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Towards a correlation of form, use and meaning of German *ge*-prefixed predicative participles

Tillmann Pross and Antje Roßdeutscher

University of Stuttgart, DE

Corresponding author: Tillmann Pross (prosstn@ims.uni-stuttgart.de)

We argue for a split semantics of German predicative participle constructions, depending on whether or not the formation of the participle involves prefixation with the dedicated morpheme *ge*-. Against the background of the analysis of participles of German *be*-prefixed verbs proposed in Pross (2019), and using the licensing of superlative constructions and *ung*-nominalizations as tests, we show that *ge*-prefixed participles denote a result relation between a property of an event and an individual. In contrast, *be*-prefixed participles, like adjectives, denote properties of individuals. We cast the distinction between event properties and individual properties in a compositional semantics of *ge*-and *be*-prefixed participles and show how the resulting semantic distinction allows to predict the distinction between target and resultant state participles drawn in Kratzer (2000) without using the questionable *immer noch* 'still' test.

1 Introduction

1.1 *Goals of the paper*

This paper is about German participles. More specifically, its focus is the analysis of predicative uses of German participles, the formation of which requires prefixation of the base verb with a dedicated morpheme *ge*- as in (1-b). In a predicative participle construction, the participle is the main predicate of a sentence and follows the copula *sein* (BE).

(1) a. Peter kühlte das Bier.
         'Peter cooled the beer.'

     b. Das Bier ist gekühlt.
         the beer BE ge-PRFX.cool.t-PTCP
         'The beer is cooled.'

German participles that require prefixation of a base verb with *ge*- as in (1-b) contrast with participles of already prefixed constructions as in (2-b), which do not show prefixation with *ge*-.

(2) a. Peter bemalte   die Wand.
         Peter be-PRFX.paint the wall
         'Peter painted the wall (with sth.)'

     b. Die Wand ist bemalt.
         the wall   BE be-PRFX.paint.t-PTCP
         'The wall is painted (with sth.)'

In the present paper we argue that the split formation of German participles corresponds to a split semantics of their predicative use. In this respect, our analysis differs importantly from previous work on German participles (like Rapp 1997; Kratzer 2000; Maienborn 2009; Gehrke 2015), where the semantics of German participles is defined independently of whether or not the participle requires prefixation with *ge-* and consequently, the formation of participles, and in particular the distribution of *ge-*, is assumed to be solely a matter of morphophonology. But, as Rathert (2009) shows, the formation of participles, and in particular the distribution of the prefix *ge-*, cannot be explained in terms of morphophonology alone (e.g. as proposed in Neef 1996) but is to a large extent semantically determined. Rathert considers only those semantic factors that concern the distribution of *ge-*, but does not connect the distribution of *ge-* to the interpretation of the participle constructions in which *ge-* figures. Against this background, the main goal of the present paper is to spell out in detail a semantics for the prefix *ge-* that explains its function in the formation of participles and sets *ge*-prefixed participles semantically apart from participles of prefix-verbs as in (2-b). The semantic distinction we aim to correlate with the split formation of participles in German concerns the type of property that underlies the state described in predicative constructions with *ge*-prefixed participles as in (1-b) and participles of prefix-verbs as in (2-b).

Following Pross (2019), we assume that the state described with participles of prefix-verbs as in (2-b) derives from an "individual property". Individual properties are prototypically exemplified by predicative constructions with adjectives as in (3).[1]

(3)   Das Bier ist kühl.
        the beer BE cool
        'The beer is cool.'

In the present paper, we contrast states derived from individual properties with states derived from "event properties". We argue that participles that require prefixation with *ge-* describe a state based on an event property, a type of state that is prototypically exemplified by present perfect constructions as in (4).

(4)   Peter ist gestolpert.
        Peter BE ge-PRFX.stumble.t-PTCP
        'Peter has stumbled.'

The semantic distinction between individual properties and event properties reproduces semantic distinctions that have previously been proposed in the literature, like the distinction between target and resultant states (Kratzer 2000), or Kimian and Davidsonian States (Maienborn 2009). But previous work assumes that the states described by predicative participles are derived independently of their morphological makeup, and in particular independently of whether or not *ge-* figures in the formation of a participle. In contrast, the analysis of participles we develop in the present paper computes the split semantics of participles and the restrictions on their use from their morphosemantic constituents.

It is important to note right in advance that in the present paper we are concerned with adjectival participles, but not with non-adjectival participles of the type discussed in Wasow (1977). Wasow (1977) is also traditionally credited for having brought up the question whether participles are derived in the lexicon or in the syntax, and participles have played

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[1] We use the term "individual property" to refer to a property of an individual, but note that this does bear any connection to the term "individual argument" of a verb.

a crucial role in advancing specific conceptions of the division of labor between syntax and the lexicon (see in particular Bruening 2014). We took great care to make our analysis independent of specific assumptions about word formation. In particular, we want to leave open whether the morphosemantic constituents of German participles we define in the present paper are syntactic heads that are selected and combined according to syntactic principles or lexical units that are selected and combined according to lexical principles. We assume that the principles of meaning composition are the same in both cases, and thus our semantic analysis can be mapped to syntactic and lexical approaches to word formation alike.

1.2 Outline of the paper

In section 2 we introduce the background assumptions we make about the event structure of German verbs and the predication of properties with participles of prefix verbs like *bemalen* in (2-a). In section 3 we argue that German predicative participles fall into two subclasses, one of which patterns with adjectival predicatives. We explain the difference between the two classes by showing that German predicative participles can be used to predicate two different types of properties, which we label "individual" and "event" properties, respectively. We propose the licensing of *ung*-nominalizations and superlative constructions as tests to distinguish between the two. With a systematic assessment of those verb classes that form their participles with the prefix *ge-*, we argue for a correlation of the predication of event properties with the presence of the prefix *ge-*. In section 4, we compare our proposal with previous approaches to predicative participles with respect to the ontology of states. We show that the distinction between target state participles and resultant state participles proposed in Kratzer (2000) can be grounded in the distinction between individual and event properties. Our approach can thus be understood as a restatement of Kratzer's analysis which, however, avoids the problems that arise when compatibility of a participle with *immer noch* 'still' is used as a test to distinguish target and resultant states. Section 5 concludes.

1.3 Basics of the morphology of German participles

In this section we provide a short overview of the basic regularities of the formation of German participles; readers who are familiar with the morphology of German participles can safely skip this section.

There are two participle suffixes in German, a suffix *-t* and a suffix *-en*. Weak verbs do not involve stem-vowel changes in any tense (comparable to regular verbs in English) and systematically form their participle with *-t* (5). Strong verbs often involve stem-vowel changes (comparable to irregular verbs in English) and form their participle with *-en* (6). Mixed verbs as in (7) form their participles with *-t*, like weak verbs, but involve a stem-vowel change, like strong verbs.

(5)   a.   malen
            'to paint'

        b.   gemalt
            ge-PRFX.paint.t-PTCP
            'painted'

(6)   a.   werfen
            'to throw'

        b.   geworfen
            ge-PRFX.throw.en-PTCP
            'thrown'

(7)　　a.　rennen
　　　　　　'to run'

　　　b.　gerannt
　　　　　　ge-PRFX.run.t-PTCP
　　　　　　'run'

Verbs like those in (5)–(7) require an additional morphological operation, prefixation with a dedicated morpheme *ge-* to form a participle, whereas verbs that already have a prefix, as in (8) and (9) do not.

(8)　　a.　bemalen
　　　　　　be-PRFX.paint
　　　　　　'to paint sth. with sth.'

　　　b.　bemalt
　　　　　　be-PRFX.paint.t-PTCP
　　　　　　'painted with sth.'

(9)　　a.　verschlafen
　　　　　　ver-PRFX.sleep
　　　　　　'to oversleep'

　　　b.　verschlafen
　　　　　　ver-PRFX.sleep.en-PTCP
　　　　　　'sleepy, overslept'

(5)/(6) show that *ge*-prefixation is independent of the weak/strong distinction and that the participle suffixes *-t* and *-en* are independent of the *ge*-prefix. But the requirement for *ge*-prefixation to form a participle is independent of morphological complexity, or so it seems, insofar as morphologically complex verbs like those in (10)/(11) also require *ge*-prefixation of the verb stem.

(10)　　a.　anmalen
　　　　　　on-PRTC.paint
　　　　　　'to cover something (with paint)'

　　　b.　angemalt
　　　　　　on-PRTC.ge-PRFX.paint.t-PTCP
　　　　　　'having something painted on it'

(11)　　a.　einschlafen
　　　　　　in-PRTC.sleep
　　　　　　'to fall asleep'

　　　b.　eingeschlafen
　　　　　　into-PRTC.ge-PRFX.sleep.t-PTCP
　　　　　　'fallen asleep'

The difference between the verbs in (8) and (9) on the one hand and those in both (5)/(6) and (10)/(11) on the other correlates with the separability of preverbal morphemes. Preverbal morphemes like *be-* in (8), *ver-* in (9) and the prefix *ge-* in (5)–(7) are inseparable from the verb. We call such inseparable preverbal morphemes prefixes, and distinguish "prefix verbs" from "particle verbs" as in (10)/(11), where the morphemes *an-* and *ein-* are separated from the remainder of the verb in the verb second configuration of main clauses

(e.g. when the complementizer is causal *denn* '(causal) since'), see(12-a) vs. (12-c). Note that there is no separation of either verbal prefixes or particles in subordinate clauses (e.g. when the complementizer is *weil* 'since'), see (12-b) vs. (12-d).

(12)   a.   … denn er bemalt   die Wand.
             … since he be-PRFX.paint the wall

       b.   … weil   er die Wand bemalt.
             … because he the wall   be-PRFX.paint

       c.   … denn er malt die Wand an.
             … since he paint the wall   on-PRTC

       d.   … weil   er die Wand anmalt.
             … because he the wall   on-PRTC.paint

Verbal prefixes like *be-* are in mutually exclusive distribution with the prefix *ge-*, see (13). In general, no more than one prefix can occur on a German verb.

(13)   a.   *begemalt
             be-PRFX.ge-PRFX.paint.t-PTCP

       b.   *gebemalt
             ge-PRFX.be-PRFX.paint.t-PTCP

For a more detailed discussion of the peculiarities of the formation of German participles, we refer the reader to Rathert (2009).

2 Background

The main goal of this paper is to derive a fine-grained typology of German predicative participles based on a systematic investigation of the event structure and morphological make-up of the input to participle formation. In this section we introduce the background assumptions underlying the tests which we use to tease apart participles that predicate individual properties and participles that predicate event properties. Following Roßdeutscher & Kamp (2010), we use the licensing of *ung*-nominalizations as a probe into the event structure of German verbs, and following Pross (2019), we use the licensing of superlative constructions as a probe into the predication of properties with participles. Before we introduce these tests in more detail, it is necessary to point out that using constraints on word formation as diagnostic tools rests on the assumption that there are systematic patterns of word formation. In this section, and in the analysis of *ge*-prefixed participles we develop in the next section, we focus on systematic patterns of word formation and discuss prototypical examples to illustrate these patterns. But there are of course always exceptions to the rule which are to a greater or lesser extent difficult to fit under a certain constraint of word formation. We discuss such exceptions to the rule in section 2.4, after we have established the set of generalizations against which such exceptions appear after all.

2.1 Event structure and German ung-nominalizations

Rappaport Hovav & Levin (2010) distinguish two broad semantic classes of verbs. The first class of "manner verbs" encodes the manner in which some action is carried out and describes internally caused events. The second class of "result verbs" encodes the coming about of some particular result state and describes externally caused events. Result verbs have a bi-eventive lexical-semantic structure in that they describe a relation between two events, e_1 and e_2, where – following Dowty (1979) – e_1 is a CAUSE event that causes a change of state event e_2 (a BECOME event). Bi-eventivity is thus to be understood in contrast to

mono-eventivity, which is associated with manner verbs that describe an activity, i.e. a single event *e* (a DO event). Roßdeutscher & Kamp (2010) correlate bi-eventivity of a verb with the licensing of an *ung*-nominalization: only transitive result verbs but not manner verbs license *ung*-nominalizations. E.g., the verb *säubern* 'to clean' in (14-a) is a result verb. It predicates a change from being dirty to being clean of the obligatory direct object. Accordingly, *säubern* has an *ung*-nominalization, see (14-b).

(14)　a.　Peter　säuberte den Tisch.
　　　　　'Peter cleaned　the　table.'

　　　b.　Die Säuberung　　　des　　　　Tisches
　　　　　the clean.ung-NMLZ the.GEN table
　　　　　'The cleaning of the table'

Intransitive German verbs generally "do not have *ung*-nominals; this is the case irrespective of whether the verb is unergative [or] unaccusative" (Roßdeutscher & Kamp 2010: 176), cp. (15).

(15)　a.　*die Lachung　　　　　(der　　　Kinder)
　　　　　the laugh.ung-NMLZ (the.GEN children)
　　　　　'the laughing of the children'

　　　b.　*die Ankommung　　　(der　　　Gäste)
　　　　　the arrive.ung-NMLZ (the.GEN guests)
　　　　　'the arrival of the guests'

An important qualification of the claim that only transitive result verbs license *ung*-nominalizations is that the transitivity requirement is understood in a strong sense that excludes verbs like *essen* 'to eat' in (16) that participate in the unspecified object alternation (16-a)/(16-b).

(16)　a.　Peter aß.
　　　　　'Peter ate.'

　　　b.　Peter aß den Apfel
　　　　　'Peter ate the apple.'

　　　c.　*Die Essung　　　　des　　　Apfels
　　　　　the eat.ung-NMLZ the.GEN apple

The example (16-b) may appear like a perfect instance of a transitive description of a change of state in the sense that Peter's eating causes the apple to undergo a change of state from being not eaten to being eaten. But this resemblance is only superficial. Verbs like *essen* that participate in the unspecified object alternation, typically so-called "incremental theme verbs", have been argued to be manner verbs (Rappaport Hovav 2008), with the transitive construction being constructed out of the manner verb (see e.g. Kratzer 2004; Kennedy 2012).

　The restriction of the formation of *ung*-nominalizations to "core transitive" verbs (in the terminology of Kratzer 2005, see also Levin 1999 for discussion) is in particular telling with respect to the event structure of German prefix-verbs. (17) and (18) are one but many examples where the unprefixed base verb has no *ung*-nominalization but the prefixed verb has an *ung*-nominalization (see e.g. the corpus study in Roßdeutscher 2010 and further discussion in Pross 2019).

(17) a. *die Malung   der   Blume
          the paint.ung-NMLZ the.GEN flower
          '(Intended:) the painting of a flower'

     b. die Bemalung   der   Wand
          the. be-PRFX.mark the.GEN wall
          'the painting of the wall (with sth.)'

(18) a. *die Bauung   eines   Hauses
          the build.ung-NMLZ the.GEN house
          '(Intended:) the building of a house'

     b. die Bebauung   des   Grundstücks
          the be-PRFX.build.ung-NMLZ the.GEN house
          'the development of the property'

Roßdeutscher & Kamp (2010) argue that the contrasts in (17)/(18) are difficult to explain under the assumption that the prefixed verb *bemalen* is derived from the verb *malen*. Instead, they propose that the same "root" √*mal* can be inserted into the templatic representation of a manner verb (which may be either a syntactic or a lexical-conceptual structure) or into the templatic representation of the event structure of a result verb, deriving either a core-transitive result verb that licenses an *ung*-nominalization or a non-core transitive manner verb that does not license an *ung*-nominalization.

2.2 Individual properties and the formation of superlatives

Given that we are interested in the predication of properties in predicative constructions, a natural starting point are predicative constructions where the main predicate is a lexical (i.e. underived) adjective like *kühl* 'cool'. A widely accepted view is that gradable adjectives predicate a property of an individual by determining a value on a scale with respect to some contextual standard (see e.g. Kennedy & Levin 2008) as in (19).

(19) Das Bier ist kühl (relativ zum relevanten Standard für Kühle)
      'The beer is cool (relative to the relevant standard for coolness)'

In the following, we refer to properties that are predicated with lexical adjectives in copula constructions with BE (relative to a standard of comparison) as *individual properties*. A unique property of German adjectival constructions that denote individual properties is the licensing of superlative constructions that are derived by suffixation of the dedicated morpheme *-st-* as in (20).

(20) Das kühlste   Bier
      the cool.st-SPL.e-ADJ beer
      'the coolest beer of all'

Individual properties can also be predicated with adjectives like *hungrig* 'hungry', where the adjective is derived from the noun *Hunger* 'hunger'. Francez & Koontz-Garboden (2017) propose that nouns like *Hunger* denote what they call a "quality". They argue that because qualities cannot be predicated of individuals directly (21-a), but portions of qualities are possessed by individuals (21-b), the derivation of an adjective from a quality-denoting noun requires possessive morphology (21-c).

(21) a. *Peter ist Hunger.
          Peter BE hunger.

    b.   Peter hat   Hunger.
           Peter HAVE hunger
           'Peter has hunger.'

    c.   Peter ist hungrig.
           Peter BE hunger.ig-POSS
           'Peter is hungry.'

(22) is a simplified denotation for *hungrig* according to the possessive analysis of Francez & Koontz-Garboden (2017).

(22)   hungrig ⤳ $\lambda x. \exists p. [\text{POSS}(x)(p) \land p \subseteq hunger]$

According to (22), *hungrig* predicates of an individual possession of a portion p of the quality denoted by *Hunger*.

2.3 Quality predication with be-prefixed participles

Pross (2019) applies the analysis of Francez & Koontz-Garboden (2017) to *be*-prefixed predicative constructions as in (23-b).

(23)   a.   Peter bemalte   die   Wand.
              Peter be-PRFX.mark the.GEN wall
              'Peter painted the wall (with sth.).'

        b.   Die Wand ist bemalt.
              the wall   BE be-PRFX.mark.t-PTCP
              'The wall is painted (with sth.).'

Unlike Roßdeutscher & Kamp (2010), who follow Wunderlich (1987) and analyze the prefix *be-* as an instance of preposition incorporation, Pross (2019) argues that *be-* is an adjectival possessive morpheme (like *-ig*) which allows to predicate a quality of an individual, similar to the adjectival case (21-c). The prototypical case of quality possession predication with *be*-prefixed constructions are *be*-prefixed participles as in (24) which have no corresponding verb, see (24) and the parallel examples (25) (cp. Dewell 2015; Günther 1974). Notably, since the class of *be*-prefixed participles illustrated with (24)-(26) does not have a corresponding verb, the participle constructions cannot be explained under the traditional assumption that "[o]nly verbs […] can appear in German adjectival passives." (Gehrke 2015: 908–909, generalizations 1 and 2).

(24)   a.   *Sie begabte   den Redner.
              she be-PRFX.gift the speaker
              '(Intended:) She gifted the speaker'

        b.   Der Redner ist begabt.
              the speaker is be-PRFX.gift.t-PTCP
              'The speaker is gifted.'

(25)   a.   *Sie befrackte   den Kellner.
              she be-PRFX.tailcoat the waiter
               '(Intended:) She made the waiter wear a tailcoat.'

        b.   Der Kellner ist befrackt.
              the man   is be-PRFX.tailcoat.t-PTCP
              'The waiter wears a tailcoat.'

(26)   a.   *Sie berühmte   den Sänger.
            she be-PRFX.fame the singer
            'She made the singer famous.'

       b.   Der Sänger ist berühmt.
            the singer is   be-PRFX.fame.t-PTCP
            'The singer is famous.'

The qualities predicated with *be*-prefixed participles in (24) and (25) are quite tangible and closely related to the meaning of the underlying noun *Gabe* 'gift' in (24) or *Ruhm* 'fame' in (26). But in general, the qualities predicated with *be*-prefixed participles are often abstract and shifted remnants of diachronic meaning change. For example, while the synchronic meaning of the noun *Mal* 'mark, spot' is restricted to a *mole* or *memorial*, diachronically *Mal* referred to a sign or picture (Grimm & Grimm 1854: Bd. 12, Sp. 1494) and (Kluge 2002: 592), and it seems to be this no longer existent meaning of *Mal* that is still inherent in the quality that is predicated in (23-b), and also underlying the meaning of the corresponding verb *malen* (Grimm & Grimm 1854: Bd. 12, Sp. 1501), (Kluge 2002: 593). Note that it is for this reason that we gloss the quality associated with the root √*mal* in (23) as 'mark'.

   While determining the meaning of a particular *be*-prefixed construction may turn out to be difficult, the actual value of an analysis of the prefix *be-* as in Pross (2019) shows up in comparison with adjectives. Like adjectives, *be*-prefixed participles license superlative constructions (27).

(27)   a.   die bemalteste Wand
            the be-PRFX.mark.t-PTCP.st-SPL.e-ADJ
            'the most painted wall'

       b.   der berühmteste Sänger
            the be-PRFX.mark.t-PTCP.st-SPL.e-ADJ
            'the most painted wall'

Superlative constructions with adjectives do not make reference to an underlying event, or allow for a temporal interpretation: (27-a) cannot be understood to mean "the most often painted wall". Thus, Pross (2019) argues, the licensing of superlatives by *be*-prefixed participles shows that like adjectives these participles do not make reference to an event. We discuss the formation of superlatives as a test for the denotation of an individual property in the absence of an underlying event in more detail in section 3.1. Moreover, like adjectives (and verbs derived from them), *be*-prefixed constructions license *ung*-nominalizations (28).

(28)   a.   die Kühlung
            the cool.ung-NMLZ
            'the cooling'

       b.   die Bemalung
            the be-PRFX.mark.ung-NMLZ
            'the painting'

One further piece of evidence Pross cites in favor of an analysis of *be*-prefixed participles according to which they are formed independently of the corresponding verbal construction is that such an analysis allows a straightforward explanation of the otherwise mysterious asymmetry of copredication with the *ung*-nominalization (28-b) in (29) and (30).

(29)   Die Bemalung₁   der   Wand war anstrengend. Sie₁ bestand
           the be-PRFX.mark.ung-NMLZ the.GEN wall   was exhausting   it   persist
           unverändert fort.
           unchanged   on.PRTC
           'The painting of the wall₁ was exhausting. It₁ persisted unchanged.'

(30)   Die Bemalung₁   der   Wand bestand unverändert fort.
           the be-PRFX.mark.ung-NMLZ the.GEN wall   persist   unchanged   on.PRTC
           # Sie₁ war anstrengend.
              it   was exhausting
           'The wall be-painting₁ persisted unchanged. #It₁ was exhausting.'

According to the tests for event and state denotation of German *ung*-nominalizations proposed in Ehrich & Rapp (2000), the data in (29) shows that the event denotation of *Bemalung* makes available a state denotation which can serve as the antecedent of the anaphoric pronoun *sie* 'it' in (29). But the state denotation of *Bemalung* in (30) does not make available an event denotation which can serve as the antecedent of the anaphoric pronoun in (30). Pross argues that copredication asymmetries with *be*-prefixed *ung*-nominalizations as in (29)/(30) show that the state denotation of *Bemalung* is not derived from the lexical entry of the verb *bemalen* but from the lexical entry of the participle *bemalt*, which does not make reference to an event. The formation of *ung*-nominalizations from *be*-prefixed participles that lack a corresponding verb is attested e.g. by examples as in (31).

(31)   Die Begabung   des   Redners
           the be-PRFX.gift.ung-NMLZ the.GEN speaker
           'The giftedness of the speaker'

The possibility to form *ung*-nominalizations from participles, and in the absence of a corresponding verb, leads Pross to a redefinition of the constraint on the formation of *ung*-nominalizations put forward by Roßdeutscher & Kamp (2010). According to Pross (2019), a construction has an *ung*-nominalization iff it predicates an individual property, and it is with respect to this constraint that we will consider *ung*-nominalization as a test for the denotation of an individual property in the remainder of the present paper. That is, if a construction does not license an *ung*-nominalization, then it does not predicate an individual property.

   In the analysis of Pross (2019), the quality underlying the participle construction in (23-b) is derived from the noun *Mal*. Pross associates the derivation of a quality from a noun with the function of the participle suffix *-t* and proposes that one way to formally approximate the derivation of a quality from an individual-denoting noun is by intensionalization of the denotation of that noun.[2] For ease of exposition, we recast the main point of Pross' DRT-based analysis in a typed λ-calculus. Assuming that the type of individuals is e, the type of events and states is ev, the type of truth values is t and the type of propositions is s, the denotation of the participle suffix *-t* is a function that derives a propositional function (an intension) of type $\langle e, \langle s, t \rangle \rangle$ from a noun denotation of type $\langle e, t \rangle$ as in (32).

(32)   participle -t ⤳ $\lambda Q.\lambda x.^{\wedge}[Q(x)]$

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[2] Francez & Koontz-Garboden (2017) analyze qualities as atomic entities of the model-theory. To account for qualities derived from nouns, Pross' proposal makes use of the analysis of individual concepts in Higher-Order Intensional Logic (Montague 1973), where intensionalization is employed to turn the individual denotation of a noun like *man* into the propositional function of having characteristic properties of a man (a function from individuals to sets of possible worlds) that returns for each world the extension of the predicate *man*.

The application of participle *-t* to a noun denotation constitutes an intermediate stage in the construction of the participle. In particular, regardless of whether the semantics of *-t* in (32) is linked to a lexical or syntactic operation, it is difficult to assign this operation to a certain category, since there is no word that would correspond to the combination of (32) and a noun denotation. The category-determining head of the participle construction is the possessive prefix *be-* in (33). It predicates an intension of type $\langle e, \langle s, t \rangle \rangle$ of an individual of type e via extensionalization of that intension. While Pross correlates this semantic function of *be-* with that of an adjectival head in the syntax, nothing speaks against associating the semantics of *be-* in (33) with a lexical adjectivization operation.

(33)   possessive be- ⤳ $\lambda Z. \lambda x. [\text{POSS}(Z)(x)]$

The denotation in (34-b) is the property predicated by the adjectival participle *bemalt* that results from the composition of the denotation of the noun *Mal* represented as in (34-a) with (32) and subsequent application of (33).

(34)   a.   mark' ⤳ $\lambda y. [mark(y)]$
         b. $\lambda x. [\text{POSS}(x) \, (\lambda y.^{\wedge}[mark(y)])]$

Following Maienborn (2005), Pross assumes a denotation of the copula BE as in (35) to derive the state denotation of the predicative participle (23-b) as in (36). Following Asher (1993), Maienborn employs '≈' to relate the abstract concept associated with the state variable s to the expression that characterizes the state.

(35)   Maienborn (2005: 114)
         copula BE ⤳ $\lambda P. \lambda x. \lambda s. [s \approx P(x)]$

(36)   (23-b) ⤳ $\lambda x. \lambda s. [s \approx \text{POSS}(x)(\lambda y.^{\wedge}[mark(y)])]$

Concluding, the purpose of this section was to introduce systematic constraints on the formation of *ung*-nominalizations and superlatives. Simple adjectives and *be*-prefixed participles both ascribe individual properties in predicative constructions, and in this respect are semantically similar. In particular, according to the analysis of Pross (2019), neither adjectives nor *be*-prefixed participles make reference to an event, or are derived from a verb. The properties of *be*-prefixed participles are thus to be expected to differ importantly from the properties of participles which are derived from verbs. In section 3, we discuss the relevant differences with respect to the formation of *ung*-nominalizations and superlatives for participles the derivation of which requires prefixation of a verb with the prefix *ge-*.

2.4 Lexical idioms

One challenge to an analysis that aims to make falsifiable claims about productive morphosemantics are lexical idioms. Like phrasal idioms, lexical idioms are constructed according to the pattern of the compositional construction, but have a fixed and shifted meaning that cannot be decomposed into the meanings of constituents of the construction. One major source of lexical idioms is diachronic change, which often conceals the original semantic composition of morphological complex verbs to an extent where a synchronic semantic decomposition of construction is no longer possible albeit the morphology of the original composition is still present. For example, we followed Pross (2019) in choosing *be-* as a prefix to be compared with *ge-*, because *be-* is a "remarkably simple and regular prefix" (Dewell 2015: 53). But there are also lexical idioms where *be-* cannot be understood as a

prefix, and where Pross' analysis is thus not applicable. E.g, as a reviewer notes for the verb *beginnen* 'to begin', there is no lexical root √*ginn* to which *be-* could attach although diachronically, *beginnen* has been analyzed as being derived from a root that does not contain the prefix *be-*, see e.g. Kluge (2002: 102). Similar considerations about lexical idiomacy apply to other constructions mentioned by reviewers and editors involving *be-* like e.g. the verb *bedauern* 'to regret'. The special status of lexical idioms like *beginnen* or *bedauern* is also often indicated by the ungrammaticality of such *be*-prefixed idioms in predicative constructions with BE, see (37-a) and (37-b).

(37) a. #Das Unglück ist bedauert.
         the disaster BE regret.t-PTCP
         '(Intended:) The disaster is regretted.'

      b. #Das Spiel ist begonnen.
         the game BE begin.en-PTCP
         '(Intended:)The game is begun.'

      c. Das Spiel hat   begonnen.
         the game HAVE begin.en-PTCP
         'The game has begun.'

According to our analysis, the ungrammaticality of (37-a) and (37-b) in predicative constructions with BE indicates a meaning shift of the *be*-prefixed constructions towards a perfective interpretation (where perfective interpretations are discussed in more detail in section 3.2) rather than an individual property. This meaning shift is made plain by the ungrammaticality of the construction with a construction BE but the grammaticality of the present perfect construction in (37-c), where the auxiliary HAVE is selected. Looked at in this light, the ungrammaticality of the copula constructions (37-a) and (37-b) can be understood to indicate that the corresponding verbs are not of the same construction type as those *be*-prefixed verbs that are grammatical in copula constructions with BE and thus do not fall under the generalization about *be*-prefixed participles we have put forward.

3 The predication of event properties

In the previous section we introduced an analysis of BE-prefixed participles according to which such participles pattern with adjectives in copula constructions. Participles prefixed with BE- and adjectives both predicate individual properties, are not derived from a verb, and do not make reference to an event. This parallel analysis accounts for the patterning of adjectives and BE-prefixed participles with respect to the formation of *ung*-nominalizations and superlative constructions, and for the large number of BE-prefixed participles which do not have a corresponding verb.

   In the current section, we show that adjectives and BE-prefixed participles that predicate individual properties differ importantly from *ge*-prefixed participles derived from verbs with respect to the formation of *ung*-nominalizations and superlatives. Our account thus differs from the extensive literature on German predicative participles – Rapp (1997); Kratzer (2000); Maienborn (2007); Welke (2007); Gehrke (2015), to name just a few prominent works – in that we do not follow the traditional assumption that German *be*-prefixed participles are derived from verbs. In particular, we claimed that the form, use and meaning of *be*-participles is not determined by properties of a (possibly) underlying verb.

   We contrast the pattern exemplified by adjectives and *be*-prefixed participles with the absence of *ung*-nominalizations and superlatives with *ge*-prefixed participles, and argue that this contrast cannot be explained under the traditional assumption of a uniform event-based semantics of German participles. We argue that the predication of event-based

properties systematically correlates with the presence of the prefix *ge-*, and that the acceptability of *ge*-prefixed predicatives depends on whether or not an individual property can be reconstructed from the lexical semantics of the base verb, as has been previously observed in the literature. We cast the observations about the role of *ge-* with respect to the predication of event properties into a compositional semantics of *ge-* and its interaction with the semantics of the participle suffix *-t* by systematically going over the verb classes that form their participles with the prefix *ge-*. Eventually, we thus arrive at a fine-grained typology of German participles, which in section 4 we employ to predict the distinction between target state participles and resultant state participles proposed in Kratzer (2000).

3.1 Event properties and predicatives

We begin our discussion with verbs derived from adjectives like *kühl* 'cool' which regularly form their participles with the prefix *ge-*, and are generally grammatical in predicative constructions with BE (they are "good inputs" to predicative formation according to Gehrke 2015).

(38)   a.   Das Bier ist kühl.
            'The beer is cool.'

       b.   Peter kühlte das Bier.
            'Peter cooled the beer.'

       c.   Das Bier ist gekühlt.
            the beer BE ge-PRFX.cool.t-PTCP
            'The beer is cooled.'

The relevant observation with which we motivate our distinction between the meaning of *ge*-prefixed participles and the meaning of constructions that ascribe individual properties is that unlike individual property predicates (such as *be*-prefixed participles or adjectives) *ge*-prefixed event property predicatives like (38-c) cannot be used in superlative constructions,[3] see (39-a) and do not license *ung*-nominalizations, see (39-b).

(39)   a.   *Das gekühlteste   Bier
            the ge-PRFX.cool.t-PTCP.st-SPL.e-ADJ beer
            '(Intended): The beer is the most cooled.

       b.   *Die Gekühlung   des Biers
            the ge-PRFX.cool.ung-NMLZ
            '(Intended): The cooledness of the beer.'

It is important to note at this point that we use superlative constructions without further modification and in prenominal position as a test to distinguish individual properties from event properties but not comparative constructions. The reason for this is that comparative constructions can also be interpreted relative to a temporal standard of comparison. In the grammatical example (40-a) (ex. (30-d) of Maienborn 2007), the *ge*-prefixed participle

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[3] Note that we are concerned with the productive use of *ge-* as a prefix in participle constructions only, i.e. where *ge-* is not present in other forms of the verb such as its infinitive. Accordingly, examples like (i) (from Rapp 1997) do not contradict our claim about the lack of superlative *ge*-prefixed participles: the infinitive of the verb underlying the participle in (i) is *gefährden* 'to endanger' and thus *ge-* in (i) is not a prefix of the type under discussion.

(i)   Die gefährdetste   Region
      the ge-PRFX.fähr.t-PTCP.st-SPL.e-ADJ region
      'The most endangered region of all'

gelesen 'read' is compared with respect to the frequency of how often the works of an author have been read, i.e. an event property. In contrast, the unmodified superlative of the same participle in prenominal position is clearly ungrammatical, which we take to indicate that the participle *gelesen* denotes an event property but not an individual property.

(40) a. [Ein] Autor, der weitaus gelesener   war als   Goethe
          [an] author, who by far   ge-PRFX.read.er-CMP was than Goethe
          '[An] author who was by far more read than Goethe'

      b. *Der gelesenste   Autor
          the ge-PRFX.read.st-SPL.e-ADJ author
          '(Intended:) 'The author is the most read'

The important semantic difference between adjectives as in (38-a) (*kühl* 'cool') and the participles of the verbs related to them as in (38-c) (*gekühlt* 'cooled') pertains to the way in which the property of being cool is linguistically predicated of the beer with (38-a) and (38-c), respectively. The truth of (38-a) depends just on whether or not the beer is cool (relative to a standard of comparison for coolness). In contrast, the truth of (38-c) depends on whether or not the beer is now cooler than it was. That is, (38-a) can be true if the temperature of the beer never changed and was always the same, and consequently there was no event of cooling the beer. But (38-c) is false if the temperature of the beer has never undergone a change of degree. Following the analysis of Kennedy & Levin (2008), we assume a denotation for the verb *kühlen* as in (41), according to which the event described by the verb *kühlen* measures out the degree of change Δ in terms of the difference between the degree of coolness at t and the degree of coolness at $t_0 < t$, where t_0 is the initial and t the final time point of the event e described by the verb.[4]

(41)   kühlen (verb) $\rightsquigarrow \lambda y.\lambda e.[cool_\Delta(y)(e) \geq stnd(cool_\Delta)]$

To further establish the pattern indicative for the semantic difference between an adjective and the *ge*-prefixed participles of the verb derived from that adjective, consider the adjective *trocken* 'dry' in (42) and the corresponding participle in (43).

(42) a. Die Wäsche ist trocken.
          the laundry BE dry
          'The laundry is dry.'

      b. die trockenste   Wüste
          the dry.st-SPL.e-ADJ desert
          'the dryest desert'

      c. die Trocknung der   Wäsche
          the drying   the.GEN laundry
          'the drying of the laundry'

(43) a. Die Wäsche ist getrocknet.
          the laundry BE ge-PRFX.dry.t-PTCP
          'The laundry has dried.'

      b. *die getrocknetste   Wäsche
          the ge-PRFX.dry.t-PTCP.st-SPL.e-ADJ laundry
          '(Intended:) the laundry is the most dried'

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[4] Following Kratzer (1996), we assume that the external argument of verbs is introduced in a separate Voice projection above the actual verbal phrase.

c. *die Getrocknung der Wäsche
   the ge-PRFX.dry.ung-NMLZ
   '(Intended:) the driedness of the laundry'

As for (38-a) and (38-c), the truth-conditions for (42-a) and (43-a) differ in that the truth of (43-a) requires that the laundry was damp and is dry now, but (42-a) can be true if the laundry has always been dry. The truth of adjectival predicatives like (38) and (42-a) depend on individual properties (and accordingly, (42-a) has an *ung*-nominalization as in (42-c)). In contrast, the truth of participles like (38-c) and (43-a) depends on properties of the relevant event, a type of property which we call "event properties" in the following. The truth-conditions of the predication of an event property are independent of the truth-conditions of individual properties. Consequently, the difference between individual properties and event properties is a categorical difference rather than a matter of complexity or underspecification as is assumed e.g. in the analysis of (Maienborn 2009: 45), who proposes that "adjectival passives only differ from adjectival base predicates in that they express an internally more complex and semantically underspecified property."

We illustrated the truth-conditional contrast between individual property predicatives and event property predicatives with the example of adjectives and *ge*-prefixed participles of the corresponding deadjectival verb. But as we argued in section 2, *be*-prefixed participles pattern with adjectives with respect to the predication of an individual property and thus the same contrast also arises between *be*-prefixed participles and *ge*-prefixed participles. To make this contrast formally explicit, we propose to distinguish event properties and individual properties in an analysis of *ge*-prefixed participle predicatives like (38-c) that parallels the analysis of *be*-prefixed participle predicatives like that in Pross (2019) – but with one important difference. Whereas the underlying qualities in *be*-predicatives are derived from nouns, the underlying event properties in *ge*-predicatives are derived from verbs. It is this difference, we argue in the following, that separates *ge*-prefixed participles from *be*-prefixed participles and adjectives (neither of which makes reference to an event).

For the denotation of the participle suffix *-t*, we have to take into account that the lexical entry in (41) involves two variables, one for the internal argument and one for the event described, i.e. the type of (41) is $\langle e, \langle ev, t \rangle \rangle$. We thus modify the derivation of a propositional function with *-t* in (32) as in (44), where Z is of type $\langle e, \langle ev, t \rangle \rangle$.

(44)   -t (+ event argument) ⤳ $\lambda Z. \lambda y. \lambda e.^{\wedge}[Z(e)(y)]$

Recall that Pross (2019) analyzes the prefix *be-* as an adjectival head (or a lexical adjectivizer) that predicates a quality of an individual via the concept of possession. In a parallel manner, we propose to analyze the prefix *ge-* as an adjectival head (or a lexical adjectivizer) the function of which is to predicate an event property. More precisely, *ge-* allows to predicate an event property of an individual via a "result" relation, which we represent as a relation RES(U)(x) between an event property U and an individual x. We use the "result"-relation RES between an individual x and an event property U to reflect the unique truth-conditions of the ascription of event properties. Whether or not the internal argument x has an event property U is to be judged on the basis of whether or not the property U comes about as a result, consequence, or effect of the event described by the underlying verb in which the internal argument x participated. The consequent denotation of the prefix *ge-* we propose is given in (45), where U (the denotation of (44) applied to a one-place predicate of events like (41)) is of type $\langle e, \langle ev, \langle s, t \rangle \rangle \rangle$.

(45)   *ge-* ⤳ $\lambda U. \lambda x. [\mathrm{RES}(U)(x)]$

On these premises, we can now compute the denotation of the predicative participle (38-c) as follows. First, we derive an event property by functional application of the denotation of the participle suffix *-t* in (44) to the denotation of the verb *kühlen* (41). Several instances of λ-conversion yield the denotation in (46-c).

(46)   a. $\lambda Z.[\lambda x.\lambda e.{}^{\wedge}[Z(e)(x)]](\lambda y.\lambda e.[cool_{\Delta}(y)(e) \geq stnd(cool_{\Delta})])$
            // by functional application: [(44)]((41))

       b. $\lambda x.\lambda e.{}^{\wedge}[\lambda y \lambda e.\ cool_{\Delta}(y)(e) \geq stnd(cool_{\Delta})](e)(x)$
            // by λ-conversion: $(Z/\lambda y.\lambda e.\ cool_{\Delta}(y)(e) \geq stnd(cool_{\Delta})$

       c. $\lambda x.\lambda e.{}^{\wedge}[cool_{\Delta}(x)(e) \geq stnd(cool_{\Delta})]$
            // by two instances of λ-conversion: (e/e), (y/x)

Next, we apply the denotation of *ge-* (45) to the event property denotation in (46-c) and after several instances of λ-conversion arrive at the individual property denotation in (47-c).

(47)   a. $\lambda U.\lambda x.[\text{RES}(U)(x)](\lambda y.\lambda e.{}^{\wedge}[cool_{\Delta}(y)(e) \geq stnd(cool_{\Delta}))]$
            // by functional application: [(45)]((46-c))

       b. $\lambda x.[\text{RES}(\lambda y.\lambda e.{}^{\wedge}[cool_{\Delta}(x)(e) \geq stnd(cool_{\Delta})(y)])](x)$
            // by λ-conversion: $(U/\lambda y \lambda e.[{}^{\wedge}cool_{\Delta}(y)(e) \geq stnd\ (cool_{\Delta})])$

       c. $\lambda x.[\text{RES}(\lambda e.{}^{\wedge}[cool_{\Delta}(x)(e))(x) \geq stnd(cool_{\Delta})(x)]]$
            // by λ-conversion: (y/x)

Finally, we stativize the derived individual property predicate by applying the denotation of BE (35) to (47-c), which yields the state denotation of (1-b) in (48-c).

(48)   a. $\lambda P.\lambda y.\lambda s.[s \approx P(y)](\lambda x.[\text{RES}(\lambda e.{}^{\wedge}[cool_{\Delta}(x)(e) \geq stnd(cool_{\Delta})(x)])])$
            // by functional application: [(35)]((47-c))

       b. $\lambda y.\lambda s.[s \approx \lambda x.[\text{RES}(\lambda e.{}^{\wedge}[cool_{\Delta}(x)(e) \geq stnd(cool_{\Delta})(x)])](y)$
            // by λ-conversion: $(P/\lambda x.[\text{RES}(\lambda e.{}^{\wedge}[cool_{\Delta}(x)(e))(x) \geq stnd(cool_{\Delta})(x)]]$

       c. $\lambda y.\lambda s.[s \approx [\text{RES}(\lambda e.{}^{\wedge}[cool_{\Delta}(y)(e)) \geq stnd(cool_{\Delta})(y)])]]$
            // by λ-conversion: (x/y)

The truth-conditions of sentences in which a *ge*-participle of a deadjectival verb serves as complement to a copula, as in (38-c) or (43-a), thus have to be evaluated in terms of the difference over time between the degrees to which the underlying adjective applies to a given individual (given in sentences like (38-c)/(43-a) as the grammatical subject). Consequently, when the event property predicated by the participle of a deadjectival verb is defined in terms of (degrees of differences of) individual properties, and if the function of the copula BE is to predicate individual properties[5], this explains why participles of deadjectival verbs can occur as copula complement.[5]

 Summarizing, we argued that participles prefixed with *be-* predicate individual properties and pattern morphologically and semantically with lexical adjectives whereas *ge*-prefixed participles of deadjectival verbs predicate event properties and do not pattern morphologically or semantically with lexical adjectives.

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[5] Formally speaking, in our analysis the acceptability of deadjectival predicatives is due to the fact that the domain of the intensionalization operation in (44) is restricted to event predicates and thus does not affect predicates which although they are in the scope of the intensionalization operator are not event predicates. The relevant non-eventive predicate underlying the predicative in (38-c) is the predicate that denotes the degree of difference in coolness from which the measure function $cool_{\Delta}$ is derived according to Kennedy & Levin (2008).

3.2 Event properties and perfects

So far, we considered *be*-prefixed participles and *ge*-prefixed participles of otherwise unprefixed deadjectival verbs like *kühlen* and *trocknen*. Both these kinds of participles are grammatical, acceptable and productive when used in copula constructions with BE. In this respect, *ge*-prefixed participles of unprefixed deadjectival verbs differ importantly from the other classes of *ge*-prefixed constructions with morphologically simple verbs which are "bad inputs" to predicative formation according to Gehrke (2015). In the remainder of this section of the present paper, we systematically go over these "bad" classes of *ge*-prefixed participles of otherwise unprefixed verbs.

3.2.1 Participles of incremental theme verbs

We begin our investigation of *ge*-prefixed participles of non-deadjectival verbs with the example of incremental theme verbs (Dowty 1991; Krifka 1992) as in (49-a). Broadly speaking, these verbs are distinguished by participation in the unspecified object alternation (Levin 1993) as in (49-a)/(49-b).

(49)   a.   Peter kochte die Kartoffel.
             'Peter cooked the potato.'
       b.   Peter kochte.
             'Peter cooked.'

Following Rappaport Hovav (2008); Kennedy (2012), and like Gehrke (2015), we analyze incremental theme verbs as non-core transitive verbs in the sense of Levin (1999); Kratzer (2005), i.e. as manner verbs in which a direct object is only optional but not subcategorized by the verb. The incremental theme verb *kochen* thus denotes a property of events (the manner of the action described by the verb) as in (50).

(50)   kochen ⤳ $\lambda e.[cook(e)]$

No individual property is made available by manner verbs. Accordingly, manner verbs do not license a superlative construction (51) nor an *ung*-nominalization (52).

(51)   *die gekochteste Kartoffel
        the ge-PRFX.cook.t-PTCP.ste-SPL
        '(Intended:) The most cooked potato'

(52)   *die Kochung   der   Kartoffel
        the cook.ung-NMLZ the.GEN   potato
        '(Intended:) the cooking of the potato'

We proposed that predicative participles are only grammatical when an individual property is predicated. Thus, it is expected that participles of incremental theme verbs are questionable out of the blue, an expectation which is borne out in line with the literature (Rapp 1997; Kratzer 2000; Maienborn 2007; Gehrke 2015), see (53).[6]

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[6] It should be noted for the sake of completeness that the acceptability of predicative participles of verbs that are not associated with the predication of individual properties can also be improved in a purely pragmatic manner when the event property described by the participle is coerced into a comparable individual property, for example with the help of a contrastive construction as in (i) (see Rapp 1996).

(i)   Die Kartoffel ist gekocht   und nicht gebraten.
      the potato   BE ge-PRFX.cook.t-PTCP and not   ge-PRFX.fry.t-PTCP
      'The potato is cooked and not fried.'

(53) ??Die Kartoffel ist gekocht.
     the potato   BE ge-PRFX.cook.t-PTCP
     'The potato is cooked.'

Note that like incremental theme verbs, otherwise unprefixed core transitive and ditransitive verbs that are not derived from adjectives form their participles with the prefix *ge-*. Accordingly, we expect that in general *ge*-prefixed predicative participles of such verbs are questionable out of the blue, see (54).

(54)   a. ??Der Apfel ist gekauft.
         the apple BE ge-PRFX.buy.t-PTCP
         'The apple is bought.'

     b. ??Der Student ist geprüft.
         the student BE ge-PRFX.examine.t-PTCP
         'The student is examined.'

     c. ??Der Schlüssel ist ihm gegeben.
         the key   BE he ge-PRFX.give.en-PTCP
         'The key is given to him.'

Traditionally, the direct object in transitive constructions with non-core transitive verbs is analyzed as an incremental theme that measures out the progress of the event described by the verb. That is, the relation between the theme and the event described by the verb is a thematic relation of incrementality. The exact nature of this incrementality relation has been subject to debate in the literature, see e.g. Krifka (1992); Kratzer (2004); Kennedy (2012) for some opposing proposals. As the goal of the present paper is rather independent of the exact specification of the incrementality relation, in the following we represent the relation between the incremental theme and the activity event in transitive uses of non-core-transitive verbs as an "aspect"-relation ASP between an individual *x* and an event *e*, leaving open the exact formalization of the incremental semantics of the ASP-relation. We define the morphologically empty ASP-operation involved in incremental theme verbs as in (55).

(55)   ASP (incremental) ⤳ $\lambda x.\lambda e.[\text{ASP}(e)(x)]$

Following Kennedy (2012), the application of the ASP-operator to the manner denotation in (50) extends the argument structure of the verb with a direct object via the composition principle of event identification, yielding the denotation in (56).

(56)   kochen (+theme) ⤳ $\lambda x.\lambda e.[\text{ASP}(e)(x) \wedge cook(e)]$

When the denotation in (56) is applied to the denotation of participle morphology *-t* (44) the event property denotation in (57) is derived.

(57) $\lambda y.\lambda e.^{\wedge}[\text{ASP}(e)(y) \wedge cook(e)]$

It should be clear at this stage of the derivation what the main difference between deadjectival and non-core transitive participles is. According to our analysis, the property that would be predicated with the denotation in (57) is not an individual property, nor can an individual property be reconstructed from the base verb. Instead, the *ge*-prefixed participle *gekocht* derived in (57) denotes an event property. But what property is predicated when we combine the event property denotation (57) with the denotation of *potato* and then apply the denotation of the copula BE (35), so as to derive the denotation of (53) in (58)?

(58)   (53) ⤳ $\lambda s.[s \approx \lambda e.^{\wedge}[\text{ASP}(e)(\textit{potatoe}') \wedge \textit{cook}(e)]]$

In the next section, we assess the "aspectual" property that would be predicated with (58) in more detail by considering the interaction between predicative participles and perfective aspect.

3.2.2 Perfective (predicative) participles

It is a well-established observation in the literature (Rapp 1996; Kratzer 2000; Maienborn 2007; Gehrke 2015) that the acceptability of (53) is improved when the context in which such constructions are interpreted enforces a shift from the event property 'be cooked' denoted by (57), in which the theme figures as a measure of the cooking event, to an interpretation that solely focuses on the result of the event described, i.e. that the potato 'has been cooked', see (59).

(59)   Die Kartoffel ist bereits gekocht.
         the potato   BE already ge-PRFX.cook.t-PTCP
         'The potato is already cooked.'

The truth-conditions of a property like that of 'having been cooked' in (59) do not make reference to individual or event properties but in fact resemble the truth-conditions standardly associated with the present perfect tense. Whether or not something has been cooked depends only on whether or not there was a completed cooking event, but not on individual properties of what has been cooked. Formally speaking, the relevant property predicated in (59) comes about through determining the ASP-relation between the underlying manner event and the theme to be a perfective or resultative relation (and this is the contribution of *bereits* in (59)). One way to make resultative aspect plain in German is to use aspectual particles, and consequently we expect, as also observed by Gehrke (2015) that predicative participles of particle verbs are grammatical when they predicate a resultative property. Consider for example the fully grammatical particle construction (60), where the perfective interpretation towards which (53) is in the example (59) is determined with the particle *ab* 'off'.

(60)   Die Kartoffel ist abgekocht.
         the potato   BE off-PRTC.ge-PRFX.cook.t-PTCP
         'The potato is fully cooked.'

It is because of the close parallel to perfect constructions (which determine completion of the event described by the verb at some time preceding the evaluation time) that, following established conventions, we propose to call *resultative* properties the properties predicated with (i) shifted event property predicatives such as (59), (ii) particle constructions as in (60). Accordingly, we call the state that consists in something having a resultative property a *resultative state*.

   The crux of our proposal for the semantics of *ge-*, however, is that we do not require *ge-* to operate on a state argument provided by the verb. In this respect, our analysis of *ge-* differs importantly from previous analyses of *ge-* like that of Gehrke (2015) in (61).

(61)   *ge-en/t* ⤳ $\lambda P \lambda y \lambda s \lambda e \exists x[P(e)(s)(x)(y)]$
         (Gehrke 2015: (42-b)), $P(e)(s)(x)(y)$ is the input to participle formation.

Since Gehrke's *ge-* in (61) can only be applied to inputs that provide a state argument, it can by definition not occur on incremental theme verbs (which Gehrke, like we do, analyzes as

a manner verb). Consequently, examples like (59), where the enforcement of a perfective interpretation renders the predicative participle acceptable cannot be explained semantically. Instead, like Maienborn & Herdtfelder (2015), Gehrke has to assume that examples like (59) are licensed pragmatically, which raises the question why and how *ge-* can be "pragmatically" combined with a manner verb as in (59).

3.2.3 Predicatives of unaccusative and unergative verbs

We noted that the event property predicated with the prefix *ge-* leaves in principle open the possibility that the event property receives a perfective interpretation. As it happens, *ge*-prefixed predicative participles and the corresponding perfect participles do not only share the same form but, as Gehrke (2015) argues for the case of unaccusative verbs, also cannot be semantically distinguished. Consider (62).

(62)   Peter ist (*seit 2 Minuten) gestolpert.
        Peter BE (since 2 minutes) ge-PRFX.stumble.t-PTCP
        'Peter has stumbled (*since 2 minutes).'

Because unaccusative verbs select BE as a perfect auxiliary, whether (62) is a predicative or present perfect construction is difficult to determine. As Gehrke (2015: fn. 12) argues, there is no reliable test that would tease apart the predicative and present perfect interpretation of (62). *Ge*-prefixed predicative participles with unergative verbs are ungrammatical (63-a), because unergative verbs are manner verbs. But it may not be by accident that the same surface form that is ungrammatical in predicative constructions is grammatical in perfect constructions with the auxiliary HAVE (see (63-b)).

(63)   a. *Peter ist geschlafen.
             peter BE ge-PRFX.sleep.en-PTCP
             '(Intended:) Peter is slept.'

        b. Peter hat   geschlafen.
             peter HAVE.AUX ge-PRFX.sleep.en-PTCP
             'Peter has slept.'

The close parallel between predicative participles and perfective aspect has been previously recognized in the literature, see in particular Welke (2007) for an over-view and extensive discussion. Since a detailed discussion of *ge*-prefixed participles in perfect constructions is beyond the scope of the present paper, we leave a further exploration of our analysis of *ge*-prefixed participles as a starting point for the possibly uniform semantic analysis of predicative and perfect participle forms to future research.

3.3 Towards a typology of German participles

A summary of the correlation of the form, use and meaning of German participles which we argued for in this section is given in Table 1.

We examined two kinds of predicative constructions, using the licensing of *ung*-nominalizations and superlatives as tests to tease the two classes apart. On the one hand, predicative constructions with adjectives and *be*-prefixed participles ascribe individual properties. On the other, predicative constructions with *ge*-prefixed participles ascribe event properties. We correlated the (un)grammaticality of predicative constructions with the predication of individual and event properties. Adjectives and *be*-prefixed participles predicate individual properties and are fully grammatical whereas *ge*-prefixed constructions with alternating transitives do not predicate individual properties at any stage of their derivation and thus

Table 1: Summary of the proposed classification of predicatives. Glossary:nq = nominal quality, nct = non-core-transitive, ct = core-transitive, ind = individual property, ev = event property, perf = present perfect interpretation, res = resultative property.

prfx	base	property	superlative	ung	predicative	example
–	adj	ind	✔	✔	✔	*kühl* (19)
be	nq	ind	✔	✔	✔	*bemalt* (23-b)
ge	deadj	ev	✘	✘	✔	*gekühlt* (38-c)
ge	unerg	perf	✘	✘	✘	*geschlafen* (63-b)
ge	unacc	perf/ind	✘	✘	✘/✔	*gestolpert* (62)
ge	nct	ev/res	✘	✘	✘/✔	*gekocht* (49-b)
ge	ct	ev/res	✘	✘	✘/✔	*gekauft* (54-a)

in predicative constructions are bad out of the blue. Participles of deadjectival verbs are between the two ends of acceptable and unacceptable predicatives. They are formed with *ge-* and thus ascribe an event property, but the copula construction is generally acceptable because the predicated event property is by itself derived from an individual property.

3.4 Extending the analysis to non-canonical ge-predicatives

A challenge to the analysis proposed in this paper are systematic exceptions to the typology of predicative participles developed so far. For example, a reviewer asks about whether and how our analysis can account of psychological verbs in (64), as some (but not all) psychological verbs license predicative constructions, *ge*-prefixed superlatives and *ung*-nominalizations.

(64)   a.   Der Politiker   ist geachtet.
            the politician is ge-PRFX.respected.t-PTCP
            'The politician is respected.'

       b.   der geachtetste Politiker
            the   ge-PRFX.respect.t-PTCP.ste-SPL politician
            'the most respected politician of all'

       c.   die Achtung   des   Politikers
            the respect.ung-NMLZ the.GEN politician
            'the respect for the politician'

If, as the reviewer suggests, (64-a) (and similar constructions with psychological verbs like *fürchten* 'to fear' or *lieben*) are grammatical in predicative constructions, we believe that systematic patterns as exemplified by (64) show that our typology of *ge*-prefixed participles is not yet fine-grained enough. According to our tests (*ung*-nominalization and superlatives), constructions as in (64) suggest that there are *ge*-prefixed participles that denote individual properties. Consequently, our analysis of the prefix *ge-* has to be further refined in that *ge-* can not only be used to predicate an event property (as discussed in section 3) but can also be used to predicate possession of a quality.

In turn, such a possessive analysis of *ge*-prefixed psychological predicatives would be very much in the spirit of the analysis of psychological qualities like *wisdom* in Francez & Koontz-Garboden (2017). Given the limitations and scope of the present paper, we leave a further exploration of this parallel to future research. According to our analysis, quality possession predication with *ge-* is also involved in participles that are puzzling under the assumption that participles are always derived from verbs as in (65).

(65)   a. #Peter streifte das Wappentier.
             Peter stripe   the heraldic animal
             '(Intended:) Peter striped the heraldic animal.'

        b. Das Wappentier   ist gestreift.
             the heraldic animal BE ge-PRFX.stripe.t-PTCP
             'The heraldic animal is striped.'

        c. die gestreifteste   Himbeertorte aller Zeiten
             the ge-PRFX.stripe.t-PTCTP.st-SPL.e-ADJ raspberry pie of all times
             'the most striped raspberry pie of all times'[7]

        d. die typische Streifung   des   Wappentieres
             the typical   stripe.ung-NMLZ the.GEN heraldic animal
             'the typical striation of the heraldic animal'[8]

According to our analysis, the licensing of *ung*-nominalizations and superlatives indicates that participles as in (65) predicate individual properties rather than event properties. Since individual property predicatives do not make reference to an event, the lack of a corresponding verb is accounted for. Finally, our proposal also suggests a quality possession analysis of predicative participles as in (66), when the possessive prefix can be morphologically silent.

(66)   a. Die Hose   ist kariert.
             the trousers BE check.t-PTCP
             'The trousers are checkered.'

        b. der karierteste   Detektiv der   Welt
             the check.t-PTCTP.st-SPL.e-ADJ detective the.GEN world
             'the most checkered detective of the world'[9]

        c. Mädchenkopf in farbiger Karierung
             girl.head   in colored check.ung-NMLZ
             'Head of a girl in colored check'[10]

In summary, we suggest that our proposal for a morphosemantically grounded typology of predicative participles be understood as a starting point for future research into deviant classes of participles, and consequent refinement of the basic distinctions we have established, rather than a final definition.

4 The ontology of states

The goal of this section is to evaluate our analysis with respect to the proposal of Kratzer (2000), who distinguishes participles that describe target states from participles that describe resultant states. We argue that our proposal distinguishes target and resultant state participles without invoking the questionable *immer noch* test on which Kratzer's analysis rests.

  According to Kratzer (2000), two types of predicative participles are distinguished by their compatibility with the modifier *immer noch* ('still') as in (67) and (68).

(67)   Die Reifen sind immer noch aufgepumpt.
       the tires BE   still   up-PRTC.ge-PRFX.pump.t-PTCP
       'The tires are still pumped up.'

---

(68)   Das Theorem ist (*immer noch) bewiesen.
      the theorem BE (*still)   be-PRFX.show.en-PTCP
      'The theorem is (*still) proved.'

Adopting terminology from Parsons (1990), Kratzer proposes that participles that allow for modification with *immer noch* denote "target states" (67) and that those that don't denote "resultant states" (68). The intuition behind the distinction between these two kinds of states is that target states but not resultant states are alterable, hence target states but not resultant states allow modification with *immer noch*.

Assuming that overt participle morphology is "meaningless" (Kratzer 2000: 391), Kratzer argues that "only those verbs can have target state passives that characterize states as part of their meaning" (Kratzer 2000: 393). Accordingly, the target state participle *aufgepumpt* 'pumped up' in (67) would be derived from a lexical representation that makes available a target state argument – the result state of the event described by the verb *aufpumpen* 'pump up' in (69-a) – and the participle *bewiesen* 'proved' in (68) would be derived from a lexical representation as in (69-b), which does not make available a state argument.

(69)   a.   Kratzer (2000: 390)
         aufpump- ⤳ $\lambda s.\lambda e.\,[pump(e) \wedge event(e) \wedge inflated(the\text{–}boat)(s) \wedge cause(e)(s)]$
     b.   Kratzer (2000: 395)
         beweis- ⤳ $\lambda e.\,[prove(the\text{–}theorem)(e)]$

Kratzer's analysis is challenged by deadjectival verbs as in (70).

(70)   Der Briefkasten ist (*immer noch) geleert.
      the mail box   BE (*still)   ge-PRFX.empty.t-PTCP
      'The mail box is (*still) emptied.'

According to Kratzer's *immer noch* test, (70) describes a resultant state, and thus the lexical stem from which the participle *geleert* 'emptied' is derived should not make available a target state argument. But deadjectival verbs lexicalize a target state, and thus should be compatible with *immer noch*. To account for this mismatch, Kratzer proposes that deadjectival verbs like *leeren* should be reanalyzed as periphrastic causatives in which an adjective incorporated into a light verb *machen* ('make') as in (71).

(71)   *Der Briefkasten ist immer noch leergemacht.
      the mail box   BE still   empty-PRTC.ge-PRFX.make.t-PTCP
      'The mail box is still made empty.'

Because (71) is ungrammatical, Kratzer suggests that target state participles of deadjectival verbs are ruled out for independent reasons: verbs derived through incorporation into a light verb never license target state participles. Besides bringing up new problems (i.e. whether a periphrastic causative analysis of deadjectival verbs is viable, see e.g. the competing well-established proposals by Hale & Keyser 1993; Kennedy & Levin 2008), the proposed analysis falls short of deadjectival verbs in general. For the overwhelming majority of deadjectival verbs, the participle is compatible with *immer noch*, although the corresponding periphrastic causative is ungrammatical, see (72) and (73).

(72)   a.   *Die Tür ist immer noch aufgemacht.
         the door BE still   open-PRTC.ge-PRFX.make.t-PTCP
         'The door is still made open.'

b. Die Tür   ist immer noch geöffnet.
    the door BE still   ge-PRFX.open.t-PTCP
    'The door is opened.'

(73)   a. *Der Briefkasten ist immer noch vollgemacht.
           the mail box   BE still   full-PRTC.ge-PRFX.make.t-PTCP
           'The mail box is still made full.'

       b. Der Briefkasten ist immer noch gefüllt.
           the mail box   BE still   ge-PRFX.full.t-PTCP
           'The mail box is still filled.'

While Kratzer attempts to explain that participles of deadjectival verbs are incompatible with *immer noch* although deadjectival verbs lexicalize a target state with an (unsuccessful) redefinition of their lexical semantics, Irmer & Mueller-Reichau (2018) propose to explain the incompatibility of participles of deadjectival verbs and *immer noch* with a refined view of the conditions under which a participle is (in)compatible with *immer noch*. Irmer and Mueller-Reichau explain (70) by proposing that an emptied mailbox is in a state in which it does not afford the same change of state that is implied by the participle *geleert* and expected by *immer noch*, since that same change of state would require that "one and the same stuff participant is operated on" (Irmer & Mueller-Reichau 2018: 593) both by the participle and the future change of state. That is, (70) requires that the same letters are taken from the mailbox that have been removed before, and this requirement is not compatible with our world knowledge that mailboxes are never filled twice with the same letters.

The heavy reliance of Irmer & Mueller-Reichau (2018) on world knowledge about particular entities and processes requires that compatibility of *immer noch* is decided on a case by case basis, which takes away much of the appeal of Kratzer's original proposal to use *immer noch* as a genuinely linguistic test to tease apart two types of participles. In particular, it is difficult to evaluate the predictions of the approach of Irmer & Mueller-Reichau (2018) for verbs derived from absolute adjectives other than *leer*. For example, the participle *getrocknet* in (74) is incompatible with *immer noch* albeit the same participant is operated on.

(74)   Die Wäsche ist (*immer noch) getrocknet.
       the laundry is still   ge-PRFX.dry.t-PTCP
       'The laundry is (*still) dried.'

Moreover, the *immer noch* test also makes wrong predictions for result verbs like *verbrennen* ('to burn') and *sterben* ('to die'), and these wrong predictions are not accounted for in the reanalysis of Irmer & Mueller-Reichau (2018). According to the established tests (Beavers 2010; Rappaport Hovav & Levin 1998) for the lexical entailment of a result state (a target state in Kratzer's terminology) these verbs differ in their entailment of a change of state from manner verbs like *wischen* ('to wipe'), compare (75-a) vs. (75-b)/(75-c).

(75)   a. Er hat den Tisch gewischt, (aber er ist nicht sauber/aber nichts an ihm ist anders).
           'He has wiped the table (but it is not clean/but nothing is different about it).'

       b. #Das Papier ist verbrannt, aber (es ist nicht verbrannt/aber nichts an ihm ist anders).
           'The paper is burnt, but (it isn't burnt/nothing is different about it).'

       c. #Peter ist gestorben, aber (er ist nicht tot/aber nichts an ihm ist anders).
           'Peter died, but (he isn't dead/nothing is different about him.)'

Given that *verbrennen* and *sterben* lexicalize a target state, Kratzer's analysis would thus predict that *verbrennen* and *sterben* are compatible with *immer noch*, a prediction which – as (68) and (76-a)/(76-b) show – is not borne out.

(76)   a.   Das Papier ist (*immer noch) verbrannt.
              'The paper is (*still) burnt.'

        b.   Peter ist (*immer noch) gestorben.
              'Peter is (*still) died.'

Kratzer explains the unexpected incompatibility of result verb participles with *immer noch* as in (76) by proposing that incompatibility with *immer noch* can only be used as a test for "true" resultant state participles. Only the states described by true resultant state participles are irreversible, but those described by "fake" resultant states (i.e. target state participles) as in (76) are in principle reversible, since (76-b) is fine in "contexts in which people are assumed to come back to life" (Kratzer 2000: 387). But this raises the question for whether and how "false" resultant state participles like (76-a) or (76-b) can be distinguished from "true" resultant state passives like (68) and (70), without presupposing what the *immer noch* test is intended to probe for. Actually, similar contextual considerations as for (76-b) should be applicable to every result verb participle, and then (70) is just as fine as (76-b) in contexts in which mailboxes may fill up after being emptied. Once the *immer noch* test is subject to contextual considerations, seemingly "true" resultant state participles like (68) appear to be similarly questionable. As (77) shows, *beweisen* 'to prove' may entail a result state (makes available a target state argument in Kratzer's terminology), contrary to the analysis (69-b) proposed by Kratzer.

(77)   #Die Hypothese ist bewiesen, aber (sie ist nicht bewiesen/aber nichts an ihr ist
        anders).
        'The hypothesis is proved, but (it isn't proved/nothing is different about it.)'

(68) is just as fine as (76-b) in a context in which a proof may be disproved (e.g. in the context of the Riemann hypothesis).

  In summary, it appears that the distinction between target states and resultant states is difficult to implement using the *immer noch* test as a guiding principle. Instead, the distinction between individual and event properties we have established underlies the distinction between resultant states and target states as we understand it to be characterized in Parsons (1990). Parsons illustrates his conception of a target state with (78).

(78)   The ball is on the roof.

Whether or not a ball is on a roof can be determined by inspection of the ball's individual properties like its position in space relative to the roof. In contrast, a resultant state is the "state of my having thrown the ball onto the roof" (Parsons 1990: 235). As for deadjectival verbs and their underlying adjectives, the difference in truth-conditions manifests itself in that fact that (78) can be true even if the ball has never been thrown, whereas a description of the state of having thrown the ball onto the roof is false if the ball has never been thrown. From this point of view, the relevant difference that Kratzer aims to test for with the *immer noch* test, is not the (ir)reversibility of states but the irreversibility of time. Once a ball has been thrown, this event cannot be undone in time, but since a ball's being on the roof is an individual property independent of the temporal order of causation presupposed by events, the individual property of the ball can change over time.

The distinction between individual property states and event property states also reproduces the distinction between "Davidsonian" and "Kimian" states that Maienborn (2005) argues to be central to predicatives with BE in general. According to Maienborn, Kimian states "are abstract objects for the exemplification of a property P at a holder x at time t" (Maienborn 2005: 113) and do not make reference to an event whereas Davidsonian states are defined in terms of the causal effects of an event. This parallels our analysis of individual and event property states insofar as individual property states are defined independently of an event whereas event property states are defined with respect to an event. Concerning the addition of "resultative" states to the ontology, event properties can either be stativized as resultant state when combined with the copula BE or perfectivized as resultative states when combined with the auxiliary BE. The improvement of the acceptability of event-property predicatives in perfective contexts is then to be explained as the coercion of an aspectual event property (like culmination or termination) into a resultative property.

The overall ontology of states according to our proposal is summarized in figure (79), where the dotted arrow indicates coercion and k-state and d-state are short for Kimian and Davidsonian states, respectively.

(79)
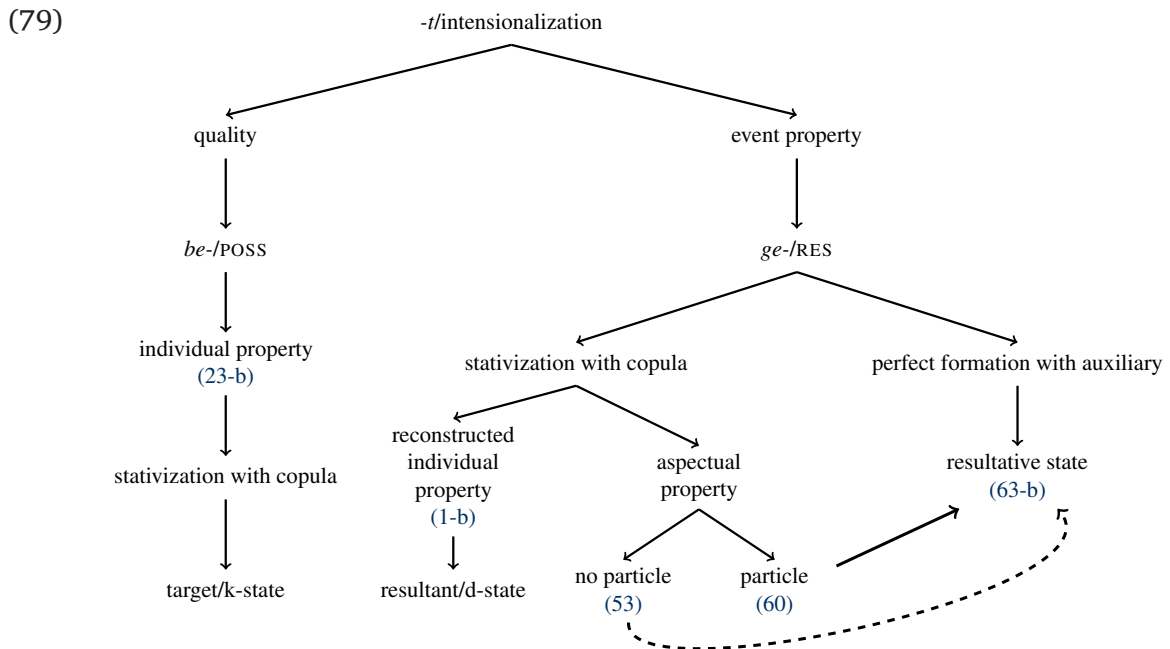
5 Summary and outlook

The main goal of the present paper was to familiarize the reader with some of the systematic patterns of the formation and interpretation of German participles. We restricted our attention to *ge*-prefixed participles in predicative constructions. But we believe the shift of perspective adopted in this paper with respect to participles, from a primary focus on verbs and events to adjectives and properties, may also inform the analysis of other uses of *ge*-prefixed participles. In particular, although *ge*-prefixed participles have the same surface form in all their different usages like predicative participle, perfect and passive, the participle is assumed to have a quite different meaning in each of these constructions. In this respect, the present paper constitutes an attempt to identify event properties as the lowest common denominator of *ge*-prefixed participles in their different possible uses, independent of whether or not the underlying verb makes available a result or target state argument. One direction of future research that arises from the discussion in the present

paper is thus whether, and if yes how, a rather abstract semantic analysis of *ge*-prefixed participles as ours can serve as a uniform input to a further specification of the meaning of the participles in the context of its use.

We already mentioned in section 3.2.2 the close relationship our analysis suggests between *ge*-prefixed predicative participles and perfect participles. But our analysis also suggests a similarly close cross-connection between *ge*-prefixed predicative participles and passive constructions. We have dubbed participle constructions with the copula BE "predicative participles". We chose this term to avoid the more established term "adjectival passive". The reason for this is that as it stands, nothing in the analysis of predicative participles we proposed involves the passivization of a verbal phrase. Our proposal can thus be understood as an implementation of the idea that "in adjectival passives, the verb's external argument is truly missing. It's not that it has been eliminated or suppressed. It was never there to begin with." (Kratzer 2000: 391). According to our proposal, the states described by predicative participles do not follow from the implications of verbal passivization but are derived from genuinely adjectival constructions.

An interesting observation in this respect, due to Maienborn & Herdtfelder (2017), is that *von* 'from/by'-phrases usually associated with verbal passives are licit in adjectival predicative constructions like (80). In the examples in (80), the matrix predicate is an adjective that does not make an event available, and consequently the *von*-phrase cannot be understood to pick up a passivized external argument of a verb.

(80)   a.   Peter ist müde von der Reise.
            'Paul is tired from the trip.'

       b.   Der Platz ist weiß von den Hagelkörnern.
            'The square is white from the hailstones.'

In light of non-eventive, thus non-passive, examples involving *von*-phrases like (80), deadjectival *ge*-prefixed predicative participles with *von*-phrases as in (81) do thus not provide conclusive evidence for a passive analysis of predicative participles, but may as well be analyzed along the lines suggested by Maienborn & Herdtfelder (2017) for the adjectival cases in (80).

(81)   a.   Die Wangen sind gerötet von der Anstrengung.
            'The cheeks are reddened by the effort.'

       b.   Der Körper ist geschwächt von der Krankheit.
            'The body is weakened by the illness.'

One further point we haven't addressed yet is the open question why no more than one prefix can occur on a German verb. Given that we associated prefixes with the predication of a property, a possible explanation may be that more than one prefix is disallowed for general semantic reasons, i.e. that predicates can only predicate one property of an argument at a time. Thus, when a prefix is applied to a verb, further prefixes are blocked because there is no property bearer available that the predication operation associated with the prefix could target. Such an explanation would be very much in the spirit of the analysis of Rathert (2009), albeit locating the relevant explanatory feature at the more fundamental level of predication in general rather than making assumptions about the semantics of specific prefixes.

Concluding, we developed an analysis of German *ge*-prefixed participles in copula constructions according to which there is a systematic correlation between the presence or

absence of the prefix *ge-* and the type of state described by the predicative. Our analysis of *ge-* was developed by comparing the properties of *ge*-predicatives with predicatives prefixed with *be-*. But we believe our analysis can in principle be extended to account for the other prefixes as well, based on the observation of Rathert (2000) that prefixes often have an aspectual function. From this point of view, prefixes like *ver-* may be analyzed as RES-operators that do not operate on events (like *ge-* does), but rather on those scales or paths in terms of which the result of the event described is conceptualized. Naturally, the same considerations hold for the wide range of particles (which we suggested to be overt realizations of lexical aspect ASP) German verbs can combine with. A further exploration of the morphosemantics of particles and prefixes other than those discussed in the paper is left to future research. But we like to stress that work like Dewell (2015) or Roßdeutscher (2016) shows that a systematic account of the semantics of German prefixes and particles is not as hopeless as is sometimes suggested, e.g. in Kratzer (2000; 2004; 2005). But quick generalizations are also not possible in the other direction. We believe that the complex patterns of German word formation and interpretation can only be revealed step by step through detailed case studies, and thus the discussion of the prefix *ge-* in the present paper is no more than just one piece of the big puzzle that arises with the investigation of the patterns underlying the form, use and meaning of morphologically complex words.

Abbreviations

We use the following glossing conventions for German examples: NMLZ = nominalizer, PRFX = prefix, PRTC = particle, PTCP = participle, SPL = superlative, CMP = comparative, ADJ = adjectivizer. If there is a suitable translation of a German prefix or particle into English, we use this translation in the morpheme gloss.

Acknowledgements

Funding Information

Competing Interests

The authors have no competing interests to declare.

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