then a book, and on top a sweater.'
- (3) Anna sah, wie Berta ihre Tasche packte. eventive reading
 Anna saw how Berta her bag packed
 'Anna saw Berta packing her bag.'
- clarification question : Was ist geschehen? / Wie ist das gekommen?
 what is happened / how is this happened
 'What happened?' / 'How come?'
- answer: Sie hat sich mit ihrer Schwester gestritten.
 she has REFL with her sister fought
 'She had a fight with her sister.'

The semantics of *wie*-complements is puzzling for a number of reasons. First, there is the question of how the eventive reading comes about. Restrictions on the embedding verbs make it obvious that eventive *wie*-complements denote neither questions nor propositions, since embedding under *fragen* and *wissen* ('ask', 'know') is blocked (see example 16 below). In the rare literature on eventive *wie*-complements it is agreed that they induce a process-perspective such that the event is presented as a scene or situation or process. This observation is confirmed by the fact that nominal labels for eventive *wie* complements are nouns like *Vorgang*, *Szene* or *Begebenheit* ('process', 'scene', 'event') (see ex. 6d below). We will therefore assume that eventive *wie*-complements denote events in progress.

Manner *wie*-complements denote, first, questions or propositions. This is obvious when they are embedded under matrix verbs like *fragen* and *wissen* ('ask', 'know'). When embedded under perception verbs or report verbs like *sehen* and *erzählen* ('see', 'report'), manner *wie*-complements have to be analyzed as free relative clauses denoting DPs of type *manner*. Both variants require, however, a manner interpretation of the *wh*-word *wie*, and even though the semantics of questions and free relative clauses is in general well understood, there is no agreement about the denotation of manner questions and manner free relatives – are manners properties of events or should they be treated as primitive ontological entities? Thus a semantic analysis has to address the issue of what the nature of manner is, in addition to (or even before) addressing the interpretation of *wie*-complements.

The third and most puzzling issue is the word *wie* itself. There are a number of languages featuring a non-manner interpretation of manner *wh*-words, and it would clearly not be adequate to assume that there are two homonymous manner words in language after language. Focusing on German *wie*, an analysis is required explaining why *wie* is used to introduce events in progress in

addition to manners of events. So from the perspective of German (as well as, e.g., Russian and Polish) the question arises: Why should a manner word be used to indicate an event in progress?

The analysis presented in this paper includes four building blocks. The first consists in assuming two different syntactic base positions of *wie*. We follow, on the one hand, Frey (2003) in assuming a verb-adjacent base position of manner adverbs in German and, on the other hand, Legate's (2010) proposal of an in situ base position of English *how* in non-manner clauses. Manner *wie* is base-generated within the VP while eventive *wie* is base-generated in the left periphery of the clause. This entails that manner *wie* is a modifier of an event type while eventive *wie* is a modifier of an event token. This difference is at the core of the semantic analysis.

The second building block is provided by the similarity interpretation of *wie*. This interpretation has been suggested, e.g., for equative comparison constructions (*Anna tanzte wie Berta*. 'Anna danced like Berta did') where *wie* is said to express a similarity relation between events. The notion of similarity is implemented in multi-dimensional attribute spaces (Umbach & Gust 2014).

The third building block is about the semantics of manner *wie*-complements. We propose to consider manners – pure manners as well as methods – as similarity classes of events of a given event type (for details see section 5.1). Methods, in particular, are understood as similarity classes of sequences of subevents. When occurring as free relative clauses (embedded under, e.g., *sehen* 'see'), manner *wie*-complements denote manner similarity classes (instead of primitive manner objects), and when occurring as interrogative clauses (embedded under, e.g., *fragen* 'ask') they denote propositions asserting that an event is in a particular manner similarity class.

The fourth building block is the semantic interpretation of eventive *wie*-complements. We start from the observation that eventive *wie*-complements express events in progress and, furthermore, from the idea that an event in progress is given by an initial sequence of subevents plus possible continuations of the proper type. We make use of the analysis of methods as similarity classes of sequences of subevents and provide a similarity-based characterization of events in progress which is close in spirit to Landman (1992) and Bonomi (1997). Bringing these two views together, eventive *wie*-complements are analyzed as methods, i.e. similarity classes of sequences of subevents, such that they share a given initial sequence (a *stage* in Landman's terms).

According to this analysis, the core difference between the manner and the eventive reading is the attachment point of the *wh*-word *wie*. In the case of the manner reading it is attached to the event type given by the verb, and it generates classes of similar events of this type; in the case of the eventive reading it is attached to the event token made available by higher functional projections, and it generates classes of similar natural continuations of this token.

In Section 2, the data will be discussed. Section 3 presents the (rare) literature on German *wie*-complements and Legate's (2010) article on English *how* clauses. From there on, our paper is organized along the building blocks listed above: Section 4 presents the syntactic analysis. Section 5 presents the semantic analysis starting with a brief overview over the similarity framework, proceeding with the semantics of manner *wie*-complements and ending with the semantics of eventive *wie*-complements.

Although non-manner uses of manner *wh*-words are found in a number of languages including Russian, Polish, French, Greek and Hebrew, and also in English, this paper focuses exclusively on German, since there seems to be considerable variation between languages. While in Russian and Polish non-manner uses of manner *wh*-words match semantically with the findings for German, English non-manner uses of *how* clearly differ in meaning. Cross-linguistic comparison requires substantial additional research, which has to be left for future work.

2 The data

When considering a sentence hosting a *wie*-complement in isolation, the reading of the complement may not be obvious. In (1), for example, the difference between the manner reading and the eventive reading is manifest only when taking the different clarification questions into account. In this section, a number of characteristics will be reviewed that help distinguishing the two readings – accenting, continuations, nominal labels, adverb position and coordination. Furthermore we will consider the matrix verbs licensing the respective readings. We will see at the end of this section that the difference between the manner reading and the eventive reading is subtle and sometimes even negligible.

In the rest of the paper manner readings and eventive readings of *wie*-complements will be distinguished by subscripts (*wie_M* / *wie_E*), which should not be misunderstood to mean that the word *wie* itself is ambiguous. As for terminology, we will use the term *manner* in a broad sense covering *pure manner*, see (4a), *instrument*, see (4b), and *method* given either as a single more concrete event, as in (4c), or as a sequence of subevents, as in (4d). We will focus on the latter.

- (4)
- a. She danced frantically.
 - b. She opened the can with a knife.
 - c. She solved the problem by taking a loan.
 - d. She drove to Metz by first going to Dijon, then from Dijon to Nancy and finally from Nancy to Metz.

Consider the manner *wie*-complement in (5). Accent on the *wh*-word is licit although not obligatory, cf. (5a). The sentence is naturally continued by specifying a manner or method, cf. (5b, c). Nominal paraphrases make use of the nouns *Art* or *Weise* ('manner', 'way'), cf. (5d).

- (5)
- a. Anna sah, *wie_M* / *WIE_M* Berta ihre Tasche packte,
Anna saw how / HOW Berta her bag packed
'Anna saw how Berta packed her bag.'
 - b. ... nämlich wild durcheinander
namely wild muddled
'... namely messy.'
 - c. ... nämlich zuerst die Turnschuhe, dann ein paar T-shirts, und obendrauf einen Pullover.
namely first the running shoes then a few T-shirts and on top a sweater
'... namely running shoes first, then some T-shirts and on top a sweater.'
 - d. Anna sah, auf welche Art / in welcher Weise Berta ihre Tasche packte.
Anna saw on which manner / in which way Berta her bag packed
'Anna saw the manner / the way in which Berta packed her bag.'

Eventive readings, in contrast, do not license accenting of the *wh*-word, (6a). Subsequent sentences preferably add another event, (6b), while *namely*-specifications are blocked, (6c). Labels in paraphrases are nominals like *Szene*, *Situation*, *Vorgang* and *Begebenheit* ('scene', 'situation', 'process', 'event'), confirming the intuition that eventive *wie*-complements emphasize a process perspective, see (6d).

- (6)
- a. Anna sah, *wie_E* /**WIE_E* Berta ihre Tasche packte,
Anna saw how / HOW Berta her bag packed
'Anna saw Berta packing her bag,'

- b. ... und das Haus durch die Hintertür verließ.
and the house through the backdoor left
'... and leaving the house by the backdoor.'
- c. ... *nämlich wild durcheinander.
namely wild muddled
'... namely messy.'
- d. Anna sah die Szene / die Situation / den Vorgang, wie Berta ihre Tasche packte.
Anna saw the scene / the situation / the process how Berta her bag packed
'Anna saw the scene / situation / process when Berta was packing her bag.'

If *wie* is combined with a gradable adverb, it functions as a degree modifier and the adverb is fronted together with the *wh*-word. Degree readings of *wie*-complements allow accenting of the *wh*-word and subsequent degree specifications, see (7), as well as paraphrases making use of degree nominals like *Geschwindigkeit* 'speed', (8). In other respects they pattern with manner readings, which is why they will not be considered separately.

- (7) Anna sah, wie_M schnell / WIE_M schnell Berta ihre Tasche packte [... nämlich blitzartig].
Anna saw how quick / HOW quick Berta her bag packed [... namely in a flash]
'Anna saw how fast Berta packed her bag. [... namely in a flash.]'
- (8) Anna sah, in welcher Geschwindigkeit Berta ihre Tasche packte.
Anna saw in which speed Berta her bag packed
'Anna saw the speed in which Berta packed her bag.'

Even though degree readings will not be in focus in this paper, we will make use of the syntactic behavior of gradable adverbs as an additional feature distinguishing manner readings from eventive readings: If a gradable adverb in a *wie*-complement stays in situ, as in (9), the eventive reading is the only option, which is evidenced by the fact that accenting and *namely* continuations specifying manners are hardly acceptable, see (10). Gradable adverbs thus provide a fairly reliable test for disambiguation: If a gradable adverb can be inserted next to the verb, the reading is most likely eventive.² But if a gradable adverb is fronted together with the *wh*-word, the *wie*-complement has a degree reading, which we subsume under the notion of manner reading. We will come back to this issue in the syntactic analysis in Section 4.

- (9) Anna sah, wie_E Berta schnell ihre Tasche packte. eventive reading
Anna saw how Berta quick her bag packed
'Anna saw Berta quickly packing her bag'
- (10) Anna sah, ??WIE_E Berta schnell ihre Tasche packte, [??... nämlich blitzartig.]
Anna saw HOW Berta quick her bag packed [... namely in a flash]
'Anna saw HOW Berta quickly packed her bag, [namely in a flash.]'

Another test distinguishing manner readings and eventive readings is based on coordination (this test is due to Zimmermann 1991). A manner *wie*-complement can be conjoined with a *wh*-interrogative of any type, see (11). Note that licensing of the adverb *sorgfältig* 'carefully' subsequent to the *wh*-word

² Some speakers insist that a manner interpretation of (9) is possible, in the sense of Anna seeing the manner of Berta's quickly packing her bag. In fact (10) is slightly improved by choosing a method continuation instead of pure manner (... nämlich indem sie alle Sachen einfach reinwarf. 'namely by simply throwing all things in'). It is further improved by choosing an achievement verb (*Anna sah, WIE Berta ihre Tasche schnell gepackt kriegte.* 'Anna saw HOW Berta got her bag quickly packed'.) Still, speakers in general dislike a manner reading if there is a gradable adverb next to the verb.

indicates the manner reading of the first conjunct. In contrast, an eventive *wie*-complement can only be conjoined with other eventive ones, as in (12a). Coordination with a manner *wie* complement or another *wh*-interrogative appears much less coherent, see (12b).

- (11) Hans erzählte, *wie*_M (sorgfältig) er sich auf das Examen vorbereitet hatte, wer ihm geholfen hatte, wo das Examen stattfand und *wie*_M er dorthin kam.
 Hans reported how (careful) he REFL on the exam prepared had who him helped had where the exam took place and how he there came
 'Hans reported how (carefully) he prepared for the exam, who helped him, where the exam took place and how he got there.'
- (12) a. Hans erzählte, *wie*_E er sich auf das Examen schlecht vorbereitet hatte und vor Aufregung stotterte und (*wie*_E er) schließlich (knapp) bestand.
 Hans reported how he REFL on the exam poor prepared had and from excitement stuttered and (how he) finally (narrowly) passed
 'Hans reported how he prepared poorly for the exams and stuttered with excitement and (how he) finally (narrowly) passed.'
- b. Hans erzählte, *wie*_E er sich auf das Examen schlecht vorbereitet hatte und vor Aufregung stotterte, ??? wer ihn prüfte und ??? *wie*_M (knapp) er schließlich bestand.
 Hans reported how he REFL on the exam poor prepared had and from excitement stuttered who him tested and how (narrowly) he finally passed
 'Hans reported how he prepared poorly for the exam, (how he) he stuttered with excitement, who tested him and how (narrowly) he finally passed.'

There are two types of complement clauses that are close in meaning but not equivalent to eventive readings of *wie*-complements, namely *dass* 'that' complements and bare infinitives, (13b,c). Eventive *wie*-complements differ from *dass*-complements, first, in entailing direct perception when embedded under perception verbs. While in (13b) indirect evidence would be sufficient – Anna may, e.g., see clothing scattered across the room – (13a) entails that Anna actually saw Berta. Direct perception has first been discussed by Barwise (1989), who showed that in the case of bare infinitives embedded under perception verbs indirect evidence would not suffice.

Another feature relevant in perception is epistemic neutrality: does the agent know what she is seeing? Bare infinitives are epistemically neutral, since (13c) will be true even if Anna does not realize that Berta is packing her bag. In contrast, neither eventive *wie*-complements nor *dass*-complements are epistemically neutral, (13a) and (b) entail that Anna recognizes Berta's activity as packing a bag, (see Barwise 1989 and section 3).

- (13) a. Anna sah, *wie*_E Berta ihre Tasche packte.
 Anna saw how Berta her bag packed
 'Anna saw Berta packing her bag.'
- b. Anna sah, dass Berta ihre Tasche packte.
 Anna saw that Berta her bag packed
 'Anna saw that Berta packed her bag.'
- c. Anna sah Berta ihre Tasche packen.
 Anna saw Berta her bag pack
 'Anna saw Berta pack her bag.'

The most important feature in the context of our paper, however, is the observation that eventive *wie*-complements, in contrast to *dass*-complements and bare infinitives, emphasize the process-like nature

of the described event and present it as 'ongoing'. This will be the starting point of the semantic analysis of eventive *wie*-complements in section 5.3.

From the point of view of the matrix clause, *wie*-complements – manner as well as eventive ones – are verbal arguments which are required by the subcategorization frame of the matrix verb, see (14a, b). They must not be confused with temporal *wie*-clauses, as in (14c), where the required argument is given by the nominal and the *wie* clause functions as an adjunct (analogous to the temporal *als*-clauses in 14d).

- (14) a. Anna sah, *wie*_M Berta ihre Tasche packte. *wie*-complement
 Anna saw how Berta her bag packed
 'Anna saw how Berta packed her bag.'
- b. Anna sah, *wie*_E Berta ihre Tasche packte. *wie*-complement
 Anna saw how Berta her bag packed
 'Anna saw Berta packing her bag.'
- c. Anna sah Berta, *wie* sie gerade ihre Tasche packte. temporal *wie*-clause
 Anna saw Berta how she just her bag packed
 'Anna saw Berta when she just packed her bag.'
- d. Anna sah Berta, als sie ihre Tasche packte. temporal *als*-clause
 Anna saw Berta when she her bag packed
 'Anna saw Berta when she packed her bag.'

Matrix verbs embedding manner readings of *wie*-complements include, on the one hand, interrogative and factive verbs and, on the other hand, perception verbs, cognitive verbs and report verbs, (15a,b). Verbs generally blocking *wh*-interrogatives, like *glauben*, *behaupten* ('believe', 'assert') also block manner readings of *wie*-complements, (15c). Manner *wie*-complements embedded under interrogative and factive verbs are commonly analyzed as interrogative clauses denoting questions. When embedded under perception verbs, cognitive verbs and report verbs they are analyzed as free relative clauses, i.e. DPs denoting manners (see section 5.2).

- (15) a. Anna fragte / wusste / bedauerte, *wie*_M Berta ihre Tasche packte.
 Anna asked / knew / regretted how Berta her bag packed
 'Anna asked / knew / regretted how Berta packed her bag.'
- b. Anna sah / erinnerte sich / erzählte, *wie*_M Berta ihre Tasche packte.
 Anna saw / remembered / reported how Berta her bag packed
 'Anna saw / remembered / reported how Berta packed her bag.'
- c. *Anna glaubte / behauptete, *wie*_M Berta ihre Tasche packte.
 Anna believed / claimed how Berta her bag packed
 'Anna believed / claimed how Berta packed her bag.'

Matrix verbs embedding eventive *wie*-complements include perception verbs, cognitive verbs and report verbs, cf. (16a). Eventive complements are blocked under interrogative and factive verbs (and also under *believe* type verbs), cf. (16b,c) (note that the *wie*-complements in (16) are clearly eventive due to adding a gradable adverb in front of the verb).

- (16) a. Anna sah / erinnerte sich / erzählte, *wie*_E Berta ihre Tasche (schnell) packte.
 Anna saw / remembered / reported how Berta her bag (quick) packed
 'Anna saw / remembered / reported how Berta was (quickly) packing her bag.'

- b. *Anna fragte / wusste / bedauerte, *wie*_E Berta ihre Tasche (schnell) packte.
 Anna asked / knew / regretted how Berta her bag (quick) packed
 'Anna asked / knew / regretted how Berta was (quickly) packing her bag.'
- c. *Anna glaubte / behauptete, *wie*_E Berta ihre Tasche (schnell) packte.
 Anna believed / claimed how Berta her bag (quick) packed
 'Anna believed / claimed how Berta was (quickly) packing her bag.'

In (17) verbs are listed which have been attested to embed eventive *wie*-complements in a corpus study (Mieskes et al. 2007), thereby disproving the widely held claim in the literature that eventive *wie*-complements are restricted to perception verbs (see Section 3).

(17) Verbs embedding eventive *wie*-complements

- Perception verbs: sehen, beobachten, hören, fühlen, (be)merken³, erleben
 'see', 'observe', 'hear', 'feel', 'observe', 'experience'
- Cognitive verbs: sich erinnern, daran denken, vergessen, träumen, sich vorstellen
 'remember', 'keep in mind', 'forget', 'dream', 'imagine'
- Speech report verbs: erzählen, berichten, beschreiben, schildern
 'tell', 'report', 'describe' 'portray'

So we can conclude that the set of verbs embedding eventive *wie*-complements is a subset of the verbs embedding manner complements, excluding interrogative and factive verbs.⁴ However, it is not always straightforward to decide for an individual example what the intended reading is, since the difference in meaning is sometimes subtle. In (18), naturally occurring examples are shown which favor an eventive reading (though a manner reading cannot be ruled out with certainty).⁵

- (18) a. Von der Dachterrasse des Hotels kann man beobachten, wie die Sonne den Himmel
 from the roof terrace the-GEN hotel-GEN can one watch how the sun the sky
 über der Stadt rot färbt.
 above the city red colors
 'From the roof terrace of the hotel you can watch how the sun colors the sky over the city red.'
- b. Die Architektin kann sich noch gut erinnern, wie sie in jede Ecke des Hauses
 the architect can REFL still good remember how she in every corner the-GEN house-GEN
 gekrabbelt ist.
 crawled is
 'The architect vividly remembers crawling into every corner of the house.'
- c. Der Eröffnungsfilm erzählt, wie zwei Jungen in die Stadt kommen.
 the opening film tells how two boys in the city come
 'The opening film tells how two boys were coming into the city.'

³ *Riechen* 'smell' does not allow for eventive readings, possible due to the fact that you cannot smell a process (?? *Er roch wie das Gas (langsam) ausströmte*. 'He smelled the gas slowly stream out').

⁴ There is one type of verbs embedding eventive readings but not manner readings, namely *träumen* / *sich vorstellen* 'dream' / 'imagine':

(a) Er wachte vor Lachen auf, weil er geträumt hatte, wie er einen Witz (laut) erzählt.
 'He woke up laughing because he dreamt that he told a joke (aloud).'

(example from the ZAS database on sentence embedding predicates (cf. www.leibniz-zas.de).

⁵ They are taken from the DEWAC corpus provided by the Corpuslinguistics group at the Humboldt University Berlin, and from newspapers.

- d. Gefrorne Tropfen fallen – Wie Christa Wolf am Dienstag auf dem Dorotheenstädtischen
frozen drops fall how Christa Wolf on Tuesday at the Dorotheenstädtischen
Friedhof in Berlin zu Grabe getragen wurde. (Titelzeile)
cemetery in Berlin to grave carried was
'Frozen drops fall – How Christa Wolf was buried on Tuesday at the Dorotheenstädtischer
Friedhof in Berlin.' (newspaper headline)
- e. [...] als sie miterlebte, wie Alec einen seiner Bodyguards tötete.
when she witnessed how Alec an his bodyguards-GEN killed
'[...] when she witnessed Alec killing one of his body guards.'

In the example in (18a) the eventive reading is preferred since the manner is already given (*den Himmel rot färben* 'color the sky red'). It may be objected that *rot* in *rot färben* is not a manner but instead a result and there might still be different ways of doing that, but this interpretation would be quite unlikely. Similarly, in (18b) a manner reading is implausible because the verb already specifies a particular manner of movement (*crawling*). Again, there might be different ways of crawling and thus a manner reading cannot be excluded with certainty. In the example in (18c) the prominent reading is an eventive one since a film first of all reports an event. But in reporting an event, it has to present a sequence of subevents and this sequence may already be considered as a manner (or method) of performing the event. Example (18d) is a newspaper headline, without a matrix clause. The prominent reading is the eventive one even though headlines do not in general block manner readings.⁶ As in the case of the film, as soon as you report an event by way of a sequence of subevents the difference between the two readings gets blurred.

Example (18e) is deliberately presented without context and is as such ambiguous between a manner and an eventive reading of the *wie*-complement. Disambiguation is possible with the help of a gradable adverb, say *grausam* ('cruelly'). If the adverb is in its base position, the reading is presumably eventive. But if it is fronted together with the *wh*-word, it yields a degree reading, (which we subsume under the notion of manner), see (19a, b).⁷

- (19) a. ... *wie_E* Alec einen seiner Bodyguards grausam tötete.
how Alec an his bodyguards-GEN cruelly killed
'... Alec cruelly killing one of his body guards'
- b. ... *wie_M* grausam Alec einen seiner Bodyguards tötete.
how cruelly Alec an his bodyguards-GEN killed
'... how cruelly Alec killed one of his bodyguards'

Applying the coordination test demonstrated in (12) is evidence again for the ambiguity of (18e). Without further context the *wie*-complement can be conjoined with other *wh*-clauses, yielding a

⁶ Here is a headline with a manner reading: *Wie man Dornröschen wach küsst*, 'How to kiss Sleeping Beauty awake', title of a Czechoslovak fairy tale film.

⁷ Again, there are different manners in which you can kill somebody cruelly. But adding one of these is dispreferred. Robin Cooper pointed out that in English the position of the adverb is crucial. The sentence in (a) is clearly better than the one in (b).

(a) He figured out how Alex cruelly killed his body guard, namely with a letter opener.

(b) (?) He figured out how Alex killed his body guard cruelly, namely with a letter opener.

In German, the contrast between (a) and (b) cannot be achieved through different adverb positions. German doesn't allow for adverbs in postposition and, as a rule, the position directly preceding the verb corresponds (semantically) to English postposition.

manner reading, as in (20a), and it can be conjoined with other eventive readings yielding an eventive reading, as in (20b).

- (20) a. Sie erzählte, *wie_M* (grausam) Alec den Bodyguard tötete, wann das war, wer dabei war
she reported how (cruelly) Alec the bodyguard killed when that was who there was
und *wie_M* er entkam.
and how he escaped
'She reported how (cruelly) Alec killed the bodyguard, when that happened, who was present and how he escaped.'
- b. Sie erzählte, *wie_E* Alec den Bodyguard (grausam) tötete, *wie_E* er dann die Waffe entsorgte
she reported how Alec the bodyguard (cruelly) killed how he then the weapon discharged
und *wie_E* er schließlich entkam.
and how he finally escaped
'She reported how Alec (cruelly) killed the bodyguard, how he then got rid of the weapon and how he finally escaped.'

Summing up the data, the contrast between manner and eventive *wie*-complements is perfectly clear when embedded under interrogative and factive verbs because these verbs block the eventive reading. In the case of perception verbs, cognitive verbs and report verbs the difference is subtle. One may enforce an eventive reading with the help of an adverb in the preverbal position. On the other hand, one may enforce a manner reading by accenting the *wh*-word or by conjunction with different *wh*-clauses. But without auxiliary measures the difference stays blurry and frequently even appears irrelevant. This is something to be reflected in the semantic analysis.

3 The literature

The literature on German eventive *wie*-complements is rare. The Duden grammar (2006) as well as the comprehensive IDS grammar (Zifonun et al. 1997) mention them only in passing, claiming that their occurrence is limited to perception verbs in the matrix clause and that they stress the process-like character of the event. Similarly, Bayer (1986) acknowledges that *wie*-complements may have a non-manner interpretation though excluding this interpretation from his analysis.

There are three articles directly dealing with eventive *wie*-complements, namely Clement (1971), Vater (1975), and Falkenberg (1989). All of them assume that eventive *wie*-complements occur only under perception verbs, and they unanimously agree that eventive *wie*-complements, in contrast to *dass* 'that' complements, emphasize the process of the described event and block stative verbs. Falkenberg in fact argues that eventive *wie*-complements behave semantically like English progressives (which will be the starting point of the semantic analysis in Section 5.3).

Talking about perception verbs, there is first of all Barwise (1989) on *Scenes and other Situations*. However, contrary to what Clement, Vater and Falkenberg claim, the occurrence of eventive *wie*-complements is not limited to perception reports. The criteria employed by Barwise – direct perception, epistemic vs. non-epistemic seeing and veridicality – are important in distinguishing bare infinitives as well as *wie*-complements from *that*-clauses but they are no help in distinguishing manner from eventive *wie*-complements.

In the context of German subordinated *wie*-clauses the article by Zimmermann (1991) should be mentioned. Zimmermann's paper is the only one showing that eventive *wie* – she calls it *subordinating conjunction wie* – not only occurs with perception verbs but also with report verbs. She considers

eventive *wie* and manner *wie* as different words since the latter has the status of a syntactic phrase whereas the former is – in her analysis – a mere conjunction. Semantically, she argues that eventive *wie* differs from *dass* ('that') in expressing that the event in question is a process and is equipped with an additional covert property: "*dass* charakterisiert den bezeichneten Sachverhalt nüchtern als existierend, *wie* tut die Anspielung auf Eigenschaften des betreffenden Vorgangs hinzu." ('*dass* soberly characterizes the stated facts as existing, *wie* adds the allusion to particular properties of the process'). Our analysis in section 5.3 will confirm Zimmermann's view and explain the nature of the covert property.

While rejecting a connection between manner and eventive *wie*, Zimmermann nonetheless suggests a connection between eventive *wie* and the temporal conjunction *wie* which expresses simultaneity between the events in the matrix and the subordinated clause, see (21b). In her analysis there is a linguistically covert event which is subject to the covert property mentioned above running in parallel to the complement clause event. Her analysis captures the connection between eventive *wie* and temporal *wie* in a way that can straightforwardly be implemented in a modern aspectual semantics framework (e.g. Demirdache & Uribe-Etxebarria 2004), which has to be left for future work though.

- (21) a. Hans hörte es, *wie* das Kind weinte.
 Hans heard it how the child cried
 'Hans heard it when the child cried.'
- b. Hans hörte das Kind, *wie* es weinte.
 Hans heard the child how it cried
 'Hans heard the child (when) crying.'

Broadening the perspective beyond German, there is first of all Legate's (2010) paper on English *how* showing that in colloquial English *how* complement clauses may have a non-manner interpretation, as in (22).

- (22) They told me how the tooth fairy doesn't really exist. = (1) in Legate (2010)

According to Huddleston and Pullum (2002), non-manner *how*-complements are equivalent to *that*-complements, and *how* in these contexts has to be reanalyzed as a declarative subordinator. Nevertheless they have to concede that non-manner *how* complements cannot, e.g., occur under *believe* (Huddleston & Pullum 2002: 954). Legate thus argues that non-manner *how*-clauses differ syntactically from *that*-clauses in behaving like DPs instead of CPs and are thus free relative clauses instead of interrogatives. But since in contrast to regular free relatives there is no evidence for movement, *how* must be base generated in its surface position. This is accounted for in the syntactic structure in Fig.1 (= 27 in Legate 2010) where *how* is in the specifier of CP position without being moved from a position lower in the clause.

Legate's proposal is discussed in detail in Nye's dissertation in (2013). Nye agrees with Legate that non-manner *how* is base generated above TP, but argues that it occupies the head rather than the specifier position and that a non-manner *how* complement has clausal instead of nominal status. We will not go into details here since syntax is not in focus in this paper.

More importantly, Nye adds a wide range of examples to those presented by Legate, all in all leading to the conclusion that English non-manner *how* complements differ substantially from German eventive *wie*-complements. First, they appear informal in register, whereas German eventive *wie*-complements are unmarked with respect to register. Secondly, they allow for a number of embedding

matrix verbs the German equivalents of which cannot embed eventive *wie*-complements, e.g., *promise*, *forgive*, *find out*. The English examples are evidence that non-manner *how*-clauses license negation and stative content, as in (22) above (which can by no means be translated into German by using a *wie*-complement), and that unlike German eventive *wie*, English non-manner *how* does not induce a process perspective (actually, none of Legate's examples is a progressive).⁸ Finally, following Legate, English non-manner *how*-clauses can be paraphrased by *the way that* which would be impossible in German and even in English is surprising for a non-manner meaning.

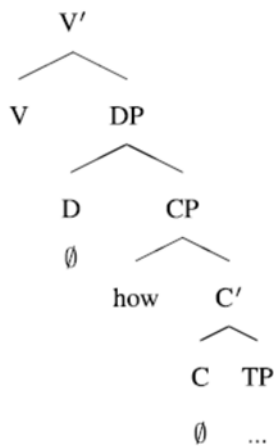


Figure 1 (27 in Legate 2010).

Recently, Liefke (to appear) presented an account solving the discrepancy between German and English by postulating two types of English non-manner *how* clauses (in addition to regular manner clauses). One of them has an eventive interpretation (as suggested in this paper for German) and occurs preferably embedded under verbs of perception. The other one has a factive interpretation, as in (22) above, and occurs under factive and presuppositional verbs (see Kastner 2015), preferably verbs of cognition and speech report. Semantically, eventive *how* is analyzed in parallel to manner *how* while factive *how* is analyzed in parallel to (factive) *that*.

Liefke's analysis focusses on English *how* clauses that are non-manner and at the same time not eventive (like (22) above), and provides a number of interesting entailment data. It is unclear, however, how the difference between eventive *how* and manner *how* is accounted for. Furthermore, by postulating two different types of non-manner *how* the connection between eventive *how* and factive *how* remains unexplained.

One of the basic premises in the present paper is that the word *wie* is the same in manner as well as eventive *wie*-complements. There is a broad range of languages exhibiting non-manner interpretations of manner words. Legate mentions French, Greek and Hebrew. Other languages would be Spanish, Italian, Norwegian, Dutch, Russian, Polish, Serbian, Bulgarian, and Basque (see Jędrzejowski and Umbach in prep.). This is strong evidence against the idea of random homonymy – why should there be two (or more) homonymous manner words in language after language? But then

⁸While German eventive *wie*-complements do not entail completion (see Section 5.3.1), English non-manner *how*-complements do if not combined with a progressive (Stephanie Solt / Robin Cooper, p.c.):

- (a) I saw you cross the street.
- (b) I saw you crossing the street [but after I looked away, I heard the car hit you].
- (c) I saw how you crossed the street to avoid meeting Fred, who was walking towards you.
- (d) I saw how you crossed the street, #but after I looked away, I heard the car hit you.
- (e) I saw how you were crossing the street, but after I looked away, I heard the car hit you.

In (a), (c) and (d) the crossing event has to be completed.

there is the question of why a manner word is used to indicate a non-manner interpretation, which is the starting point of the analysis in our paper. We will adopt Legate's syntactic proposal and focus on semantics. It is important to keep in mind though that the semantic analysis in this paper is aimed at German.

4 The syntactic analysis: Two base positions of *wie*

The analysis of *wie*-complements requires, just like that of complements in general, considering internal aspects as well as restrictions imposed by the matrix verb. Taking the internal perspective, the primary issue is the base position of the *wh*-word, which will be argued to be different for manner and eventive readings of *wie*-complements. From the external perspective, the difference between interrogative complements and free relative clauses must be accounted for.

Recall that we use the term *manner* in a broad sense covering *pure manner*, *instrument* and *method*.⁹ *Pure manner* is typically given by adverbs, *instrument* is typically given by prepositional phrases and *method* is typically given by *indem* ('by') clauses (Behrens & Fabricius-Hansen 2002), see (23a-d). It is important to note that a method may consist of a single more concrete instance of the verbal predicate, but it may also include a sequence of subevents, as in (c) and (d). All of these manner variants can be asked for by *wie* and may thus be targeted by manner *wie* complements.

- (23) a. Sie tanzte wild.
she danced frantical
'She danced frantically.'
- b. Sie öffnete die Dose mit einem Messer.
she opened the can with a knife
'She opened the can with a knife.'
- c. Sie löste das Problem, indem sie einen Kredit aufnahm.
she solved the problem by she a loan took
'She solved the problem by taking a loan.'
- d. Sie fuhr nach Metz, indem sie erst nach Dijon, dann von Dijon nach Nancy und schließlich von Nancy nach Metz fuhr.
she drove to Metz by she first to Dijon then from Dijon to Nancy and finally from Nancy to Metz drove
'She drove to Metz by first going to Dijon, then from Dijon to Nancy and finally from Nancy to Metz.'

We follow the standard account of adverbial modifiers in German (Frey 2003, Maienborn 2003, Schäfer 2013) in assuming that the base position of manner modifiers is adjacent to the verb, which is evidenced by clarification questions, see (24). Since *wie* is a *wh*-word, it is moved to the front of the clause or, in terms of syntactic structure, to the specifier of CP.

- (24) a. (Anna sah/fragte), *wie*_M Berta tanzte.
Anna saw/asked how Berta danced
'Anna saw/asked how Berta danced.'

⁹ Schäfer (2013) provides a more fine-grained classification of manner adverbs distinguishing between (his) *pure manner*, *agent-oriented manner*, *method-oriented manner* and *degree*. For the purpose of our paper the simpler classification is sufficient.

- b. [*wie*_i Berta danced t_i]
- c. Berta hat *WIE* getanzt?
Berta has HOW danced
'Berta danced HOW?'

If *wie* is combined with a gradable adverb, it acts as a degree modifier and the adverb is fronted together with the *wh*-word. We follow Schäfer (2013) in assuming that, e.g., the degree phrase *wie schnell* in (25a) has been moved from the original verb adjacent manner position. This entails that in (25a) the manner position is occupied, even though by a trace. Therefore, if a gradable adjective overtly occurs in the manner base position, as in (25b), the fronted *wh*-word cannot result from movement out of the manner base position. For this reason, the *wie*-complement in (25b) does not have a manner reading: If the manner position is overtly occupied, *wie* cannot normally represent manner – *wie*-complements with a gradable adjective adjacent to the verb are most likely eventive.¹⁰ Thus adding gradable adverbs provides a fairly reliable way to decide between the two readings.

- (25) a. Anna sah, [*wie schnell*]_i Berta die Möhren t_i putzte.
Anna saw how quick Berta the carrots prepared
'Anna saw how quickly Berta prepared the carrots.'
- b. Anna sah, *wie*_E Berta die Möhren schnell putzte.
Anna saw how Berta the carrots quick prepared
'Anna saw Berta quickly preparing the carrots.'

Saebo (2015) considers English *how* questions distinguishing between *manner* (in our terms: *pure manner*) and *method*, and refers to the observation by Jaworski (2009) that *how* questions can be interpreted in different ways. Answering the question in (26) by (a) indicates a manner interpretation while (b) and (c) indicate a method and instrument resp.

- (26) How did Judith kill Holofernes? [Jaworski 2009, p. 134]
- a. With a mixture of revulsion and determination.
 - b. With a mixture of seduction and cunning.
 - c. With a mixture of bile and snake venom.

Saebo argues that manners are adjuncts providing restrictions of verbal predicates while methods are arguments of abstract verbal predicates implementing the action. He postulates that there are two types of verbal predicates, abstract ones equipped with an argument slot for a method, and concrete ones without such a slot. This account makes strong predictions – abstract predicates should always occur with a method specification, and *by*-gerunds combine only with abstract predicates – and it has

¹⁰ In section 2 cases were mentioned in which a manner interpretation cannot be excluded with certainty even though the verb adjacent manner position is occupied, see footnotes 2 and 7. However, cases like this are rare and dispreferred by native speakers.

Similarly, one reviewer wonders whether *wie* can be manner if the adverb is combined with a demonstrative. This is in fact possible if *wie* refers to, e.g., an instrument, that is, manner-instrument is added to pure manner:

Nun verstand Anna, *wie* Berta die Möhren so schnell putzen konnte, nämlich mit einer Wurzelbürste.

Now understood A. how B. the carrots so fast clean could namely with a root brush

'Now Anna understood how Berta could clean the carrots so fast, namely with a root brush.'

Note that *wie* in this example is equivalent to *warum* 'why', which is presumably due to the matrix verb *verstehen* 'understand' and results in a high base position – another future topic.

to resort to coercion when *by-gerunds* are chained. In view of these problems we will adhere to the mundane idea that manners, including methods, are adjuncts.¹¹

From the perspective of the matrix clause, the primary issue is the type of the embedded clause – are *wie*-complements interrogatives or free relative clauses? As shown in Section 2, *wie*-complements may be embedded by verbs like *fragen* and *wissen* ('ask', 'know') which gives them the status of interrogative clauses, see (27a). Interrogative *wie*-complements can only have manner readings: (27b) is hardly acceptable, because the gradable adverb in the manner base position blocks a manner interpretation (cmp. ex. 10 in section 2). When embedded under perception verbs, cognitive verbs and report verbs, we consider *wie*-complements as free relative clauses (e.g. Caponigro 2004, Hinterwimmer 2013), that is, they have the status of DPs. Free relative *wie*-complements may then have either a manner or an eventive reading, (27c).

- (27) a. Anna fragte / wusste / bedauerte, *wie*_M Berta ihre Tasche packte.
 Anna asked / knew / regretted how Berta her bag packed
 'Anna asked / knew / regretted how Berta packed her bag.'
- b. ?? Anna fragte, *wie*_M Berta ihre Tasche schnell packte.
 Anna asked how Berta her bag quick packed
 'Anna asked how Berta quickly packed her bag.'
- c. Anna sah / erinnerte sich / erzählte, *wie*_M / *wie*_E Berta ihre Tasche packte.
 Anna saw / remembered / reported how Berta her bag packed
 'Anna saw / remembered / reported how Berta packed her bag / was packing her bag.'

We thus follow Legate (2010) in assuming that eventive *wie*-complements are free relative clauses and denote DPs. Nye (2013), in contrast, argues for a clausal status presenting contexts which appear to be restricted to clausal complements. We won't go into the English data here, it suffices to see that none of the embedding verbs of eventive *wie*-complements exclusively selects for clauses.

The other syntactic issue with eventive *wie*-complements is the position of the *wh*-word. Since it does not function as a manner modifier of the verb, it cannot be base-generated in the manner position adjacent to the verb. We follow Legate again in assuming that *wie* in eventive readings is base-generated in its surface position, i.e. in the left periphery. Legate suggests that English non-manner *how* is generated as a specifier of CP, that is, in the same position that manner *how* occupies after movement. The other option would be the head of CP position where complementizers are located. Nye presents tests that speak, in her opinion, for non-manner *how* to be in the head position. That would, however, require reanalysis of the *wh*-word as a complementizer.

The syntactic difference between manner and eventive *wie*-complements – the *wh*-word being base-generated in a verb-adjacent position as opposed to being base-generated as a specifier of CP – will in fact be the pivotal point to explain the semantic difference between manner and eventive *wie*-complements: In a verb-adjacent position the manner modifier combines with the event type, whereas in the specifier of CP position the modifier – whatever it is called – combines with the token event. Modifying an event type amounts to run-of-the-mill intersective modification. Modifying an event token is like non-restrictive modification of DPs, you just add a property to a particular entity.

¹¹ The idea of abstract predicates goes back to the notion of *criterion predicates* discussed by Kearns (2003) and Saebo (2008).

Summing up, we will assume the syntactic structures shown (greatly simplified) below. The one in (28) is that of interrogative (manner) *wie*-complements. (29) and (30) represent free relative clauses. The manner free relative and the eventive one are nearly identical: In both structures *wie* is in the specifier of CP position. The only difference is that, in the manner structure, there is a trace of *wie* in the manner base position next to the verb. This difference will be the starting point for the semantic analysis in the next section.

(28) **manner interrogative**

- a. (Anna fragte,) *wie*_M Berta die Tasche packte.
Anna asked how Berta the bag packed
'(Anna asked) how Berta packed her bag.'
- b. [_{CP} *wie*_M_i [_{C'} Q [_{VP} Berta the bag t_i packed]]]

(29) **manner free relative**

- a. (Anna sah) *wie*_M Berta die Tasche packte.
Anna saw how Berta the bag packed
'(Anna saw) how Berta packed her bag.'
- b. [_{DP} ∅ [_{CP} *wie*_M_i [_{C'} ∅ [_{VP} Berta the bag t_i packed]]]]

(30) **eventive free relative**¹²

- a. (Anna sah) *wie*_E Berta die Tasche packte.
Anna saw how Berta the bag packed
'(Anna saw) Berta packing her bag.'
- b. [_{DP} ∅ [_{CP} *wie*_E [_{C'} ∅ [_{VP} Berta the bag packed]]]]

5 The semantic analysis: similarity of events and of stages

The semantic analysis of *wie* complements – manner as well as eventive – is based on the idea that the *wh*-word *wie* denotes similarity, as it does in, e.g., equative constructions. Manners in general are understood as similarity classes of events.¹³ Eventive *wie* is analyzed as a special case, namely as indicating methods, i.e. classes of similar sequences of subevents, which share a given initial sequence, or *stage* in terms of Landman (1992).

In section 5.1 we will briefly introduce the similarity framework our analysis is based on. Technical details will be reduced to a minimum. Then, in 5.2 a semantic analysis of manner *wie*-complements will be proposed that makes use of manners considered as similarity classes instead of primitive entities. Section 5.3 is about the semantics of eventive *wie*-complements. The core point is the idea of capturing their process-like nature by interpreting them as an initial sequence in a method similarity class.

¹² We subsume these structure under the notion of free relatives even if they are not relative clauses in the strict sense because there is no gap abstracted over.

¹³ We use the term *similarity class* although they are just sets because the term is established in the literature on similarity and conveys the idea of classification.

5.1 The similarity framework

In Umbach & Gust (2014) and Gust & Umbach (to appear), a generalized account of German equatives is proposed including scalar as well as non-scalar occurrences, see (31). This approach is based on the idea that equatives express similarity, which is implemented as indistinguishability with respect to a given set of dimensions, and similarity is the contribution of the standard marker *wie*. Thus the standard marker *wie* is not semantically empty (as assumed in standard degree semantics), but instead denotes a similarity relation: In (31a), Anna's height is said to be similar to Berta's height; in (31b) Anna's speed at running is similar to Berta's speed; in (31c) Anna's table is similar to Berta's table; finally in (31d) Anna's way of dancing is similar to Berta's way of dancing.

- (31) a. Anna ist so groß wie Berta.
Anna is so tall how Berta
'Anna is as tall as Berta.'
- b. Anna ist so schnell gerannt wie Berta.
Anna is so fast ran how Berta
'Anna ran as fast as Berta.'
- c. Anna hat so einen Tisch wie Berta.
Anna has so a table how Berta
'Anna has a table like Berta's.'
- d. Anna tanzte so wie Berta.
Anna danced so how Berta
'Anna danced like Berta.'

We will assume that the *wh*-word in *wie*-complements has the same meaning as the standard marker *wie* in equatives, viz. similarity. It has to be kept in mind, however, that similarity in our framework is implemented as indistinguishability with respect to a given set of features and should not be confused with the meaning of the English word *similar* (for differences see Umbach & Gust 2021).

The similarity analysis of equatives is close to the kind analysis suggested in Anderson & Morzycki (2015) since in the nominal and verbal case (though not in the adjectival case) similarity classes created by *wie* correspond to ad-hoc formed kinds. This is evidenced by experimental findings showing that features of comparison are restricted to "in virtue of" properties (Greenberg 2003) which are commonly considered as essential in kind formation (see König & Umbach 2018, Umbach & Stolterfoht in prep). In the verbal case, these features correspond to what is called "event-internal modifiers" of manner verbs in Schäfer (2013).

The basic idea of the similarity analysis of equatives is such that the *wh*-word *wie* heading the standard clause is interpreted as a 3-place similarity relation, $SIM(x, y, \mathcal{F})$. Variables x and y represent items to be compared (individuals or events) and \mathcal{F} is a contextual parameter called *representation* including, among other things, the relevant dimensions of comparison.

Consider the verbal equative in (31d): In the similarity analysis the *wie* clause expressing the standard is interpreted as a free relative clause, i.e. a DP denoting a set of events similar to Berta's dancing with respect to particular features of comparison, see (32a,b). It will be argued in the next

section that manner *wie*-complements have exactly the same interpretation – [*Anna sah / Anna tanzte so*] *wie Berta tanzte* – they are DPs denoting sets of events similar to Berta's dancing, see (32b).¹⁴

- (32) a. $[[wie]] = \lambda e. \lambda e'. \text{SIM}(e', e, \mathcal{F})$
 b. $[[[_{\text{DP}} \emptyset [_{\text{CP}} \text{wie}_{\text{M}_i} [_{\text{C}} \emptyset [_{\text{VP}} \text{Berta dance } t_i]]]]]]$
 $= \lambda e. \text{im. dance}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$

It would, of course, be unsatisfactory if similarity would just be a primitive predicate. Therefore, similarity is spelt out with the help of three components which are combined in a *representation* \mathcal{F} . The basic idea of our framework is to have a referential semantics where predicates talk about entities in the world, and a representational layer where classifiers talk about auxiliary items like degrees, numbers, symbols etc., and vectors thereof. Entities of the world are related to auxiliary items by processes of measurement or feature extraction.

The framework includes three components (for details see Gust & Umbach to appear). First, there are *multi-dimensional attribute spaces* defined by 1-n dimensions of arbitrary scale types (metric, ordinal or nominal) – note that scales in degree semantics can be seen as 1-dimensional spaces with a metric scale level. Secondly, there are *generalized measure functions* mapping individuals and events to points in attribute spaces; they can be seen as generalized versions of adjectival measure functions (cf. Kennedy 1999): While adjectival measure functions map individuals to degrees on a single ratio type dimension, generalized measure functions map individuals to vectors with multiple dimensions of arbitrary scale types (including ordinal and nominal scales). Thirdly, there are *classifiers*, which are defined as predicates over points in attribute spaces; they determine granularity by providing a "grid" such that points within a cell cannot be distinguished.

Similarity of individuals or events is defined by indistinguishability with respect to a representation \mathcal{F} such that two individuals or events are similar if and only if the points they are mapped to are indistinguishable (for details see Umbach & Gust 2014 and Gust & Umbach to appear).

Let us take the verb *dance* as an example. We focus on tango and assume, for the sake of the example, that relevant dimensions of comparison are LEVEL, STYLE, FIGURES, DECORATION (with scale types *ordinal, nominal, ordinal, metric*). Then a dancing event is "measured" by the function in (33), that is, level, style, figures, and the number of decorations are taken into account. Now suppose that Berta's dancing is high level Milongero style, and includes Ochos and Ganchos and five decorations. So it is

¹⁴ The combination of the *wie*-clause with the parameter part of the equative looks like this: We assume that the pronominal element *so* denotes similarity, as does *wie*, but in addition has an anaphoric or deictic capacity represented by a free variable *target*. Thus the parameter part of the equative is interpreted as in (32c). The free variables *target* and *m'* are introduced by *so* expressing that Anna's dancing is in the set of events *m'* that are similar to *target*. The *wie*-clause is combined with the matrix clause by identifying *m* and *m'*, which is achieved by (simplified) unification, \oplus : the free variable *target* is instantiated by the token event of Berta's dancing *e''*, and the features of comparison in \mathcal{F} and \mathcal{F}' must be identical, (32 d). This derivation accounts for the correlative status of *so* in equatives.

- (32) c. $[[\text{Anna tanzte so}]]$
 $= \exists e. \text{dance}(e) \ \& \ \text{ag}(e, \text{anna}) \ \& \ m' = \{e' \mid \text{sim}(e', \text{target}, \mathcal{F})\} \ \& \ \text{dance}(e') \ \& \ e \in m$
 d. $[[\text{Anna tanzte so wie Berta tanzte}]]$
 $= \exists e. \text{dance}(e) \ \& \ \text{ag}(e, \text{anna}) \ \& \ e \in m \ \& \ \text{dance}(e'') \ \& \ \exists e''. \text{ag}(e'', \text{berta}). \ \& \ e'' \in m$
 $\ \& \ m = (\{e' \mid \text{sim}(e', \text{target}, \mathcal{F})\} \ \& \ \text{dance}(e')) \ \oplus \ \{e' \mid \text{sim}(e', e'', \mathcal{F}') \ \& \ \text{dance}(e')\}$
 $= \exists e. \exists e''. \text{dance}(e) \ \& \ \text{ag}(e, \text{anna}) \ \& \ e \in m \ \& \ \text{dance}(e'') \ \& \ \text{ag}(e'', \text{berta}) \ \& \ e'' \in m$
 $\ \& \ m = \{e' \mid \text{sim}(e', e'', \mathcal{F}') \ \& \ \text{dance}(e')\}$

mapped to <high level, Milongero, {Ochos, Ganchos}, 5>. Suppose, moreover, that there is a classifier – let us call it *STYLISH** – conflating advanced and high level and disregarding the difference between Ochos and Ganchos while requiring the number of decorations to be more than three. A classifier to this end would be the one in (34). Accordingly, the class of dancing events similar to Berta's dancing – *dancing like Berta does* – includes all events mapped to points within the range of *STYLISH**.

$$(33) \mu_{\text{dance}} : D \rightarrow \text{LEVEL} \times \text{STYLE} \times \text{FIGURES} \times \text{DECORATION}$$

where $\mu_{\text{dance}}(x) = \langle \mu_{\text{LEVEL}}(e), \mu_{\text{STYLE}}(e), \mu_{\text{FIGURES}}(e), \mu_{\text{DECORATION}}(e) \rangle$

and

LEVEL :	BEGINNER < ADVANCED < HIGH LEVEL < PROFESSIONAL
STYLE :	{MILONGERO, VILLA URQUIZA, TANGO DE SALON, CANYENQUE}
FIGURES :	$\wp\{\text{OCHOS, GANCHOS, BOLEOS, VOLCADAS, COLGATAS}\}$
DECORATION :	\mathbb{N}

$$(34) \text{STYLISH}^*(v)$$

iff $\text{LEVEL}(v) : \text{ADVANCED} \vee \text{LEVEL}(v) : \text{HIGH LEVEL} \ \& \ \text{STYLE}(v) : \text{MILONGERO} \ \& \ \text{FIGURES}(v) : \{\text{OCHOS}\}$
or $\text{FIGURES}(v) : \{\text{OCHOS, GANCHOS}\} \ \& \ \text{DECORATION}(v) \geq 3$
(when v is a vector in $\text{LEVEL} \times \text{STYLE} \times \text{FIGURES} \times \text{DECORATION}$)

Similarity classes of events represent manners. In the example above Berta's manner of dancing would be described as "*high level Milongero style including Ochos and Ganchos and five decorations*" which is pure manner. Manner in the sense of *instrument* refers to an instrument dimension (for example, {HAMMER, KNIFE, POISON, GUN} in the case of *killing*). Manners in the sense of methods (which is, what we are interested in in this paper) specify sequences of subevents of performing an event of a certain type. Sequences of subevents are represented by strings and are implemented as values of a dimension *sequence* (for a string-based view of events see Fernando 2015). We define:

- (i) A method measure function $\mu_{\text{seq}} : E \rightarrow S$ takes events to strings of names of basic events.
- (ii) Strings are partially ordered by a relation *initial-part-of* such that for strings α and β , $\alpha \leq_{\text{init}} \beta$ iff $\text{length}(\alpha) \leq \text{length}(\beta)$ and $\alpha_i = \beta_i$ for index i from 1 to $\text{length}(\alpha)$.
- (iii) The *initial-part-of* relation on strings in attribute spaces is reflected by an *initial-sequence-of* relation on events: $e \leq f$ iff $\mu_{\text{seq}}(e) \leq_{\text{init}} \mu_{\text{seq}}(f)$.¹⁵ (Initial sequences correspond to *stages* in Landman 1992).

Let us consider bag-packing events. Suppose that there is a generalized measure function $\mu_{\text{bag-pack}}$ mapping bag-packing events to an attribute space with dimensions SEQUENCE, DILIGENCE and others. Values of the SEQUENCE dimension are strings (see (i) above), values of the DILIGENCE dimension range from 1 to 5; other dimensions will be ignored for the sake of exposition, see (35a).

Whether two events count as similar is – as in the case of Tango dancing – a matter of classifiers. In (35b) a classifier *SMALL-BAG** is shown that does not distinguish between 3 and 4 pairs of socks, or between a sweater and a down jacket, and diligence is just above minimum. Suppose that there are two events e_1 and e_2 mapped by $\mu_{\text{bag-pack}}$ to vectors as shown in (36a) and (b). According to the *SMALL-BAG** classifier, the events e_1 and e_2 cannot be distinguished and thus count as similar.

¹⁵ It is an interesting open question how tight this reflection has to be in terms of temporal development (Louise McNally, p.c.).

- (35) a. $\mu_{\text{bag-pack}}: D_E \rightarrow \text{SEQUENCE} \times \text{DILIGENCE} \times \dots$
 where $\mu_{\text{bag-pack}}(x) = \langle \mu_{\text{seq}}(e), \mu_{\text{diligence}}(e), \dots \rangle$
 and SEQUENCE: strings of names of basic events
 DILIGENCE: 1 ... 5
 etc.
- b. SMALL-BAG*(v)
 iff $\exists s_i$ in SEQUENCE(v). $s_i = \text{3-PAIRS-OF-SOCKS-IN}$ or $s_i = \text{4-PAIRS-OF-SOCKS-IN}$
 & $\exists s_j$ in SEQUENCE(v). $s_j = \text{SWEATER-IN}$ or $s_j = \text{DOWN-JACKET-IN}$
 & DILIGENCE(v) ≥ 2 (where v is a vector in SEQUENCE \times DILIGENCE \times ...)
- (36) a. $\mu_{\text{bag-pack}}(e_1) = \langle [\text{RUNNING-SHOES-IN} \circ \text{3-PAIRS-OF-SOCKS-IN} \circ \text{HARRY-POTTER-IN} \circ \text{SWEATER-IN}], 2, \dots \rangle$
 b. $\mu_{\text{bag-pack}}(e_2) = \langle [\text{RUNNING-SHOES-IN} \circ \text{4-PAIRS-OF-SOCKS-IN} \circ \text{HARRY-POTTER-IN} \circ \text{DOWN-JACKET-IN}], 4, \dots \rangle$

In concluding, it is important to note that the notion of similarity in this framework is qualitative (property-based) unlike that in Gärdenfors' (2000) conceptual spaces which is quantitative (distance-based). Even more importantly, unlike Gärdenfors' conceptual spaces, multi-dimensional attribute spaces in our framework are integrated into referential semantics by means of generalized measure functions. These functions map referents (individuals or events) to points in attribute spaces, just like measure functions in degree semantics map individuals to degrees. Similarity in this system is a relation between referents which is defined by means of indistinguishability of corresponding points in attribute spaces (for details see Umbach & Gust 2014 and Gust & Umbach to appear).

5.2 Manner *wie*-complements

One building block of the analysis of *wie*-complements in this paper is the interpretation of their manner readings as interrogative clauses and as free relative clauses (see section 4). There is a long-standing dispute in the literature about how to understand the notion of manner. We will briefly go into this issue before presenting our semantic analysis of manner *wie*-complements.

5.2.1 Are manners primitive ontological entities?

A comprehensive overview over the idea of manner in semantics is given in Pinon (2008): Do they denote properties of events, or are they primitive ontological entities? Do they exist independently of a specific event? How are they related to an event? Is there a single manner of an event or are there multiple ones corresponding to different aspects? For the various positions see the references in Pinon (2008), and see Schäfer (2013) and Alexeyenko (2015).

The common way of talking about manner in the current literature is such that manners are primitive entities and there is a manner function from events to manners. Adverbs are then interpreted as predicates on manner entities. An example along the lines of Schäfer (2013) is shown in (37). In (b) an unspecific function MANNER is used, in (c) the manner function is specified for a particular type of event, M-DANCE, which is an alternative considered by Schäfer.

- (37) a. Annette danced stylishly.
 b. $\exists e. \text{dance}(e) \ \& \ \text{agent}(e, \text{anna}) \ \& \ \exists m. \text{MANNER}(e, m) \ \& \ \text{stylish}(m)$
 c. $\exists e. \text{dance}(e) \ \& \ \text{agent}(e, \text{anna}) \ \& \ \exists m. \text{M-DANCE}(e, m) \ \& \ \text{stylish}(m)$

The representation in (37c) is surprisingly close to the idea of multi-dimensional attribute spaces presented in the preceding section. If you think of the manner function as a generalized measure function and the manner variable m as ranging over points in attribute spaces, (37c) corresponds to (38):

$$(38) \quad \exists e. \text{dance}(e) \ \& \ \text{agent}(e, \text{anna}) \ \& \ \exists m. \mu_{\text{dance}}(e) = m \ \& \ \text{STYLISH}^*(m)$$

(where m is a point in LEVEL×STYLE×FIGURES×DECORATION)

In our framework, points in attribute spaces differ from referential entities like individuals and events in being mere auxiliaries facilitating classification of individuals and events with respect to certain properties. They are dependent on the individuals or events they are attributes of. Their ontological status is analogous to that of degrees in degree semantics – points in the attribute space are auxiliary units just like degrees.

The interpretation of *wie*-complements raises the question of what the domain is that the wh-word *wie* ranges over. Since we do not consider points in attribute spaces to be on par with individuals and events, we prefer thinking of *wie* as ranging over sets of events mapped by manner measuring functions onto points in attribute spaces. If you allow for some granularity such that closely adjacent points are indistinguishable, such sets of events constitute similarity classes: sets of all events for which the measure function yields indistinguishable values, see (39).

$$(39) \quad m = \{e' \mid \text{sim}(e', e, \mathcal{F})\} \quad \text{where } \mathcal{F} \text{ includes relevant dimensions of comparison}$$

plus suitable generalized measure functions, and also
classifiers providing granularity, (cf. 5.1)

This view may at first sight appear unnecessarily complex – why talk about similarity classes instead of primitive manner entities? – but it has three significant advantages. First, we get a little closer to the internal make-up of manners. The similarity framework does not tell you which measure functions are relevant for a particular manner, but it allows predictions that can be tested empirically (see Umbach & Stolterfoht in preparation). Second, analyzing the wh-word *wie* in complements as similarity shows the connections to other uses of *wie*, e.g., in equatives, see (32) above. Third, and most important in this paper: The similarity analysis of manner reveals what manner and eventive *wie*-complements have in common and provides an answer to the question we started out from, namely why a manner question word is used to indicate an event in progress.

One argument raised against the similarity approach is about perception. Seeing how Anna dances should not be analyzed such that it entails seeing all similar events. We assume that perceiving a manner in form of a similarity class, as in (39), entails perceiving the 'seed event' of this set (variable e in 39). The other elements of the class are indistinguishable from the 'seed event' with respect to certain features of comparison, but they are not indistinguishable per se. Indistinguishability does not entail identity (see Umbach & Gust 2021), and thus similar/indistinguishable events will not be simultaneously perceived. What you see when seeing how Anna dances is, first, Anna dancing – this is why *wie*-complements entail direct perception – and, secondly, that her dancing has attributes with respect to which her dancing is indistinguishable from other dancing events. In contrast to the manner-as-primitives view according to which what is seen is a manner object, the similarity view retains the link between event and manner, which is an acknowledged problem for the manner-as-primitives analysis, see Alexeyenko (2015, p.161), and it avoids the debate on whether primitive manner objects can be perceived as such.

5.2.2 Manner *wie*-complements interpreted by similarity

We saw in section 2 that manner *wie*-complements occur, on the one hand, embedded under perception verbs, cognitive verbs and report verbs and, on the other hand, under interrogative and factive verbs, see (15a,b). In section 4, the former were analyzed as free relative clauses and the latter as interrogative clauses, with *wie* being base generated in the manner position adjacent to the verb in both cases. Before going into the similarity analysis of manner *wie*-complements, let us see what the interpretation would look like if we consider manners as primitive entities related to the event by a MANNER relation. The free relative interpretation is shown in (40), the interrogative one in (41).¹⁶

(40) Analysis by **manners-as-primitive-entities**: manner free relative clauses

- a. (Anna sah) *wie*_M Berta die Tasche packte.
- b. [_{DP} ∅ [_{CP} *wie*_{M_i} [_{C'} ∅ [_{VP} Berta bag-pack *t*_i]]]]
- c. $\lambda e. \iota m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ \text{MANNER}(e, m)$

(41) Analysis by **manners-as-primitive-entities**: manner interrogative clauses

- a. (Anna fragte,) *wie*_M Berta die Tasche packte.
- b. [_{CP} *wie*_{M_i} [_{C'} Q [_{VP} Berta bag-pack *t*_i]]]]
- c. $\lambda p. \exists e. \exists m. p \leftrightarrow \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ \text{MANNER}(e, m)$

The reason why we think that the analysis above is unsatisfactory has been laid out in the previous section. Most importantly, it cannot – as far as we can see – be extended to account for eventive *wie*. Using primitive manner entities would thus predict that the manner reading and the eventive reading of *wie*-complements are unrelated, which would be an unsatisfactory result.

We propose the similarity-based analyses in (42) and (43). It is important to note that they are not fundamentally different from standard semantic interpretations in (40)/(41). They are just more detailed and spell out the making of manner objects. In (42) the interpretation of a manner free relative clause is shown. As in the case of equatives (section 5.1), *wie* denotes a similarity relation: $\lambda e'. \lambda e. \text{SIM}(e', e, \mathcal{F})$ (recall that the parameter \mathcal{F} includes the relevant dimensions of comparison and is given by context). Combining *wie* with the verb yields (c)/(d), where combination is simply intersective modification. This is analogous to the manner-as-primitive-entity version in (40), where manner also functions as an intersective modifier. The only difference between the similarity version and the manner-as-primitive-entity version is that in the former *m* is of type $\langle e, t \rangle$ instead of *e* and is connected to the event by *being a class of similar events* (with respect to \mathcal{F}) instead of *being manner-related to the event*. In (e), the free relative clause is type-shifted from $\langle e, t \rangle$ to $\langle e \rangle$ by the iota operator taking sets to (maximal) plural individuals.¹⁷ We assume that the event variable is bound by existential closure only after adding the matrix clause, cf. (f).

(42) Analysis by **manners-as-similarity-classes**: manner free relative clauses

- a. (Anna sah) [_{DP} ∅ [_{CP} *wie*_{M_i} [_{C'} ∅ [_{VP} Berta bag-pack *t*_i]]]]
- b. $[[\textit{wie}]] = \lambda e. \lambda e'. \text{SIM}(e, e', \mathcal{F})$

¹⁶ For the sake of transparency, we summarize *die Tasche packen* in these and the following representations in a single predicate *bag-pack*.

¹⁷ see Caponigro (2004). Note, however, that manner *wie* complements are closer to kinds than to maximal plural individuals, see also Hinterwimmer (2013) for kind-denoting free relatives. In the present paper we stay with *iota* to keep things simple.

- c. $[[[_{VP} \text{Berta bag-pack } \text{wie}_{M_i}]]]$
 $= \lambda e \lambda m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- d. $[[[_{CP} \text{wie}_{M_i} [_{C'} \emptyset [_{VP} \text{Berta bag-pack } t_i]]]]]$
 $= \lambda e \lambda m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- e. $[[[_{DP} \emptyset [_{CP} \text{wie}_{M_i} [_{C'} \emptyset [_{VP} \text{Berta bag-pack } t_i]]]]]]]$
 $= \lambda e. \text{im. bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- f. $[[\text{Anna see } [_{DP} \emptyset [_{CP} \text{wie}_{M_i} [_{C'} \emptyset [_{VP} \text{Berta bag-pack } t_i]]]]]]]$
 $= \exists e'. \exists e. \text{see}(e') \ \& \ \text{ag}(e', \text{anna}) \ \& \ \text{th}(e', \text{im. bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}))$
 $\ \& \ m = \{e'' \mid \text{sim}(e'', e, \mathcal{F})\}$

In (43) the interpretation of a manner interrogative clause is shown. We make use of a simplified Karttunen-style analysis such that embedded interrogatives denote questions and questions are sets of (true) propositions (Karttunen 1977). We neglect the details of question semantics and instead focus on the role of manner. From the point of view of manners-as-primitive-entities, propositions range over manners in the same way they range over persons in, e.g., (44). If manners are viewed as similarity classes, propositions have to range over similarity classes. Similarity classes of a given event vary with respect to representations \mathcal{F} . So propositions range over the set of similarity classes of a given event varying in \mathcal{F} – in prose, the set of manners in which an event of the given event type can be performed. Such a domain is defined by $M(e) = \{m \mid \exists \mathcal{F}. m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}\}$.¹⁸

(43) Analysis by **manners-as-similarity-classes**: manner interrogative clause

- a. $(\text{Anna fragte}) [_{CP} \text{wie}_{M_i} [_{C'} \text{Q} [_{VP} \text{Berta bag-pack } t_i]]]]$
- b. $[[[_{VP} \text{Berta bag-pack } \text{wie}_{M_i}]]]$
 $= \lambda e \lambda m. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- c. $[[[_{CP} \text{wie}_{M_i} [_{C'} \text{Q} [_{VP} \text{Berta bag-pack } t_i]]]]]$
 $= \lambda m. \exists e. \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}) \ \& \ m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}$
- d. $[[[_{CP} \text{wie}_{M_i} [_{C'} \text{Q} [_{VP} \text{Berta bag-pack } t_i]]]]]$
 $= \lambda p. \exists e \exists m. p \leftrightarrow m \in M(e) \ \& \ \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta})$
where $M(e) = \{m \mid \exists \mathcal{F}. m = \{e' \mid \text{sim}(e', e, \mathcal{F})\}\}$

(44) $[[\text{who Peter loves}]]$

$$= \lambda p. \exists e. \exists x. p \leftrightarrow \text{person}(x) \ \& \ \text{love}(e) \ \& \ \text{ag}(e, \text{peter}) \ \& \ \text{theme}(e, x)$$

We started this section by explaining the notion of manner by similarity of events. Similarity classes of events are akin to event kinds in sharing "in virtue of" properties (see section 5.1). This suggests that the reification of (the denotations of) free relative clauses might in fact result in kinds rather than

¹⁸ One reviewer suggested to rephrase (43d) such that e and \mathcal{F} are existentially quantified over while dismissing the explicit mention of the domain $M(e)$. This is simpler and in fact equivalent. But since we want to make the domain explicit, we leave (43d) as it is and add the rephrase here:

(43e) $[[[_{INT[CP} \text{wie}_{M_i} [_{C'} \text{Q} [_{VP} \text{Berta bag-pack } t_i]]]]]]$
 $= \lambda p. \exists e \exists \mathcal{F}. (p \leftrightarrow \{e' \mid \text{sim}(e', e, \mathcal{F})\} \ \& \ \text{bag-pack}(e) \ \& \ \text{ag}(e, \text{berta}))$

(maximal) plural individuals. An analysis along this path would be beyond the scope of this article. However, if you wonder what sort of an individual a similarity class might be, think of it as a kind.

5.3 The meaning of eventive *wie*-complements

The core issue in this paper is the semantics of eventive *wie*-complements, and the main motivation for the additional effort of explaining manners by similarity is that in this way the connection between manner and eventive *wie* complements will be transparent. The most important empirical observation on eventive *wie*-complements is that they have a process-like character. So our hypothesis is that eventive *wie*-complements are imperfective in the sense of presenting a process as ongoing. Starting from the commonly accepted idea that events in progress are associated with a set of possible continuations, we will suggest an analysis of such events as similarity classes built from an initial event sequence – the sequence that is observed – plus possible natural continuations. According to this analysis, events in progress constitute a special sort of manner similarity classes, special in three respects: First, these classes represent methods, that is, sequences of subevents of an event of a given type. Second, the sequences are similar to a natural course of events of the relevant type. Third, all sequences share a common initial sequence, or stage, that has already been realized.

We will start with providing evidence that eventive *wie*-complements do in fact denote events in progress, then discuss the basic characteristics events in progress and how they were accounted for in Landman (1992) and in Bonomi (1997), and finally suggest a semantics for eventive *wie*-complements. To be clear from the outset, we do not claim that *wie* is a progressive operator analogous to progressive morphology in English. In our analysis, *wie* selects for an event in progress – a stage – in order to build a similarity class of natural continuations.

5.3.1 Eventive *wie*-complements denote events in progress

The characterization of eventive *wie*-complements in the literature is mostly negative: They don't express a manner of performing an event, they cannot be used as embedded questions and, syntactically, the *wh*-word has not been moved. Moreover, they are not equivalent to *dass* ('that') complements, since they cannot be embedded under *glauben* ('believe') and, unlike *dass*-complements, they entail direct perception when embedded under perception verbs – *Anna sah wie_E Berta ihre Tasche packte*. ('Anna saw how Berta packed her bag.') entails that Anna actually saw Berta packing her bag – mere evidence, e.g. clothing scattered across the room, would not suffice.

The only positive characterization found in the literature is the commonly agreed on intuition that *wie_E*-complements indicate a process perspective – they describe a process or scene. From this observation, Falkenberg (1989) draws the conclusion that eventive *wie*-complements are imperfective, like English progressive clauses. He shows that they allow for the so-called *imperfective paradox* – (45a) does not entail that the crossing of the river event was completed while (45b) does. Thus a continuation by *Sie kam aber nicht auf der anderen Seite an*. ('But she did not reach the other side.') would be consistent in the case of (45a), but not in the case of (45b). Falkenberg furthermore points out that eventive *wie*-complements may contain "*dabei sein*" constructions ('be in the process of doing sth.') as in (46a) and also the *Rheinische Verlaufsform* (Rhenish progressive) which is a substandard German progressive form, (46b).

- (45) a. Anna sah, *wie*_E Berta den Fluss überquerte.
 Anna saw how Berta the river crossed
 'Anna saw how Berta was crossing the river.'
- b. Anna sah, dass Berta den Fluss überquerte.
 Anna saw that Berta the river crossed
 'Anna saw that Berta crossed the river.'
- (46) a. Anna sah, *wie* Berta dabei war, den Fluss zu überqueren.
 Anna saw how Berta in-the-process was the river to cross
 'Anna saw how Berta was crossing the river.'
- b. Anna sah, *wie* Berta den Fluss am überqueren war. (Rheinische Verlaufsform)
 Anna saw how Berta the river at cross was
 'Anna saw how Berta was crossing the river.'

We follow Falkenberg in assuming that *wie*_E-complements are imperfective in the sense of viewpoint aspect: the situation is presented from the inside, as an ongoing event. In English, imperfectivity is marked by progressive morphology (for details see Deo 2020). In German, imperfectivity is mostly unmarked since simple tenses are indeterminate between a progressive and non-progressive interpretation. Possible markers are particles like *gerade* 'just' and "*dabei sein*" constructions, and also the (substandard) *Rheinische Verlaufsform*. Eventive *wie*-complements are in fact compatible with these markers, see (46). Moreover, if it is true that eventive *wie*-complements select for imperfectivity, they should conform to the well-known constraints on lexical aspect, i.e. they should license activities and accomplishments but not states and achievements.

States are excluded in *wie*_E-complements, see (47a) (= 21 in Vater 1975). This is independent of whether they express stage level or individual level predicates (47a,b). Verbs of position like *stand*, *sit*, *lie*, though clearly stative, may in rare contexts occur in English progressives, (48) (= 10a in Deo 2020). In *wie*_E-complements, position verbs are hardly acceptable, (49a). The sentences improve, however, by adding an activity conjunct, (49b,c). This effect is reminiscent of the pseudo-coordination form of progressives in Norwegian in which a position verb is combined with an activity.¹⁹ Without going into details, we will consider this effect as support for the claim that *wie*_E-complements reject statives.

- (47) a. *Ich sah, *wie*_E Hans krank war.
 I saw how Hans sick was
 'I saw Hans being sick.'
- b. *Anna hörte / erzählte *wie*_E Berta *Die Glocke* von Schiller auswendig konnte.
 Anna heard / reported how Berta *Die Glocke* of Schiller by heart knew
 'Anna heard/reported Berta knowing Schillers poem *Die Glocke* by heart.'
- (48) The socks are lying under the bed.
- (49) a. ?? Anna sah, *wie*_E Berta in der Küche saß.
 Anna saw how Berta in the kitchen sat
 'Anna saw how Berta was sitting in the kitchen.'
- b. Anna sah, *wie*_E Berta in der Küche saß und heulte.
 Anna saw how Berta in the kitchen sat and cried
 'Anna saw how Berta was sitting in the kitchen crying.'

¹⁹ See Tonne (2006); her example (1a) is '*Bama satt og leste*.' (lit: the children sat and read), which means that the children were reading but not necessarily sitting. The position verb is prototypical for the activity but not entailed (sit in the kitchen and cry; stand and talk on the telephone etc.); p.c. Atle Groenn.

- c. Dann stürmten sie raus und sahen, *wie*_E Ganon am Boden lag und sich wand wie ein Wurm.²⁰
 Then rushed they out and saw how Ganon at ground lay and REFL squirmed how a worm
 'Then they rushed outside and saw how Ganon lay on the ground and squirmed like a worm.'

Contrary to expectation, achievements are not excluded in *wie*_E-complements. But if they occur they have either an accomplishment-like reading with an additional preparatory phase, or they have a *slow-motion* reading, see (50a,b).

- (50) a. Anna sah / erzählte, *wie*_E Berta ihren alten Schulfreund wiedererkannte.
 Anna saw / reported how Berta her old schoolmate recognized
 'Anna saw/reported how Berta recognized her old schoolmate.'
- b. Anna sah / erzählte, *wie*_E Berta das andere Ufer erreichte.
 Anna saw / reported how Berta the other river side reached
 'Anna saw/reported how Berta reached the other side of the river.'

Accomplishment-like readings as well as *slow-motion* readings have been observed by Rothstein (2004) for English achievement verbs occurring in the progressive. The former are available for the majority of achievement verbs and add a short preparatory phase to the instantaneous event expressed by the achievement. The latter are always available, they make the instantaneous event appear as being stretched over time. Rothstein furthermore observes that the former pattern with accomplishments is not entailing the completed event thereby licensing the imperfective paradox, while the latter pattern with activities since they do entail the completed event and block the imperfective paradox, see (50c,d) below (= 8b, p.39 and 48a, p. 57, Rothstein 2004).

- (50) c. The plane was landing when it exploded in midair (so it didn't land).
 d. #Mary is spotting her arch enemy at the party but she hasn't yet spotted her.

5.3.2 Events in progress construed as stages in method similarity classes

The semantics of imperfective sentences and, in particular, the English progressive has been discussed at length in the literature; see, e.g., Dowty (1979), Landman (1992), Bonomi (1997), Portner (1998) and, recently, Fiorin and Delfitto (2017) and Varasdi (2017); for an overview see Deo (2020).

The basic idea is that imperfectivity indicates viewing an event "from the inside" or as "ongoing". Accordingly, the reference time is included in the event time. In (51a) the reference time is that of the matrix event; imperfectivity of *wie*_E-complements would predict that Anna did not necessarily watch all of Berta's bag-packing. This is what we find, see (51b).

- (51) a. Anna sah, *wie*_E Berta ihre Tasche packte.
 Anna saw how Berta her bag packed
 'Anna saw Berta packing her bag.'

²⁰ Example from the term paper 'Event-Lesart in *wie*-Komplementen mit Zustandsverben' by Chiara Aigner and Judith Linden, winter semester 2016, university of Cologne. The authors did a corpus search on position verbs in eventive *wie*-complements (in the DEWAC corpus, HU Berlin). They found few genuine *wie*_E-complements, as in (49c), and also a number of temporal *wie*-clauses of the form in (a)

(a) Plötzlich sieht der den Teufel, *wie* er auf seinem Thron sitzt und vor Kälte bibbert.
 'Suddenly he sees the devil how he is sitting on his throne jittering from cold.'

- b. Anna sah drei Minuten lang zu, wie_E Berta ihre Tasche packte. Das Packen dauerte
 Anna saw three minutes long to how Berta her bag packed. The packing lasted
 insgesamt drei Stunden.
 in total three hours

'Anna watched Berta packing her bag for three minutes. The packing took three hours in total.'

The 'ongoing' characteristics entails that the event segment denoted by the imperfective sentence is continued. When Anna sees Berta packing her bag she will not expect Berta to stop as soon as she left the room but instead she will assume that Berta continues when she is no longer watching. This type of expectation is subsumed under the notion of inertia in cognitive science. Furthermore, if the speaker describes Berta's activity as being of the type of *bag-packing*, expected continuations are of the same type. Or, from Anna's point of view, if she classified Berta's activity as being of the type of *bag-packing* she will expect its continuation to be of the type of *bag-packing*, too.²¹ So if you ask Anna: *what is Berta doing there?* she would answer: *Berta ist am Koffer packen. / Berta is packing her bag.* even though she doesn't see more than Berta rummaging around in her belongings.

The discussion in the literature centers around the question of which requirements have to be met by continuations of the event in order for the imperfective sentence to be true. Which interruptions would falsify the truth of *Berta is packing her bag*? Intuitively, the sentence is true even if the bag-packing stops due to an earth quake. But it is not true if the process stops because Berta realizes that there is nothing available to put in the bag (maybe because she is in the wrong room). The idea of truth-preserving interruptions is the core question of the famous *imperfective paradox*.²² It led to the idea of *inertia worlds* which are worlds identical to the actual world up to reference time and from there on everything takes a natural course – nothing unexpected happens. Based on the idea of inertia worlds Dowty (1979) proposed that *Mary is building a house* is true in a world *w* at an interval *i* iff in every inertia world *u* for *w* the interval *i* is a subinterval of a larger interval where *Mary build a house* is true.

There are a number of problems with possible interruptions and questions of naturalness which led to the event based account in Landman (1992). It makes use of *stages of events* and *continuation branches*. Stages are "parts of an event which are big enough and share enough with the event to be called a less developed version of the event" (Landman 1992, p. 23). Continuations match with stages: If an event *e* is a stage of an event *f*, then *f* is a continuation of *e*. Continuation branches are described by Landman as follows:

"We follow the actual continuation of our event *e* in our world until it stops. Then we perform a thought experiment: How would *e* have continued if it hadn't stopped? But we only do so if the thought experiment is reasonable on the basis of what is internal to *e*; if the thought experiment brings us to a world where *e* continues further than is reasonable on the basis of *e* itself, we don't perform it." (Landman 1992, p. 26).

²¹ Relatedly, *wie_E*-complements are not epistemically neutral in the sense of Barwise, that is, (51a) entails that Anna thinks Berta is packing her bag.

²² The imperfective paradox points to the observation that for activities, as in (1), but not for accomplishments, as in (2), the entailment from (a) to (b) holds, see the concise presentation in Varasdi (2017).

- (1) a. Mary was pushing a cart. b. Mary pushed a cart.
 (2) a. Mary was crossing the street. b. Mary crossed the street.

If (2a) is interrupted by some unforeseen accident it is still true while (2b) is false. (2a) is still true because normally Mary would reach the other side of the street. This is different in *Mary was crossing the Atlantic (by swimming)*. This sentence is false even if Mary after holding on for 500m is carried to the other side by magic forces, since that would not count as a natural continuation.

Landman's implementation makes use of closest (i.e. most similar, Lewis 1973) worlds such that in the case of an interruption in the actual world the continuation of the event in the closest worlds is considered, up to the next interruption, and this is repeated as long as switching to another world is still reasonable. So continuation branches are possible continuations of a given event stage (this is why Varasdi 2017 classifies Landman's account as a possibility-based theory of the progressive). The stage is realized in the actual world – it is an event token, for example, the stage of Berta's bag-packing observed by Anna. But we don't yet know how it will develop from then on because reference time is within event time. Due to cognitive inertia we take only natural continuations of the type of *bag-packing* into account, and we judge the progressive to be true if we can think of a possible and also natural continuation of the token stage. This is why *Mary was crossing the street* is true even if she was hit by a truck, and *Mary was swimming across the Atlantic* is false if after the first 500 meters she is carried to the other side by magic forces.

While in Landman's account possibility is encoded with the help of possible worlds, the account suggested in Bonomi (1997) is extensional making use of *stereotypical frames* and *natural courses of events*.²³ Stereotypical frames are functions from events and contexts yielding sets of natural courses of events. Truth conditions for the progressive are defined such that an event *e* is an *event in progress of type V* iff there is a stereotypical frame such that each natural course of events licensed by this frame contains an event which is of type *V* and includes the event in progress. A sentence in the progressive is true in Bonomi's system if the actual course of events is contained in the natural courses of events selected by the relevant stereotypical frame.

"... *Leo is going to Metz* is true iff there is an event whose characteristics, with respect to some features of the world and a given stereotypical constraint, force the perception of *e* as *part* of a process of Leo's going to Metz, [...] there can still be different chains of events leading to an event of Leo's getting to Metz. He might take a toll road or a freeway, stop at X rather than Y, and so on. This is why we have to refer to a plurality of courses of events, even though the type of the event which is going on is already definite." (Bonomi 1997, p. 193-194)

From Bonomi's analysis to the similarity analysis of eventive *wie*-complements it is just a few steps. The basic idea of our interpretation of eventive *wie*-complements is built on three key components. First, sets of courses of events correspond to **methods**, that is, to sets of sequences of subevents performing an event of a certain type (for example, sequences of subevents adding up to a *bag-packing* event). Secondly, the stage of the event realized within reference time – the stage of Berta's bag-packing observed by Anna – is a **token** corresponding to an initial sequence of a bag-packing sequence. Thirdly, even though the initial stage has various continuations, namely all the sequences it is an initial part of, the truth of the sentence should be confined to **natural** sequences only – the stage of Berta's activity is truly described by *wie Berta ihren Koffer packt* if there are natural continuations of this stage which are of the type *bag-packing*.

²³ "The idea is that our perception of an event involves a bunch of possible developments of that event. My going to the blackboard and taking a piece of chalk can be considered as part of a number of alternative events, as putting the room in order, writing some instructions, proving a theorem, and so on. Since the same event *e* can be 'embedded' into several possible continuations, the context is a determining factor in selecting the relevant ones. If *e* is considered in connection with a given set of concomitant facts, then its possible extensions are events of a certain type. But if another set of concomitant facts is selected as the relevant background, then the type of the global event which is considered in progress will be different." (Bonomi 1997, p. 174).

- f. [[Anna see $[_{DP} \emptyset$ [$[_{CP} \text{wie}_E$ [$[_{C'} \emptyset$ [$[_{VP}$ Berta bag-pack]]]]]]]]
 = $\exists e'. \text{see}(e') \ \& \ \text{ag}(e', \text{anna}) \ \& \ \text{th}(e', \text{ie. ag}(e, \text{berta}) \ \& \ \exists f. e \leq f \ \& \ \text{bag-pack}(f) \ \& \ \text{natural}(f) \ \& \ \exists m. m = \{f' \mid \text{sim}(f', f, \mathcal{F})\} \ \& \ \forall f'. f' \in m \rightarrow e \leq f')$

Comparing the interpretation of eventive *wie*-complements in (52) to that of manner *wie*-complements in (42), the difference in meaning is inherently connected to the difference in syntax. We follow Carlson (2003) in assuming that the lexical projection of a major phrase contains only type information while token information is made available only in higher functional projections. In the manner reading of *wie*-complements the *wh*-word is base-generated below VP and thus has access to the event type; the similarity class functions as an intersective modifier, and this is what we expect from a manner modifier. In contrast, in the eventive reading the *wh*-word is base-generated above VP and has access only to the event token. The similarity class provides a constraint on the event token by postulating natural continuations. In this case, the similarity class functions as a non-restrictive modifier. We do not call the token modifier a manner modifier in order to avoid confusion. However, if you see manners as similarity classes of events, the token modifier is a manner modifier, too.

In this analysis, the modal impact of imperfectivity is encoded in the similarity analysis by the type-token distinction. While the stage referred to by a progressive sentence is a token, the set of continuations is a type constituted by possible continuations – only one of them will be realized (if at all). From this point of view our analysis draws on possibilities although not on possible worlds.

Finally, one might think that German *wie* in eventive complements is a progressive operator analogous to progressive morphology in English. However, in our analysis eventive *wie* presupposes a stage in order to build the dependent similarity class, and it is the notion of the stage indicating that the event is 'ongoing', that is, reference time is within event time. In Deo (2020) two roles of grammatical devices (obligatory vs. optional) are distinguished in signaling the presence of imperfectivity: Either they induce imperfectivity or they merely presuppose imperfectivity. In our analysis, *wie* in eventive complements takes the latter role. Still, since in German simple tenses are ambiguous between a perfective and an imperfective reading, eventive *wie* non-vacuously indicates an imperfective interpretation.

6 Conclusion

The central issue addressed in this paper is the semantics of eventive *wie*-complements in contrast to manner *wie*-complements. This includes a number of questions the most puzzling of which is: Why is a manner word used to indicate an event in progress?

The answer is given in two steps. First, we argue that the *wh*-word *wie* should not be considered as ranging over primitive manner objects but instead be interpreted as expressing similarity. Manners are made by similarity classes – classes of events sharing a set of features.

This view makes the commonality of the two types of *wie*-complements visible: They both involve similarity classes. But while in the case of manner complements the similarity class restricts the event type, in the case of eventive complements it adds information about an event token, namely that it is a stage in a set of similar natural continuations.

The idea of natural continuations reflects the idea of an event being in progress. In the similarity account, natural continuations are provided as a similarity class of sequences of subevents sharing the same initial sequence. From this perspective the question we started out from can be answered as follows: The *wh*-word *wie* expresses similarity, and both the manner reading and the eventive reading

of *wie*-complements involve similarity classes. In the manner reading similarity classes reflect arbitrary properties of events and function as restrictive modifiers of event types. In the eventive reading similarity classes non-restrictively modify event tokens by wrapping them into a class of similar continuations. So the form of the similarity class in eventive readings is a special case of a general manner similarity class (and you might call it a manner, too, though we do not in order to avoid confusion).

The similarity analysis explains why *wie*-complements have a manner as well as an eventive reading without postulating two homophonous versions of the *wh*-word. It accounts for the different syntactic characteristics the *wh*-word – being moved from a base position adjacent to the verb as opposed to being base-generated above VP – and it accounts for the observation that eventive *wie*-complements express events in progress. Finally, it accounts for the finding that all matrix verbs that license free relative manner readings also license eventive readings: the latter are just a special case of the former. This may explain why it is sometimes hard to distinguish the two readings.

The similarity analysis opens the door for future work on a uniform interpretation of the German *wh*-word *wie* across syntactic constructions, including equative comparison, temporal *wie*-clauses, *wie* appositions and also overt *wie*-questions. It also offers the opportunity to take a fresh look at the topic of manner modification. The most exciting puzzle for future work, however, is this: Non-manner uses of manner *wh*-words are found in a broad variety of European and non-European languages, but their meaning seems to vary. Is there nevertheless a systematic relation between manner *wh*-words and non-manner uses thereof across languages?

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References

- Alexeyenko, Sascha (2015) The Syntax and Semantics of Manner Modification: Adjectives and Adverbs. Dissertation, University of Osnabrück.
- Anderson, Curt & Marcin Morzycki (2015) Degrees as Kinds. *Natural Language and Linguistic Theory* 33-3, 791-821.
- Barwise, Jon (1989) Scenes and other situations. In Jon Barwise: *The Situation in Logic*, CSLI Lecture Notes 17.
- Bayer, Josef (1986) The role of event expression in grammar. *Studies in Language* 10-1, 1-52.
- Behrens, Bergljot & Cathrine Fabricius-Hansen (2002) Connectives in contrast: A discourse semantic study of Elaboration based on corpus research. In Hilde Hasselgård, Stig Johansson, Bergljot Behrens, Cathrine Fabricius-Hansen (eds.) *Information structure in a cross-Linguistic perspective*. Rodopi, Amsterdam/new York, 45-61.
- Bonomi, Andrea (1997) The Progressive and the Structure of Events. *Journal of Semantics* 14: 173-205.

- Caponigro, Ivano (2004) The Semantic Contribution of WH-Words and Type Shifts: Evidence from Free Relatives Crosslinguistically, in R. B. Young (ed.), *Proceedings of SALT XIV*. CLC Publications, Cornell University, Ithaca.
- Carlson, Greg (2003). Interpretive Asymmetries in Major Phrases. In A-M. DiSciullo (ed.) *Asymmetry in Linguistic Theory*. Benjamins. 299-311.
- Clement, Danielle (1971) Satzeinbettungen nach Verben der Sinneswahrnehmung. In D. Wunderlich (ed.) *Probleme und Fortschritte der Transformationsgrammatik*, München, Hueber, 245-265.
- Cooper, Robin (in prep) Type theory and language. From perception to linguistic communication.
- Demirdache, Hamida & Myriam Uribe-Etxebarria (2004) The Syntax of Time Adverbs. In J. Lecarme, J. Gueron (eds.) *The Syntax of Time*. MIT Press
- Deo, Ashwini (2020) Imperfectivity. In Matthewson, L., C. Meier, H. Rullmann and T. E. Zimmermann (eds.) *Companion to Semantics*, New York: Wiley Blackwell.
- Dowty, David (1979), *Word Meaning and Montague Grammar*, Reidel, Dordrecht.
- Duden Grammatik (2006). Dudenverlag Mannheim
- Falkenberg, Gabriel (1989) Einige Bemerkungen zu perzeptiven Verben. In G. Falkenberg (ed.), *Wissen, Wahrnehmen, Glauben*. Niemeyer, Tübingen, 27-45.
- Fernando, Tim (2015) The semantics of tense and aspect: a finite-state perspective, In S. Lappin and C. Fox (eds.), *The Handbook of Contemporary Semantic Theory*. Wiley, 203—236.
- Fiorin, Gaetano & Denis Delfitto (2017) A Perspective-Based Account of the Imperfective Paradox. In J. Blochowiak, C. Grisot, S. Durrleman, C. Laenzlinger (eds.) *Formal Models in the Study of Language*, Springer.
- Frey, Werner (2003) Syntactic conditions on adjunct classes. In Ewald Lang, Claudia Maienborn & Cathrine Fabricius-Hansen (eds.) *Modifying Adjuncts*. Berlin: Mouton de Gruyter, 163-209.
- Gärdenfors, Peter (2000) *Conceptual Spaces*. Cambridge MA: MIT Press.
- Greenberg, Yael (2003) Manifestations of Genericity. New York & London: Routledge.
- Gust, Helmar & Carla Umbach (to appear) A qualitative similarity framework for the interpretation of natural language similarity expressions. To appear in Lucas Bechberger, Kai-Uwe Kühnberger and Mingya Liu (eds). *Concepts in Action - Representation, Learning and Application. Language, Cognition, and Mind*. Springer.
- Hinterwimmer, Stefan (2013) Free Relatives as Kind-Denoting Terms. In C. Beyssade, F. Del Prete and A. Mari (eds.) *Genericity*, Oxford: Oxford University Press, 140-156.
- Huddleston, Rodney & Geoffrey Pullum (2002) *The Cambridge Grammar of the English Language*. Cambridge University Press.
- Jaworski, William (2009) The logic of how-questions. *Synthese*, 166, 133–155.
- Jędrzejowski, Lukasz & Carla Umbach (in preparation) Non-interrogative subordinated wh-clauses. OUP.
- Karttunen, Lauri (1977) Syntax and semantics of questions. *Linguistics & Philosophy* 1, 3–44.
- Kastner, I. (2015) Factivity mirrors interpretation: The selectional requirements of presuppositional verbs. *Lingua* 164, 156-188.
- Kearns, Kate (2003) Durative achievements and individual-level predicates on events. *Linguistics and Philosophy*, 26, 595–635.
- König, Ekkehard & Carla Umbach (2018) Demonstratives of Manner, of Quality and of Degree: A Neglected Subclass. In M. Coniglio, E. Schlachter & T. Veenstra (eds.). *Atypical demonstratives: syntax, semantics and typology*. Berlin, de Gruyter Mouton.
- Landman, Fred (1992) The Progressive. *Natural Language Semantics* 1, 1-32.
- Legate, Julie Anne (2010) On how *how* is used instead of *that*. *Natural Language & Linguist Theory* 28: 121–134.
- Lewis, David (1973). Counterfactuals. Oxford: Blackwell Publishers and Cambridge, MA: Harvard University Press.

- Liefke, Kristina (to appear) Two Types of English Non-Manner How-Clauses. *Proceedings of Sinn & Bedeutung 2020*, London
- Maienborn, Claudia (2003) Event-internal adverbials: Semantic underspecification and conceptual interpretation. In: Ewald Lang, Claudia Maienborn & Cathrine Fabricius-Hansen (eds.). *Modifying Adjuncts*. Berlin: de Gruyter, 475–509.
- Martin-Löf, Per (1984) *Intuitionistic Type Theory*, Bibliopolis, Naples
- Moltmann, Friederike (2007) Events, Tropes and Truthmaking. *Philosophical Studies* 134, 363-403.
- Mieskes, Sarah; Pracejus, Natasha; Nasir, Hibatulnaseer (2007) 'Wie'-Komplemente. Termpaper seminar "Reference to Facts & Events". University of Osnabrück, summer semester 2007.
- Nye, Rachel (2013) *How complement clauses distribute: complementiser-'how' and the case against clause-type*. Dissertation, Universiteit Gent.
- Piñón, Christopher (2008) From properties to manners: a historical line of thought about manner adverbs. *Studies van de Belgische Kring voor Linguïstiek – Travaux du Cercle Belge de Linguistique – Papers of the Linguistic Society of Belgium*, volume 3.
- Portner, Paul (1998) The progressive in modal semantics. *Language* 74:760 -787
- Rothstein, Susan (2004) *Structuring Events: a study in the semantics of lexical aspect*. Blackwell.
- Sæbø, Kjell Johan (2008) The structure of criterion predicates. In J. Dölling, T. Heyde-Zybatow, & M. Schäfer (eds.) *Event structures in linguistic form and interpretation*. Berlin: Mouton de Gruyter, 127–147.
- Sæbø, Kjell Johan (2016) "How" questions and the manner–method distinction. *Synthese* 193(10), 3169–3194.
- Schäfer, Martin (2013) *Positions and interpretations. German adverbial adjectives at the syntax-semantics interface*. Berlin: De Gruyter Mouton.
- Siekmann, Jörg (1990) Unification Theory. In C. Kirchner (ed.) *Unification*. Academic Press.
- Tonne, Igebjorg (2006) Elucidating Progressives in Norwegian. In Torgrim Solstad, Atle Gronn, Dag Haug (eds.) *A Festschrift for Kjell Johan Sæbo*. Oslo.
- Tversky, Amos (1977) Features of similarity. *Psychological Review* 84:327–352.
- Umbach, Carla & Helmar Gust (2014) Similarity Demonstratives. *Lingua* 149, 74-93
- Umbach, Carla & Helmar Gust (2021) Grading Similarity. Löbner, S., Gamerschlag, T., Kalenscher, T., Schrenk, M., Zeevat, H. (Eds.) *Concepts, Frames and Cascades in Semantics, Cognition and Ontology*. Springer.
- Umbach, Carla & Britta Stolterfoht (in preparation) Ad-hoc kind formation by similarity.
- Vater, Heinz (1975) *Wie*-Sätze. In K. Braunmüller & W. Kürschner (eds.) *Grammatik. Akten des 10. Linguistischen Kolloquiums 2*, Tübingen, 209-222.
- Varasdi, K. (2017) Worlds, Events, and Inertia. *Journal of Logic, Language and Information*, 26(3), 303–332. <https://doi.org/10.1007/S10849-017-9253-3>
- Zifonun, G., L. Hoffmann & B. Strecker (1997) *Grammatik der deutschen Sprache*. De Gruyter, Berlin.
- Zimmermann, Ilse (1991) Die subordinierende Konjunktion *wie*. In: Reis, Marga und Inger Rosengren (eds.). *Fragesätze und Fragen*. Linguistische Arbeiten 257. Tübingen: Niemeyer, 113-122.