Resultatives and the architecture of event structure

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1. Introduction

The term *resultatives*, or more specifically what Halliday (1967) first called "resultative attributes", refer to those constructions in which a result state is generally brought about by the action denoted by the verb (see Green, 1972; Randall, 1983; Simpson, 1983; Hoekstra, 1988; Carrier & Randall, 1992; Levin & Rappaport Hovav, 1995; Washio, 1997; Wunderlich, 1997; Rappaport Hovav & Levin, 2001; Goldberg & Jackendoff, 2004; Wechsler, 2005; Mateu, 2012, *i.a.*). The result state is typically denoted by adjective (1-a) or prepositional phrases (1-b), but also by adverbs (1-c) and noun phrases (1-d). In resultative constructions, thus, the verb and the result phrase combine and form a complex predicate that can be (roughly) paraphrased as *x causes y to become z by doing w*, e.g., (1-a) can be paraphrased as John caused the table to become clean by wiping.

(1)   a.   John wiped the table clean.
        b.   The toddler broke the vase into pieces.
        c.   I broke a piece off.
        d.   I painted the car a pale shade of yellow. (Simpson 1983: 142)

An important restriction regarding resultative constructions relates to the claim that there can only be one result state predicated in a single clause (Goldberg, 1991, 1995; Tenny, 1987, 1994; Levin & Rappaport Hovav, 1995; Tortora, 1998; Rappaport Hovav, 2008, 2014). This restriction is apparently supported by the fact that two distinct result states in a single clause do not appear to be possible, e.g., **John wiped the table clean dry* (cf. *John wiped the table clean/dry*). In this respect, Tenny (1987: 190) claims that "there may be at most one 'delimiting' associated with a verb phrase", where an eventuality can be delimited as a result of the meaning of the verb (e.g., *John died in 3 minutes/#for 3 minutes)*, or through the use of a result phrase (e.g., *John wiped the table clean in 3 minutes/#for 3 minutes*). In a similar vein, Goldberg (1991: 368) argues that "if an argument x refers to a physical object, then more than one distinct path [= a result state, JA] cannot be predicated of x within a single clause." Although this restriction has been formulated in different ways by different authors, e.g., the *Single Delimiting Constraint* by Tenny (1994), the *Unique Path Constraint* by Goldberg (1991), the *Further Specification Constraint* by Tortora (1998), or the *Single Development Constraint* by Matsumoto (2006), they all boil down to restricting the number of distinct result states that can be predicated in a single clause.

In the present paper, I provide naturally-occurring data that challenge such a widely-accepted restriction on resultative constructions. More specifically, I focus on so-called result verbs, i.e., verbs encoding changes of state and location (e.g., *break*, *smash*, *freeze* etc., see Rappaport Hovav & Levin, 2010), and the types of result phrases they combine with. Contra Rappaport Hovav & Levin (2010), I show that result verbs can combine with result phrases denoting distinct result states than the one encoded by the result verb. Consequently, this shows that semantically two result states can be predicated of the

same entity in a single clause—the result state encoded by the verb and the one denoted by the result phrase—contra Tenny (1987), Goldberg (1991), Levin & Rappaport Hovav (1995), among others. I propose that the grammatical restriction on the number of result states that can be predicated in a single clause is a (syntactic) restriction regarding the architecture of event structure, i.e., structurally there can only be one overt predicate denoting a result state (either a change of state or location) in a single clause. In more formal terms, adopting a neoconstructionist approach to argument/event structure, I propose that little *v* selects for one result predicate as its complement denoting either a change of state (e.g., an Adjective Phrase (AP)) or a change of location (e.g., a Prepositional Phrase (PP)), but never both in the same event structure.

The present paper is structured as follows. In Section 2, I provide a brief overview of the widely-accepted restriction regarding the number of result states in resultative constructions. In Section 3, I lay out the analysis of the data under discussion and I show that the current proposal makes some welcome predictions as well as accounting for some challenging data for previous approaches. Section 4 concludes the present paper.

2. The Unique Path Constraint

The Unique Path Constraint (hereafter, UPC) by Goldberg (1991), as defined in (2), is possibly the most well-known constraint when it comes to the alleged (grammatical) restriction regarding the number of result states that can be predicated in a single clause.

(2)   The Unique Path Constraint: if an argument X refers to a physical object, then more than one distinct path [= result state, JA] cannot be predicated of X within a single clause. (Goldberg 1991: 368)

Such a grammatical restriction can be illustrated by the the following examples (from Goldberg 1991: 368, 370), argued to be ungrammatical on the basis of the UPC, i.e., due to the fact that there are two result phrases denoting distinct result states—a change of state (e.g., *black and blue* (3-a)) and a change of location (e.g., *out of the room* (3-a)) being predicated in the same clause.

(3)   a.   *Sam kicked Bill black and blue out of the room.
        b.   *He wiped the table dry clean.
        c.   *Sam tickled Chris off her chair silly.

Concomitantly, verbs that encode a change of state or location, i.e., so-called result verbs (see Rappaport Hovav & Levin, 2010), are argued to disallow result phrases that introduce distinct result states than the one encoded by the verb (see also Rappaport Hovav, 2008, 2014). For instance, the following examples are claimed to be ungrammatical since the verbs encode either a change of location (e.g., *fall*) or a change of state (e.g., *break*), whereas the result phrases denote a distinct result state than the one encoded by the verb. Thus, the examples in (4) are also ruled out on the basis of the UPC, insofar as the result verb and the result phrase denote two distinct result states predicated of the same entity.[1]

(4)   a.   *She carried John giddy. (Simpson 1983: 147)
        b.   *Bill broke the vase worthless. (Jackendoff 1990: 240)
        c.   *The vase fell broken. (Rappaport Hovav 2014: 23)

However, there are some examples that apparently violate such a grammatical restriction as they involve combinations of result verbs and PPs denoting a distinct result state, i.e., a change of location, as illustrated in (5).

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[1]   It has been argued that result verbs do permit result phrases but only if the result phrase further specifies the result state encoded by the verb, as in *John froze the soup solid* or *John arrived in Barcelona*. In this case, there is only one 'actual' result state and the restriction on the number of result states is not violated (see Tortora, 1998; Rappaport Hovav & Levin, 2010). Such combinations of result verbs and result phrases will not be taken into consideration in the present paper insofar as the result phrases do not constitute a distinct result state and therefore do not violate the UPC.

(5) a. The cook cracked the eggs into the glass. (Levin & Rappaport Hovav 1995: 60)
     b. Daphne shelled the peas onto the table. (Levin & Rappaport Hovav 1995: 60)
     c. He broke the walnuts into the bowl. (Goldberg 1991: 376)

In relation to such examples, it is important to note that the UPC does not appear to constrain the number of result states per clause, but rather the number of result states that can be predicated of a single entity. As a matter of fact, Levin & Rappaport Hovav (1995) themselves suggest that such examples are possible since the two distinct result states are predicated of distinct entities, e.g., in (5-a) the eggshells break, whereas the contents move, which suggests that "the restriction [= one result state per clause, JA] may be that only one change per entity may be expressed in a single clause." (Levin & Rappaport Hovav 1990: 60). Drawing on Levin & Rappaport Hovav's observation, Beavers & Koontz-Garboden (2017a) argue that two distinct result states are possible if they are predicated of distinct entities, as in *The skiers skied the trail clean of snow*, where the entity denoted by the subject (i.e., *The skiers*) undergo the change of location encoded by the verb, whereas the entities denoted by the object (i.e., *the trail*) undergo the change of state denoted by the result phrase. Similarly, in Ausensi (to appearc) (see also Ausensi, 2019), I explicitly argued in favor of a more nuanced view of this alleged restriction and proposed what I called the 'One Scalar Change per Entity Constraint'—where a scalar change is understood as a result state (see Rappaport Hovav & Levin, 2010)—namely two scalar changes can be predicated in the same clause as long as they are predicated of distinct entities. However, this more nuanced view also runs into problems, since, as Goldberg & Jackendoff (2004) point out, there appear to be examples of result verbs and PPs where the two distinct result states (i.e., a change of state encoded by the verb and a change of location denoted by the PP) are predicated of the same entity, e.g., *The chocolate melted out of the box*.

In the present paper, drawing on Goldberg & Jackendoff (2004), I provide naturally-occurring examples of result verbs and path PPs (i.e., PPs denoting changes of location) (6), as well as result verbs combined with APs (7) in which the result state that the PPs and APs denote is distinct from the one by the verb.[2]

(6) a. Your already cooked bacon might be overcooked and the cheese might melt out of the hamburger. (GloWbE)
     b. It essentially has some of the carbon burned out of the surface layer. (GloWbE)
     c. A lot of the water sprayed onto the ship had frozen onto the steel. (GloWbE)
     d. This time I didn't melt the chocolate into the custard mixture. (GloWbE)

(7) a. Sailor finishes his beer [...] steps on it, crushing it flat. (COCA)
     b. Frankie was pulling a lever that wound his cables in and crushed it tighter. (COCA)
     c. All-news channels are now splitting the niche smaller and smaller. (GloWbE)
     d. The ceiling split open. (COCA)

Drawing on such data, I note that semantically there can be more than one distinct result state in a single clause, as well as more than one result state predicated of the same entity, contra Goldberg (1991), Levin & Rappaport Hovav (1995), Beavers & Koontz-Garboden (2017a), Ausensi (2019, to appearc), among others. Yet, I contend that structurally these examples only involve the realization of one result predicate, selected as the complement of little *v*.[3]

3. Deconstructing resultatives

Before laying out the analysis of the data under discussion, it is necessary to provide a brief overview of the theory of argument/event structure entertained in the present paper. I assume that verb meanings consist of an event structure that decomposes into event templates, defining temporal and causal structure, and roots, providing real-world details about the event (Rappaport Hovav & Levin, 1998; Borer 2003; Ramchand 2008; Alexiadou et al. 2015, *i.a.*) More specifically, I assume a neoconstructionist approach to argument/event structure (Harley & Noyer 2000; Embick 2004; Harley

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[2] The examples in this paper are extracted from *Google Books* (GBooks), *Corpus of Contemporary American English* (COCA) and *Corpus of Web-Based Global English* (GloWbE).
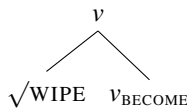[3] I am grateful to Josep M. Fontana for drawing my attention to these examples.

2005; Borer 2005; Ramchand 2008; Alexiadou et al. 2015), whereby verbs are created in the syntax by merging roots and event templates, defined by functional heads in the verbal domain (see Marantz 1997; Hale & Keyser, 2002; Folli & Harley 2005; Mateu & Acedo-Matellán 2012). In this respect, I adopt the theory of event structure laid out in Embick (2004) and Beavers & Koontz-Garboden (2020). The basic functional heads that build argument/event structures are the verbalizing little v head, which basically comes in two flavors, i.e., v_{BECOME} and v_{CAUSE}. The v_{BECOME} introduces entailments of change and categorizes the root, whereas v_{CAUSE} introduces entailments of causation and the external argument, here called *effector* in a more broad sense (see Van Valin & Wilkins, 1996). Compare this below (from Beavers & Koontz-Garboden 2020: 14).

(8)   a. $[\![v_{\text{BECOME}}]\!] = \lambda P \lambda x \lambda e \exists s[become'(s,e) \wedge P(x,s)]$
            "Event e gives rise to a state s of type P for individudal x."
       b. $[\![v_{\text{CAUSE}}]\!] = \lambda Q \lambda y \lambda v \exists e[effector'(y,v) \wedge cause'(v,e) \wedge Q(e)]$
            "Event v with y as its effector causes an event e of type Q."

In addition, following Embick (2004), McIntyre (2004), Harley (2005), Mateu & Acedo-Matellán (2012), I assume that roots are structurally interpreted as manner or result depending on how they associate with the event structure. More specifically, following Embick (2014: 370-2), I assume that roots adjoined to v through Direct Merge create a complex head where the root is structurally interpreted as providing the manner with which a result state is brought about.[4] In contrast, roots in the complement position of v are interpreted as the state that comes about after the event is over. Compare this below.
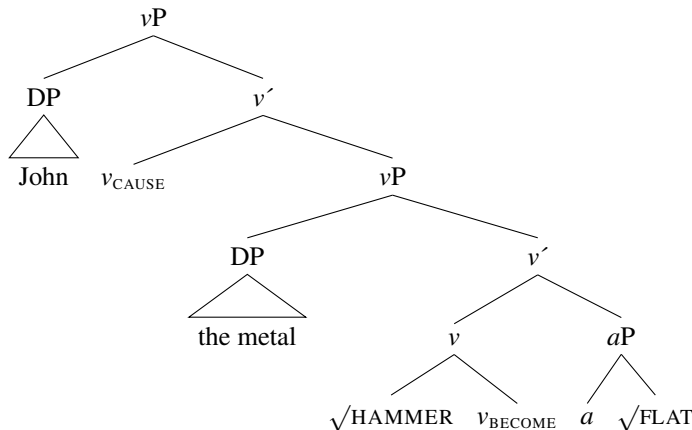
(9)   Manner specification   (10)   Result specification
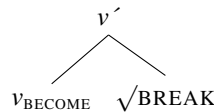
Putting all the pieces together, a resultative construction of the *hammer the metal flat* type is represented as follows (further see Embick, 2004).

(11)   John hammered the metal flat. ($\approx$ cause the metal to become flat by hammering)

Lastly, regarding the role of roots, it is important to first note that under current theories of event structure, it is assumed that the meanings roots and templates introduce are mutually exclusive. For instance, Embick (2009) argues that roots never introduce templatic meanings such as change (e.g. v_{BECOME}), what he calls the Bifurcation Thesis for Roots (see also Arad 2005; Borer 2005; Dunbar & Wellwood 2016). Following Beavers & Koontz-Garboden (2020), Ausensi (to appeara), Ausensi et al. (2020, under review), I assume that some classes of roots can introduce templatic meanings such as change with

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[4]   Manner adjunction to v is only possible if a complement is taken by v (see Mateu & Acedo-Matellán, 2012).

grammatical consequences. For instance, what Beavers & Koontz-Garboden (2020) call Result Roots (e.g., √BREAK), in contrast to Property Concept Roots (e.g., √COOL), inherently comprise as part of their entailments meanings that some theoretical approaches assume to be part of templatic meanings introduced solely by projections such as v_{BECOME}.[5]

(12) a. $[\![\sqrt{\text{BREAK}}]\!] = \lambda x \lambda s [broken'(x, s) \wedge \exists e'[become'(e', s)]]$
      b. $[\![\sqrt{\text{COOL}}]\!] = \lambda x \lambda s [cool'(x, s)]$

Having laid out the theory of argument/event structure entertained, I propose that the grammatical restriction on the number of result states that can be predicated in a single clause is a (syntactic) restriction regarding the architecture of event structure in the sense that there can only be one overt result predicate per clause, namely an AP denoting a change of state, or a path PP, denoting a change of location. This naturally follows from the theory adopted in the present paper insofar as little v can only select for one complement denoting a result state. As I note in Section 3.1, the current proposal makes some welcome predictions, and it accounts for some challenging data for previous approaches.
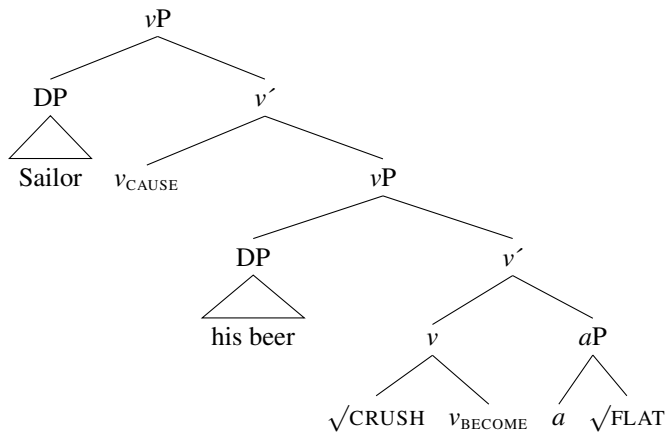
I start by analyzing the transitive instances of the data under discussion (e.g., *All-news channels are now splitting the niche smaller and smaller*). I propose that such transitive variants of the constructions under discussion are cases of so-called transitive complex events (McIntyre, 2004; Embick, 2004; Mateu, 2012; Acedo-Matellán & Mateu, 2014) where the verb (semantically) encodes a result state (e.g., *John crushed his beer flat*). In this case, I propose that verbal roots are merged as modifiers to v, as they describe–while semantically encoding a result state—the manner with which the causer brings about the result (e.g., *John caused the beer to become flat by crushing*). Structurally, however, the result state is denoted by a result phrase, not by the verb itself. In this case, little v thus selects for one result predicate as its complement, i.e., either a PP denoting a change of location (13) or a aP (14), yielding a change of state interpretation. The two possible structures are given below, with examples for each.

(13) This time I didn't melt the chocolate into the custard mixture. ($\approx$ cause the chocolate to be in the custard mixture by melting)
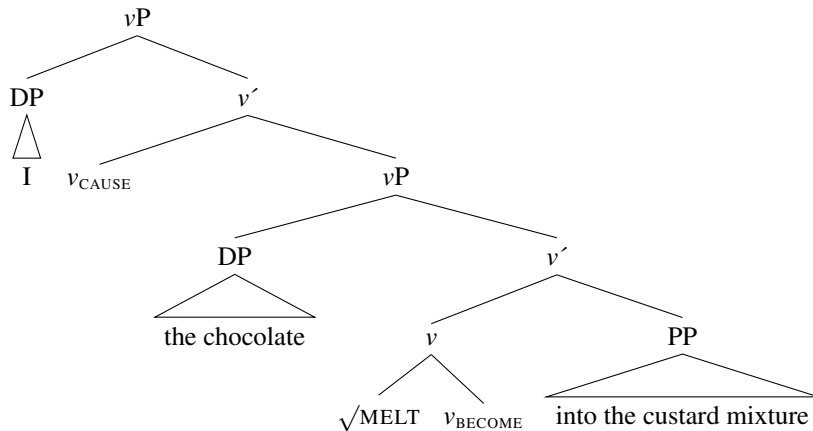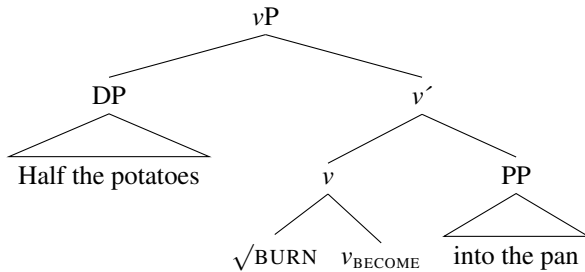

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(14)   Sailor crushed his beer flat. (≈ cause the beer to become flat by crushing)

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                    vP
          ┌──────────┴──────────┐
         DP                     v´
          |              ┌───────┴───────┐
        Sailor         v_CAUSE          vP
                               ┌──────────┴──────────┐
                              DP                      v´
                               |              ┌────────┴────────┐
                            his beer          v                aP
                                          ┌───┴───┐         ┌───┴───┐
                                      √CRUSH  v_BECOME      a    √FLAT
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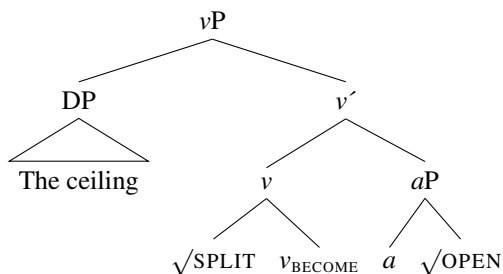
Regarding the intransitive instances of the data under discussion (e.g., *The ceiling split open*), I propose that they are cases of intransitive complex events of change of state, where the verbal root also merges as a modifier to *v*. As in transitive complex events, the verbal roots, while semantically encoding a result state, also describe the manner with which a theme achieves a result state, which is denoted by a result phrase (e.g., *The ceiling became open by splitting*). The little *v* head selects for one result predicate as its complement, either a path PP (15), describing a change of location, or for an *a*P, describing a change of state (16). The two possible structures are given below, with examples for each.

(15)   Half the potatoes burned into the pan. (GloWbE). (≈ get into the pan by burning)

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                    vP
          ┌──────────┴──────────┐
         DP                     v´
          |              ┌───────┴───────┐
   Half the potatoes     v              PP
                     ┌───┴───┐           |
                 √BURN  v_BECOME     into the pan
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(16)   The ceiling split open. (≈ become open by splitting)

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                    vP
          ┌──────────┴──────────┐
         DP                     v´
          |              ┌───────┴───────┐
     The ceiling         v              aP
                     ┌───┴───┐       ┌───┴───┐
                 √SPLIT  v_BECOME    a    √OPEN
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In short, I propose that in the constructions at stake, the roots of result verbs, while semantically encoding a result state (as per Rappaport Hovav & Levin, 2010), merge as modifiers to *v* describing the manner (of action) that brings about the (structural) result state, which is denoted by result phrases, i.e., PPs/APs.
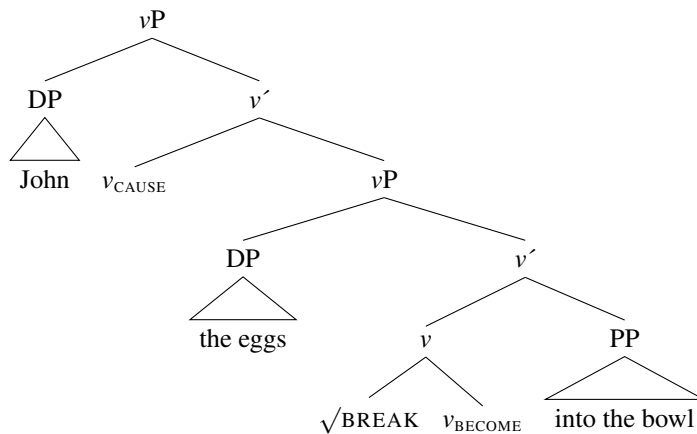
3.1. Welcome predictions

The current proposal provides a natural explanation for data that have challenged previous approaches. Regarding the examples in (3), repeated below as (17), such data are naturally accounted

for in the present account since they contain two overt realizations of the same predicate, and are therefore predicted to be ungrammatical by the present approach. Put differently, there are two overt result predicates, e.g., an AP and a path PP (17-a) or two APs (17-b), which has been argued not to be grammatically possible, insofar as little v selects for one result state predicate as its complement.

(17) a. *Sam kicked Bill black and blue out of the room.
      b. *He wiped the table dry clean.
      c. *Sam tickled Chris off her chair silly.

The challenging data for previous approaches in (5), repeated below as (18), are also naturally accounted for in the present analysis, insofar as the verbal roots merge as modifiers to v, whereas it is the path PP that denotes the result (i.e., *cause the eggs to be in the vase by breaking*), as illustrated in (19).

(18) a. The cook cracked the eggs into the glass.
      b. Daphne helled the peas onto the table.
      c. He broke the walnuts into the bowl.

(19) John broke the eggs into the bowl. ($\approx$ cause the eggs to be in the vase by breaking)

Lastly, the present account makes a number of welcome predictions. First, it predicts that (in)transitive complex events—where the verb semantically encodes a result state (e.g., *break*)—can only combine with either a path PP or an AP, but never both at the same time. As shown by the data below, such a prediction appears to be borne out.

(20) a. *John broke the eggs into the bowl open.
      b. John broke the eggs into the bowl.
      c. John broke the eggs open.

(21) a. *The eggs broke into the glass into the bowl.
      b. The eggs broke into the glass.
      c. The eggs broke into the bowl.

Second, the present approach further predicts that events where the verb encodes a manner of action (e.g., *hammer*, *wipe*, *push*, see Rappaport Hovav & Levin, 2010), as in *hammer the metal flat*, can only combine with path PPs or APs, but never both. In this case, the verbal root, e.g., $\sqrt{\text{HAMMER}}$, also merges as a modifier to little v, which selects for one result state predicate (cf. (11)).

(22) a. *Tam laughed himself silly faint.
      b. Tam laughed himself silly.
      c. Tam laughed himself faint.

(23) a. *Sam hammered the metal into the ground flat.
      b. Sam hammered the metal flat.
      c. Sam hammered the metal into the ground.

Third, assuming that result roots have the semantic denotation as in (12-a) predicts that such a class of roots always introduce entailments of change regardless of structure. In other words, result roots inherently comprise as part of their meaning entailments of change, as Beavers & Koontz-Garboden (2020) argue, and are therefore predicted to entail change regardless of structure. As I show below, this prediction is borne out, since even when result roots are structurally interpreted as manner—when they merge as modifiers to v—change entailments cannot be severed from their meaning (see also Rappaport Hovav, 2017).[6]

(24) a. Half the potatoes burned into the pan (#but nothing was burned).
   b. The ceiling split open (#but nothing was split).
   c. Sailor crushed his beer flat (#but nothing was crushed).

Lastly, a caveat is in place. Goldberg (1991: 371) provides some examples that apparently contain two overt result predicates, i.e., an AP and a PP, contra the current proposal.

(25) a. He pounded the dough flat into a pancake-like state.
   b. The liquid froze solid into a crusty mass.

It is important to note that in such examples the PPs do not actually denote a distinct result state than the one denoted by the AP. In other words, the PP in these cases is a property PP as it denotes a change of state—not a change of location—that is a further specification of the change of state denoted by the AP. More importantly, however, remember that I have proposed that little v can only select for one complement, and in these cases, the property PPs do not appear to be complements, but rather adjuncts, evidenced by the ordering restriction they display (further see Matushansky et al., 2012).

(26) a. *He pounded the dough into a pancake-like state flat.
   b. *The liquid froze into a crusty mass solid.

In other words, in these cases, there is only one complement being selected for, namely the AP, and the property PPs are adjuncts that denote a result state that is a further specification of the change of state denoted by the APs, as illustrated below.

(27) He pounded the dough flat into a pancake-like state.
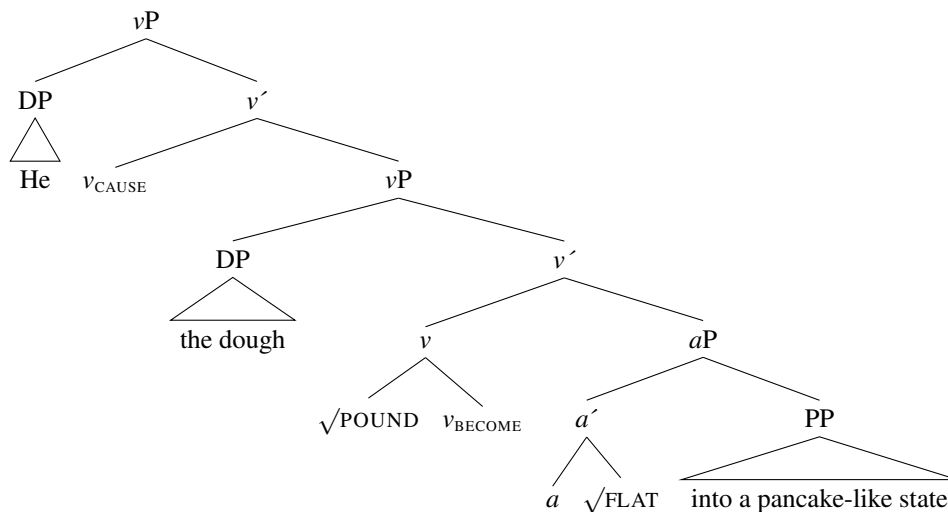
In short, the present account does not predict that such examples are not possible, since the PP—a property PP, not a path PP—is an adjunct denoting a result state that further specifies the result state denoted by the complement, i.e., the AP.

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[6] This fact is left unexplained in analyses that assume that roots do not have semantic content that is grammatically relevant (e.g., Borer 2003, 2005; Mateu & Acedo-Matellán 2012).

4. Conclusion

In the present paper, I have proposed that there is a (syntactic) restriction on the architecture of event structure, namely structurally there can only be one overt result predicate per event structure. I have argued that this is due to the fact that little *v* can only select for one predicate denoting a result state as its complement. In other words, I have proposed that little *v* can select for a predicate denoting a change of state (e.g., an AP) or a change of location (e.g., a path PP), but never both in the same event structure.

In addition, I have shown that semantically there can be two result states simultaneously predicated of the same entity, namely when result verbs combine with result phrases that denote a distinct result state than the one encoded by the verb. In these cases, I have proposed that the roots of result verbs merge as modifiers to *v*, as they describe the manner that brings about the result state, which is denoted by a result phrase.

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