

Manner/Result Complementarity and the Limits of Event Structure

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1 Introduction

- Since the days of Generative Semantics, event decompositions have been central to theories of verb meaning. On this approach a (sense of a) verb is a pairing of a morphological root and an event structure qua a frame or AVM, built up recursively from two types of primitives (Rappaport Hovav and Levin 1998):

- (1) a. Universal event types relating individuals, events, and states into “event templates”:
 - i. [x BE < root >]
 - iii. [x BECOME < root >]
 - ii. [x ACT_{<root>} (y)]
 - iv. [ϕ CAUSE ψ]
- b. Lexical semantic “roots” naming real world actions (jogging) and states (hungry, dead) that fill out the template and distinguish verbs with the same template.
- (2) a. *hunger*, [x BE < hungry >] (stative)
- b. *jog*, [x ACT_{<jogging>}] (unergative)
- c. *die*, [x BECOME < dead >] (unaccusative)
- d. *kill*, [[x ACT] CAUSE [y BECOME < dead >]] (causative)

- The key idea is that (the structure of) event templates are linguistically significant, determining syntactic, morphological, and modificational behavior, and can be identified by these.
- Roots are identified by the specific verbal morpheme, and are grammatically insignificant — *break* and *open* do not differ in grammatical behavior, but will from *run* or *jog*.
- Such theories should in principle also predict (im)possible verbs (Dowty 1979).

#1 Constraints on (im)possible event structures predict in turn (im)possible verbs.

- (3) *John glumped Mary. *[[x BECOME < dead >] CAUSE [y BECOME < dead >]]

#2 Constraints on (im)possible root meanings — e.g. limits on numbers or types of truth conditional content they can have — likewise predict (im)possible verbs.

- In this vein, Rappaport Hovav and Levin (2010) (RHL) have argued that verbs fall into two broad classes: manner (4a) and result (4b) (a tacit assumption in other work as well).

- (4) a. **Manner verbs:** *blink, jog, run, yell, scrub, sweep, wipe, etc.*
- b. **Result verbs:** *break, clean, destroy, dim, shatter, etc.*

- RHL (p. 24) claim that no verb encodes both — the manner in which something comes to be broken is unspecified for *break*-type verbs, while the result is unspecified for *run*-type verbs.
- This follows from how event structures are built: a verb has (i) exactly one root that (ii) can either modify an ACT predicate (2a) or be an argument of a BECOME (2b,c), ruling out (5).

- (5) [[x ACT_{<root₍₁₎>}] CAUSE [x BECOME < root₍₂₎ >]]

- Thus roots either name events or name states, and there’s only one per monomorphemic word (cp. resultatives *sweep clean* with two roots but also two morphemes).
- This supposed distinction has broad implications for work in verb classes and typology (see e.g. Beavers et al. 2010 on its relation to the motion typology of Leonard Talmy 2000).
- However, the complementarity claim is not so simple (Beavers and Koontz-Garboden 2012).

#1 When asked as a question of denotation — i.e. how many types of truth conditions (lexical entailments; Dowty 1991) a verb can encode — there is evidence *against* complementarity.

- I argue that certain verbs — in particular manner of killing verbs (Krohn 2008) — encode both meaning components at once, an argument I make based on various tests for identifying manner and result in canonical manner and result verbs.

(6) **Manner of killing verbs:** *crucify, drown, hang, guillotine, electrocute*

- This means at its core there is no complementarity, at least not truth conditionally.

#2 However, can a single verb simultaneously have manner and result roots *at event structure*?

- Surprisingly, the answer is no: there *is* a complementarity. However, the evidence for this must come from how meanings are derived syntactically, and I look in particular at the behavior of scopal operators (Dowty 1979, von Stechow 1995, 1996, Marantz 2007).

∴ The resolution is that there is only a single root, but it must be of the third logically possible class of *manner+result roots*, giving us limited event structures, but a rich set of meanings.

There may be no categorical constraints against possible verbal semantics, although there may be categorical constraints against possible grammatical behavior of verbs.

- I look first at the truth conditional claim and then the event structural claim. I then turn to other possible constraints on verb meaning. Despite the diminished predictive power, event structural approaches do have linguistic motivation, and even tendencies can be significant.

2 Result meanings and manner of killing verbs

- I first establish what is meant by a “result verb”, and here I follow RHL, who argue that verbs lexicalizing a result are specifically those verbs that

“[denote] events of scalar change . . . where a scale is a set of degrees—points or intervals indicating measurement values—on a particular dimension (e.g., height, temperature, cost), with an associated ordering relation” (RHL, 8)

- There two broad categories of scalar change (Kennedy and McNally 2005: 346-347):

- (7) a. *Gradable*: The soup warmed \approx the degree of warmth of the soup increased.
 b. *Non-gradable*: John died \approx John went from state \neg dead to state dead

- I consider several scalar change tests, and show that manner of killing verbs encode it.

2.1 Result diagnostic #1: Contradiction

- Encoding a result should generate some general non-cancelable inference as such. *Something [some observable property] is different about x* covers property change (Beavers 2011b):

- (8) a. #Bob just broke/shattered/destroyed my stereo_i, but nothing is different about it_i.
b. Bob_i just yelled/wiped the table_j, but nothing is different about him_i/it_j.

- By this diagnostic, manner of killing verbs pattern with result verbs:

- (9) #Bob just drowned/hanged/crucified Joe, but nothing is different about him.

2.2 Result diagnostic #2: Restricted resultatives

- Result verbs should be limited in their occurrence in resultative constructions, which also encode scalar change (Wechsler 2005, Beavers 2008), wherein only compatible verb+result combinations are possible, unlike manner verbs (Rappaport Hovav 2008: 22).

- (10) a. Cinderella scrubbed the floor clean/shiny/bare.

- b. Cinderella scrubbed her knees sore/the dirt off the floor.

- (11) a. Then the biologists dimmed the room to the level of starlight... (www.findarticles.com/p/articles/mi_m1134/is_2_112/ai_98254950)

- b. # We dimmed the room cold/empty. (Rappaport Hovav 2008: 22-23)

- Manner of killing verbs again pattern like scalar change verbs:

- (12) a. Faulty ground wires in a building electrocuted him to death in 2004. (buzz.yahoo.com/article/1:y_news:31f4c8213ef1e2e4e5ae60d75a00b97f)

- b. #Kim drowned Sandy blue/crucified her arms sore.

∴ So far the diagnostics indicate that manner of killing verbs encode a result. But which? for many speakers the result is death, though it may be one that leads to death (being hung up, attached to a cross, etc.). In either case, there's still a result (except maybe *electrocute*).

3 Manner encoding and manner of killing verbs

- Manner is a notoriously slippery category to define. RHL (p.32) take perhaps the first truly insightful stab at it, defining manner as non-scalar (non-measurable) change:

“A nonscalar change is any change that cannot be characterized in terms of an ordered set of values of a single attribute ... The vast majority of nonscalar changes ... involve complex changes—that is a combination of multiple changes—and this complexity means that there is no single, privileged scale of change”

- Thus manner is a complex sequence of (perhaps temporary) changes that define an action, such as the movement of arms and legs during running. I develop several diagnostics here.

3.1 Manner diagnostic #1: Subject selectional restrictions

- At least among transitives, if a verb encodes manner, those constraints will (likely) fall on the subject, limiting which subject DPs are possible (see Guerssel et al. 1985, Koontz-Garboden 2009 on causative/inchoative alternations). This will not be true for result verbs.

(13) a. John broke the vase with a hammer.

b. The hammer/the earthquake broke the vase.

(14) a. John wiped the floor with a wet rag.

b. #The wet rag/the earthquake wiped the table. (on intended reading)

- Manner of killing verbs seem to pattern with proper manner verbs:

(15) a. Wyatt hanged/crucified the outlaw with sailing rope.

b. #Sailing rope hanged/crucified the outlaw.

c. #The wind hanged/crucified the outlaw (by opening the trap door/raising his cross).

3.2 Manner diagnostic #2: Contradiction

- Manner should derive some positive, non-cancelable inference. Manner is heterogeneous, so to prove there exist manner+result verbs I focus on just one type, bodily movement.
- *x didn't move a muscle* is contradictory with some manner verbs, but not with result verbs, in appropriate contexts where (a) the subject has causal responsibility but (b) negligently fails to act (e.g. Talmy's 2000: 420-421 "extended letting"; see also Wolff et al. 2010).

(16) a. #Kim ran/jogged/scrubbed the floor, but didn't move a muscle.

b. Kim destroyed his car, but didn't move a muscle — rather, after he bought it he let it sit on his front lawn on cinder blocks until it disintegrated.

c. Kim broke my DVD player, but didn't move a muscle — rather, when I let her borrow it a disc was spinning in it, and she just let it run until the rotor gave out!

- Manner of killing verbs pattern like manner verbs, and negligence context cannot save them, e.g. Rick Perry (the individual, not as a metonymic stand in for the state government) may have responsibility here, but this cannot be described by these verbs.

(17) a. #Rick Perry electrocuted/crucified the prisoner, but didn't move a muscle — rather, after taking office he failed to issue a pardon!

b. #Rick Perry drowned/hanged the prisoner, but didn't move a muscle — rather, during the execution he just sat there, tacitly refusing to order a halt!

3.3 Summary

- Putting it all together, manner of killing verbs encode both manner and result, thereby counterexemplifying complementarity as a truth conditional fact. We believe the same to be true for ballistic motion ditransitives (e.g. *toss*, *hurl*) and cooking verbs (e.g. *braise*, *poach*).
- However, this is about denotation. Asking the question another way gives another answer.

4 Manner/result complementarity and the architecture of event structure

4.1 RHL's analysis and the question of assumptions

- I first revisit RHL's more theoretical claim, which relies on two assumptions:
 - (i) A lexeme has only a single root. (an implicit assumption)
 $*[x \text{ ACT}_{\langle \text{root}_1 \rangle} [\text{CAUSE} [y \text{ BECOME} \langle \text{root}_2 \rangle]]$
 - (ii) A root either encodes manner or result, but not both (Lexicalization Constraint, p.25):
 $*[x \text{ ACT}_{\langle \text{root} \rangle} [\text{CAUSE} [y \text{ BECOME} \langle \text{root} \rangle]]$
- This rules out one verb with both manner and result meanings. Given that such verbs exist, at least one of these assumptions *must* be false. I argue that (i) is true, (ii) false.
- Assumption (i) is not a truth conditional claim; it is about decompositional structure, standardly motivated by possible readings of scopal modifiers, which are sensitive to bracketing either lexically (Dowty 1979) or syntactically (von Stechow 1996):

- (18) a. Kim opened the door again, and this had happened before. (repetitive 1)
 $\text{again}([[x \text{ ACT}] \text{CAUSE} [y \text{ BECOME} \langle \text{open} \rangle]])$
- b. Kim opened the door again, and this had happened before. (repetitive 2)
 $[[x \text{ ACT}] \text{CAUSE} \text{again}([y \text{ BECOME} \langle \text{open} \rangle])]$
- c. Kim opened the door again, and it had been open before. (restitutive)
 $[[x \text{ ACT}] \text{CAUSE} [y \text{ BECOME} \langle \text{again}(\text{open}) \rangle]]$

- Roots are scopal units; *clean the table again* means all clean. Assume (19b) for restitutive:
 - (19) a. $\text{open} = \lambda x \lambda e_1 [\text{open}'(x, e_1)]$ ($e' \ll e = e'$ precedes e)
 - b. $\text{again} = \lambda P \lambda x \lambda e_1 [P(x, e_1) \wedge \exists e_1' [e_1' \ll e_1 \wedge P(x, e_1')]]$
 - c. $\text{again}(\text{open}) = \lambda x \lambda e_1 [\text{open}'(x, e_1) \wedge \exists e_1' [e_1' \ll e_1 \wedge \text{open}'(x, e_1')]]$
- I consider whether it is more likely for (i) or (ii) to be false.

4.2 Manner+result verbs as “lexical resultatives”

- Suppose that manner of killing verbs have event structures with separate manner and result roots, i.e. assumption (i) is invalid (maybe maintaining (ii)). They would be like resultatives.

- (20) a. *guillotine*, $[[x \text{ ACT}_{\langle \text{guillotining} \rangle}] \text{CAUSE} [y \text{ BECOME} \langle \text{dead} \rangle]]$
 b. *hammer flat*, $[[x \text{ ACT}_{\langle \text{hammering} \rangle}] \text{CAUSE} [y \text{ BECOME} \langle \text{flat} \rangle]]$

- But resultatives have interesting property: *again* can yield restitutive readings, scoping between the roots (Beck and Snyder 2001: 56-57, Beck and Johnson 2004: 108-110).

- (21) A sheet of metal is made flat but later gets bent. John hammers it flat again.
 $[[x \text{ ACT}_{\langle \text{hammering} \rangle}] \text{CAUSE} [y \text{ BECOME} \langle \text{again}(\text{flat}) \rangle]]$

- If manner of killing verbs are “lexical resultatives”, they should have the same behavior.
- Admittedly, it is difficult to envision restitutive killing, but imagine a zombie or a video game context where creatures can die repeatedly. Crucially, (22) do not allow restitutive readings:

- (22) a. John drowned the zombie again (#and last time it was with a chainsaw).
 b. The sheriff hanged the zombie again (#and last time he beheaded him).

- The *only* reading is that *again* scopes over both manner *and* result — a repetitive reading.
- However, *again* is known to have purely repetitive uses (e.g. *John again opened the door*, though not usually sentence finally). Perhaps manner of killing verbs only permit this *again*?
- Scopal *re-* always has a restitutive reading, suggesting it always scopes low (and the repetitive reading is derived pragmatically; Dowty 1979, Wechsler 1989, Marantz 2007, 2009).

(23) Kim reopened the door, and it had been open/opened before.
 [[x ACT] CAUSE [y BECOME < again(open) >]]

- Crucially, *reguillotine/redrown* means exactly what *guillotine/drown again* do:

(24) I reguillotined/redrowned the zombie.

- Now we need a lot more stipulation. A simpler analysis is to drop assumption (i).

4.3 Manner+result verbs via complex manner+result roots in result position

- Conversely, these fact is easily accommodated if we maintain (i) we abandon claim (ii), allowing a root to have a meaning indicating death caused by a particular process:

(25) a. *guillotine*, [[x ACT] CAUSE [y BECOME < guillotine >]]
 b. *guillotine* =
 $\lambda x \lambda e_1 [dead'(x, e_1) \wedge \exists e_2 [cause'(e_2, e_1)] \wedge \forall e_3 [cause'(e_3, e_1) \rightarrow guillotining'(e_3)]]$

- Restitutive *again* gives a reading where death and a root-named process occurred before:

(26) a. [[x ACT] CAUSE [y BECOME < again(guillotine) >]]
 b. *again(guillotine)* = $\lambda x \lambda e_1 [[dead'(x, e_1) \wedge \exists e_2 [cause'(e_2, e_1)] \wedge \forall e_3 [cause'(e_3, e_1) \rightarrow guillotining'(e_3)]] \wedge \exists e_1' [e_1' \ll e_1 \wedge [dead'(x, e_1') \wedge \exists e_2' [cause'(e_2', e_1')] \wedge \forall e_3' [cause'(e_3', e_1') \rightarrow guillotining'(e_3')]]]]]$

- Is there independent evidence for such roots? Koontz-Garboden (2005, 2010a) (see Dixon 1982) distinguishes “property concept” (*red, cool*) from “caused result” roots (*thaw, melt*):

(27)	Property Concept	Caused Result
Lexical category	Adj	V
Stative entails change	No	Yes

- As Rappaport Hovav (2011) notes, caused result roots also disallow true restitutive readings:

(28) a. John thawed the meat again. (necessarily two ‘defrostings’)
 b. John melted the soup again. (necessarily two ‘defrostings’)

- If, as Koontz-Garboden (2011) argues, caused result verbs have denotations like (29), the necessarily repetitive reading follows exactly as with *guillotine* in (26).

(29) *thaw* := $\lambda x \lambda e_1 [thawed'(x, e_1) \wedge \exists e_2 [cause'(e_2, e_1)]]$.

- Manner of killing verbs are caused result roots (e.g. no basic adjective, the stative form entails change as with *John was guillotined*). The difference is manner of killing verbs are the subset whose result is death (or similar) and that entail not just cause but manner as well.

4.4 Manner+result verbs via complex manner+result roots in manner position

- Thus far manner+result verbs have event structures of result verbs, but a root with additional, manner-based content. Is it possible for manner+result verbs to be basically manner verbs?
- One case are ballistic motion verbs (e.g. *throw, hurl, flip, toss*), which encode a manner (type of ballistic release) (30a) and a result (the agent loses the theme) (30b) (Beavers 2011a).

- (30) John threw/flipped/tossed the ball (to Sandy)... (to frame)
 John threw/flipped/tossed Sandy the ball... (double object frame)
- a. #but he didn't move a muscle — rather he just sat there next to the ball machine he was in charge of and let it do all the work.
- b. #but it is still in his hand.

- Additionally, the double object construction has some meaning wherein the indirect object must be able to possess the theme (although this is cancellable). That this is only in one argument frame suggests it comes from the template, not the root (cp. *bequeath*).

- (31) a. John threw the ball to London.
 b. #John threw London the ball. (possible possession from construction)

- (32) a. #John bequeathed some money to London.
 b. #John bequeathed London some money. (possible possession from root)

- As Beck and Johnson (2004: 113-116) discuss, these verbs allow purely restitutive readings whereby the recipient must have had the theme at some prior event:

- (33) a. John threw Sandy the ball again.
 b. John flipped Sandy the can again.
 c. John tossed Sandy the packet of peanuts again.

- Excluded from scope of *again* are the released and the manner of release. The scope facts follow if ballistic motion verbs have event structures with (possible) possession outside the root, and the root encoding manner and releasing, in manner position:

- (34) a. *throw*, [[x ACT_{<throwing>} z] CAUSE ◇ [y HAVE z]]
 b. [[x ACT_{<throwing>} z] CAUSE ◇ again([y HAVE z])]

4.5 Summary

- A “lexical resultative” analysis requires additional stipulations about scope. A “complex root meaning” analysis requires no such stipulations, save that manner+result roots exist.
- But this is expected: we know roots can encode manner and that they can encode result. The null hypothesis is that they can also encode both; ruling this out would be a stipulation.

(35)

	-manner	+manner
-result	N/A	<i>run, jog, swim</i>
+result	<i>break, shatter, die</i>	<i>electrocute, hang, crucify</i>

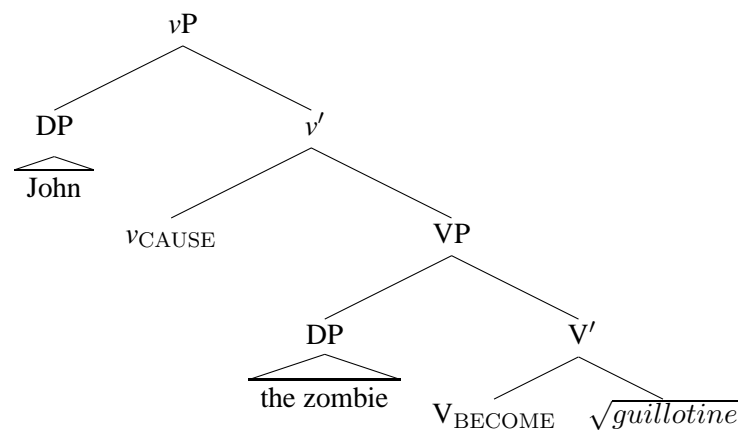
- All expected event structures are attested (the two exceptions due to sortal constraints):

(36)

root	manner position	result position
-manner, +result	N/A	yes
+manner, -result	yes	N/A
+manner, +result	yes	yes

- Again, ruling anything out would require stipulations. This is the null hypothesis.
- The only stipulation is the prohibition against “lexical resultatives,” for which I have no explanation. One explanation *might* come from approaches that assume event structures are syntactic objects and that lexical semantic roots are morphological roots.

(37)



- In that case there are as many semantic roots as morphological roots, one (definitionally) in the case of monomorphemic verbs, though this depends on how your morphology is done.

5 Other Constraints on root meaning?

- So we have no prohibition against encoding manner and result simultaneously. Are there *any* constraints on root meanings that might predict (im)possible verbs?
- Dowty (1979: 125-129) addresses this, and does propose a few tentative possibilities that I ultimately do not think pan out (I translate these into the terminology used here):
 - **No result root will describe values along different scales simultaneously** - Manner roots seem to encode exactly this. Among result roots Beavers (2011a: 27-30) argues that the ditransitive root for *hand* requires concurrent change-of-possession and change-of-location, i.e. non-reducible possession and position scales.
 - **No root will encode discontinuous scalar values** - Tricky if scales can be constructed on the fly (e.g. *The image on the screen grew* can be an instantaneous jump). Scales may thus be partial rather than total orderings.
 - **No root will encode different states at different times, i.e. there is no *grue* (green until time *t* and blue afterwards)** - Arguably caused result roots do this; also what about *doom* ‘fine now but guaranteed to be screwed later’?
- These might be tendencies due to simplicity and pragmatics, but not constraints.

- Another proposal is that template-type meanings like cause and change are excluded from roots, limiting possible readings in basic lexicalizations (Embick’s 2009 “Bifurcation Thesis for Roots” or Arad’s 2005 “Root Hypothesis”; see also Borer 2005):

(38) *John glimps/is glimps. [x BE < dead-by-wolf-attack >]

- The data from caused result, manner-of-killing, and ballistic motion roots effectively demonstrates that this is also not true: all encode causation and thereby also explicit change (see also Koontz-Garboden 2010b on caused result roots and Beavers 2011c on ditransitives).
 - If roots can encode templatic meaning, do we need templates? Beavers (2011c) argues yes.
- #1 Crucially, only templates actually define the combinatorics, i.e. scopal positions for roots. Although some roots encoded both manner and result, these could not be separated by *again*.
- #2 Similarly, argument realization seems to be sensitive to templatic semantics, but not necessarily the same semantics when encoded by a root.
- For example, in possessive constructions — which encode templatic HAVE semantics — realize possessors more prominently than possessees (Barss and Lasnik 1986, Harley 2003):

(39) a. John sent every_i recipient his_i royalty check.
 b. *John sent its_i recipient every_i royalty check.

- Roots that encode HAVE meaning do not require this c-command asymmetry:

(40) a. John bequeathed every_i inheritance to its_i beneficiary.
 b. *John bequeathed his_i inheritance to every_i beneficiary.

- So we do need a root/template contrast, even if roots can mean anything.

6 Concluding Remarks

- In general, it seems there are no obvious constraints on what a lexical semantic root can encode — certainly no prohibition against encoding a manner and a result at the same time.
- In essence, this is the null hypothesis, but it weakens the predictive power of decompositional theories regarding impossible verbs.
- However, there may be a tendencies dispreferring certain meanings, arising from pragmatic factors and functional pressures.
- Consider again manner/result complementarity: it could be that the optimal way to express manner+result combinations in general is to lexicalize separate manner and result roots and supply a combinatoric process (resultative constructions).
- This would reduce lexicalization in favor of some combinatorics. But in some areas where some manner+result combinations are frequent — killing, cooking, and getting rid of — it is more economical to just lexicalize a root that does it all.
- Manner/result complementarity is a default, with manner+result arising in certain contexts.

- Thus complementarity does not hold categorically, but it may as a tendency, which does not hamper its consequences, e.g. Beavers et al. (2010) attempt to tie Talmy’s (2000) typology to manner/result complementarity, but also note that Talmy’s typology is *tendency* anyway (e.g. Zlatev and Yangklang 2004 suggest that Thai has a manner+path verbs).
- Similarly, I would not be surprised to see some of Dowty’s constraints as defaults for pragmatic reasons — how useful would a verb encoding both, say, change in cost and color simultaneously?
- Nonetheless, there may be no categorical constraints on what a word can mean. However, we have identified one “impossible” verb: “lexical resultatives” with specific scopal properties.

<p>Event structures may not derive (im)possible verb meanings truth conditionally, but may derive verb meanings with (im)possible combinatoric properties.</p>
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- Key in this is sharpening the relevant questions to make clear what the predictions are, and distinguishing between what a word means and how that meaning is represented.

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