Reflections on Manner/Result Complementarity

Malka Rappaport Hovav
The Hebrew University of Jerusalem

Beth Levin
Stanford University

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Nonstative verbs from various lexical fields are often classified as either manner or result verbs—a distinction implicated in language acquisition (Behrend 1990, Gentner 1978, Gropen et al. 1991), as well as in argument realization. Intuitively speaking, manner verbs specify as part of their meaning a manner of carrying out an action, while result verbs specify the coming about of a result state. Verbs of each type are listed in (1). As the lists illustrate, the manner/result distinction crosscuts the transitive/intransitive distinction.

(1) a. MANNER VERBS: nibble, rub, scribble, sweep, flutter, laugh, run, swim, ...

b. RESULT VERBS: clean, cover, empty, fill, freeze, kill, melt, open, arrive, die, enter, faint, ...

The distinction is grammatically relevant, as manner and result verbs differ in the patterns of argument realization they display (Fillmore 1970, Rappaport Hovav and Levin 1998, 2005, despite questions raised by Goldberg 2001 and Mittwoch 2005). For example, while manner verbs are found with unspecified and nonsubcategorized objects in nonmodal, nonhabitual sentences, result verbs are not.

(2) a. Kim scrubbed all morning.

b. Kim scrubbed her fingers raw.

(3) a. *The toddler broke.

b. *The toddler broke his hands bloody.

A further indication of the grammatical relevance of this distinction comes from an observation made in Levin and Rappaport Hovav (1991, 1995) that manner and result are often in complementary distribution: that is, a given verb tends to be classified as a manner verb or as a result verb, but not both. This generalization presupposes a distinction between what a verb LEXICALIZES—i.e. what it lexically

encodes as part of its meaning—and what can be inferred from a particular use of that verb in context. For instance, though the verbs in (1a) lexicalize manners, some of them denote events that are often associated with prototypical results. So while *wipe* and *scrub* lexically specify manners involving surface contact and motion, these actions are typically used with the intention of removing stuff from a surface, and in particular contexts, this removal will be strongly implicated; however, since it can be explicitly denied, it is not lexically encoded—or lexicalized—-in the verb.

(4) a. I just wiped/scrubbed the counter; it hasn't been so clean in days.

b. I wiped the table, but none of the fingerprints came off.

c. I scrubbed the tub for hours, but it didn't get any cleaner.

Likewise, the result verbs *clean* and *clear* encode states that often (but not always) result from actions normally carried out to remove stuff from a surface or container. In a particular context, a specific action will be strongly implicated, as in (5a), but again no particular action is lexically specified, as shown by the possibility of providing various continuations explicitly specifying the action involved, as in (5b).

(5) a. I cleaned the tub; as usual, I used a brush and scouring powder.

b. I cleaned the tub by wiping it with a sponge/by scrubbing it with steel wool/by pouring bleach on it/by saying a magic chant.

When a verb lexically specifies either manner or result, the other component can be expressed outside the verb, as in (6).

(6) a. Pat wiped the table clean.

b. Pat cleaned the tub by scrubbing it with steel wool.

Lexicalized components of meaning can be considered lexical entailments in the sense of Dowty (1991), often involving what Dowty (1989) calls individual thematic roles. The notions of manner and result are generalizations over particular kinds of individual thematic roles. If they are grammatically relevant, they can be considered what Dowty (1989) calls L-thematic roles. In order to distinguish lexicalized meaning from inferences derived from particular uses of verbs in sentences, we take lexicalized meaning to be those components of meaning that are entailed in all uses of (a single sense of) a verb, regardless of context.[1]

[1]We assume each verb we treat has a single sense, unless there is strong evidence for positing polysemy. As we discuss in work in progress (Rappaport Hovav and Levin 2007; see also section

This paper focuses on the observed complementarity of manner and result and examines two issues which arise in this context. First, we ask whether the complementarity reflects an actual constraint on the meanings that can be lexicalized in verbs, and if so, what the nature of the constraint is. In section 2, we propose that manner/result complementarity does reflect a real constraint which arises from the way in which lexicalized meanings are related to event schemas. In section 5, we suggest that, properly understood, the constraint regulates how much meaning can be lexicalized in a verb. The second issue concerns the precise characterization of the lexicalized meaning components. Previously, these notions have only been identified intuitively; however, any attempt to understand the relation between the classification of verbs as manner and result and their grammatical behavior must begin with an understanding of the semantic basis of the classification itself. As a prerequisite to validating the complementarity hypothesis, then, we devote sections 3 and 4 to a precise characterization of the notions of manner and result. With this preamble, we begin in the next section by elucidating the representations of verb meaning that we assume.

1 Roots and event schemas

Following much current work, (e.g., Borer 2005, Goldberg 1995, Hale and Keyser 2002, Jackendoff 1990, Marantz 1997, Pesetsky 1995, Pinker 1989, Rappaport Hovav and Levin 1998), we adopt the distinction between an idiosyncratic component of verb meaning, often called the "root", and a structural component representing an event type, which we refer to as an "event schema". There is a limited inventory of event schemas, representing the types of events available for linguistic encoding.

Each root has an ontological categorization, chosen from a fixed set of types, including state, result state, thing, stuff, surface/container, manner, instrument (cf. Jackendoff 1990, Rappaport Hovav and Levin 1998).[2] A root's ontological categoriza-

7), a handful of result verbs show the behavior of manner verbs in restricted circumstances, and concomitantly no longer lexically entail a result; similarly a few manner verbs behave like result verbs in certain contexts, in this instance no longer lexically entailing a manner. We take such verbs to be polysemous since there is no element of meaning which is constant in all contexts; however, a wide range of data can be handled without assuming polysemy.

[2]We assume that a given root can only have a single ontological categorization despite the existence of a handful of apparently polysemous denominal verbs such as *string*. Such verbs take their names from artifacts with multiple functions. A string can be conceptualized either as stuff (e.g., *string a guitar*) or as a one-dimensional location (a surface in an extended sense; e.g., *string pearls*). Without committing ourselves to a complete analysis of such verbs, we suggest that the different functions of string and comparable artifacts would lead to distinct ontological categorizations, with only one being relevant in a given use of the verb. See Clark and Clark (1979) for discussion of the factors which give rise to denominal verbs such as *string*.

tion determines its association with an event schema.

Rappaport Hovav and Levin (1998:109) formulate "canonical realization rules", as in (7)-(11), to express the ways in which the ontological category of the root determines its integration into an event schema. Sample canonical realization rules are given below; the right-hand side of each rule provides a possible predicate decomposition instantiation of the event schema associated with a root whose ontological category is specified in the left-hand side of the rule.[3]

(7) manner → [x ACT$_{<MANNER>}$]
(e.g., *jog, run, creak, whistle, ...*)

(8) instrument → [x ACT$_{<INSTRUMENT>}$]
(e.g., *brush, hammer, saw, shovel, ...*)

(9) container → [x CAUSE [y BECOME AT <*CONTAINER*>]]
(e.g., *bag, box, cage, crate, garage, pocket, ...*)

prerna: Note that this is the scheme for a location verb

(10) internally caused state → [x <*STATE*>]
(e.g., *bloom, blossom, decay, flower, rot, rust, sprout, ...*)

(11) externally caused, i.e. result, state →
[[x ACT] CAUSE [y BECOME <*RESULT-STATE*>]]
(e.g., *break, dry, harden, melt, open, ...*)[4]

Roots are integrated into event schemas as arguments (e.g., (9)-(11)) or modifiers (e.g., (7)-(8)) of predicates in the event schemas. Roots are italicized and in angle brackets; they are notated via subscripts when functioning as modifiers. We do not necessarily take these associations to be steps in a derivation; rather, they express regularities which need to be captured.

With this background, we ask how best to formulate the constraint against lexicalizing both manner and result. Grimshaw (2005:85), in answer to the question "How complicated can a verb meaning be?", suggests that there are no constraints on what is lexicalized in a root:

[3]For the purposes of investigating manner/result complementarity, the specific type of predicate decomposition representation does not matter. The representations could be recast along neo-Davidsonian lines, as in Rothstein (2004), or as minimalist syntactic structures, as in Borer (2005), Embick (2004), Ramchand (in press), and Zubizarreta and Oh (2007).

[4]Change of state verbs are typically differentiated via their associated state, as this canonical realization rule suggests; however, considerable recent work on the semantics of gradable adjectives and change of state verbs suggests that this picture needs refinement; see section 4.1. Decompositions such as (11) must then be modified accordingly, perhaps as in Kennedy and Levin (2008).

> On the one hand, it seems that the answer is: as complicated as you want. For example, suppose there is a manufacturing process that involves pulverizing something, then mixing it with molten plastic, allowing it to harden and then encasing it in steel. Of course, we can label the entire process with one verb: to *smolt*, for example.

Grimshaw goes on, however, to propose that there are constraints on the complexity of verb meaning, suggesting that the unlimited complexity in meaning she refers to is confined to the root, with the event schema "rigidly constrained." She continues the quote above, "however, looked at from a different perspective, such a verb [i.e. *smolt*] is semantically no more complex than any other: it is either a causative or an activity predicate" (2005:85).

Manner/result complementarity, however, involves the root. Therefore, we rephrase our question: Are there constraints on what can be lexicalized in a verb root? Our key claim is that there is a constraint on how roots can be associated with event schemas, which in turn constrains the meaning that a root can lexicalize.

2 The lexicalization constraint

There is a generalization implicit in the canonical realization rules in (7)-(11), which leads us to formulate a lexicalization constraint.

(12) The lexicalization constraint: A root can only be associated with one primitive predicate in an event schema, as either an argument or a modifier.[5]

This constraint is similar in spirit to the constraint with the same name in (13) proposed by Kiparsky (1997) in a study of denominal verbs, in that semantic roles are often taken to be labels for positions in an event schema (Jackendoff 1972).

(13) The lexicalization constraint: A verb can inherently express at most one semantic role (theme, instrument, direction, manner, path ...). (Kiparsky 1997: 30)

Assuming the event schemas of (7)-(11), and assuming that manner roots modify the predicate ACT and result roots are arguments of BECOME, a root can modify

[5] Ramchand (in press) argues that a single root may be attached to multiple positions in an event structure; therefore, if our formulation of this constraint is justified, some adjustment to her theory may be needed.

ACT or be an argument of BECOME in a given event schema. A root cannot modify both these predicates at once without violating the lexicalization constraint. Thus, there can be no root which expresses both manner and result, and manner/result complementarity follows.

The lexicalization constraint is precisely that: a constraint on material that is lexicalized—whether as a word, a stem, or an affix. In English, most words are morphologically simple as there is no developed notion of stem; thus, manner/result complementarity is manifested in words. In contrast, in languages in which verbs are productively formed from stems and affixes, manner/result complementarity holds of the pieces of words, rather than the words themselves. In such a language verbs can combine manner and result meanings, if each is expressed in a distinct part of a word. Precisely this is observed in so-called bipartite verb languages, such as Lakhota (Foley and Van Valin 1984:40-45, based on Boas and Deloria 1939) and Washo (Jacobsen 1980:91). In Lakhota many verb stems describe states which are permanent results of actions, such as *–blečha* 'be shattered (said of brittle material)' or *–blaza* 'be ripped open', while there is a set of prefixes which describe manner or means, such as *ya–* 'with the mouth', *na–* 'with the foot or leg', or *wa–* 'by a sawing motion, with a knife'. Prefixes and stems combine to form verbs, as in *yablečha* 'break or cut with the teeth' or *nablečha* 'break by kicking or stepping on'.

However, for the lexicalization constraint to have real empirical content, the criteria which determine whether a root's type is manner or result must be made explicit.

3 Refining the notions of manner and result

We turn next to the question of what semantic, lexically encoded notion of result is relevant to manner/result complementarity. An obvious move is to equate the notion of result with telicity, a notion which has been intensively investigated and has received careful semantic explication (e.g., Filip 2000, 2005, Hay, Kennedy, and Levin 1999, Krifka 1992, 1998, Rothstein 2004, Verkuyl 1993). Telicity is often said to involve a result state (e.g., Dowty 1979, based on Kenny 1963, Pustejovsky 1991), and some result verbs are necessarily telic. There is reason, however, to believe that the two notions should not be equated.

First, the relevant notion of result should be lexically encoded, yet as much recent work makes clear, telicity is lexically encoded only for a very small part of the English verb inventory (Kratzer 2004, Filip 2005, Filip and Rothstein 2006, Rappaport Hovav 2008); more often, telicity is compositionally determined (Filip and Rothstein 2006, Hay, Kennedy and Levin 1999, Kennedy and Levin 2008, Krifka

1998). More importantly, lexical telicity fails to appropriately distinguish manner and result verbs. Although the verbs that these studies reveal to be lexically telic are result verbs (e.g., *arrive, reach, die, crack, find*), many result verbs are not lexically telic. For example, degree achievements are result verbs (see section 4.1), yet show both telic and atelic uses, as shown in (14).

(14) a. The chemist cooled the solution for three minutes.

b. The chemist cooled the solution in three minutes; it was now at the desired temperature.

Many current analyses of degree achievements (Filip 2008, Kennedy and Levin 2008, Rappaport Hovav 2008) consider neither the telic nor the atelic use basic. Moreover, some instances of telicity cannot be analyzed in terms of a result state since verbs such as *read* and *peruse* have telic uses that do not involve an obvious result state (Levin and Rappaport Hovav 2005, Rappaport Hovav 2008).

In order to identify an alternative to telicity, we turn from the change of state domain, which has been our focus so far, to the motion domain, which shows a comparable complementarity of meaning components. Classifications of motion verbs in terms of the conflation—or lexicalization in our terms—of distinct semantic components (Talmy 1985, 2000) distinguish between verbs which conflate motion and path and verbs which conflate motion and manner. Inherently directed motion verbs such as *arrive, ascend*, and *enter* conflate motion and path. For example, *ascend* specifies a direction of motion (upward), but not the manner in which the motion is effected. In contrast, manner of motion verbs such as *amble, dance, jog, run*, and *swim* conflate motion and manner. For example, *amble* specifies a manner of motion (a slow, leisurely walk), but is neutral with respect to the direction of motion. Although Talmy does not state this explicitly, motion verbs appear to fall into either one class or the other, and this observation, therefore, suggests that there is a manner/direction complementarity akin to manner/result complementarity. In fact, Levin and Rappaport Hovav (1992) take directed motion verbs to be a type of result verb.

To better understand the notion of result, we examine what direction of motion has in common with result state. We identify a common semantic property that justifies subsuming both result state and direction of motion under the notion of result and distinguishing them both from manner.

4 Manner and result as scalar and nonscalar changes

Manner and result verbs are dynamic, and all dynamic verbs involve change (Dowty 1979). There is a fundamental distinction, however, between two types of change which are lexicalized by verbs: scalar and nonscalar changes (McClure 1994, Rappaport Hovav 2008). We suggest that all result roots specify scalar changes, while all manner roots specify nonscalar changes. These two types of change are in complementary distribution: a root may only lexicalize one type. This restriction holds even though we will show that both kinds of change may themselves be internally complex.

4.1 Scalar changes

Verbs denoting events of scalar change lexically specify a scale, 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 (Kennedy 2001, Kennedy and McNally 2005). The dimension represents an attribute of an argument of the verb, with the degrees indicating the possible values of this attribute. A scalar change in an entity involves a change in value of this attribute in a particular direction along the scale, with the direction specified by the ordering relation.

Both change of state verbs and directed motion verbs specify such changes, and we discuss each in turn. We illustrate scalar change in the change of state domain with the verbs *warm* and *cool*. Both are associated with a scale of values on the dimension of temperature (i.e. degree celsius or fahrenheit), but the ordering of these values differs. For *warm*, the values are in increasing order: a warming event necessarily involves an entity showing an increase in value along the dimension of temperature. For *cool*, the scale has the reverse ordering relation, so a cooling event involves a decrease in value along the dimension of temperature. Many change of state verbs, including *warm* and *cool*, are related to gradable adjectives, which are themselves also lexically associated with a scale; they do not lexicalize a notion of change, but simply a value that either exceeds or falls short of a standard value on the scale—which of the two is determined by the ordering relation. Thus, the adjective *warm* specifies a temperature value above some standard, often room temperature, while the adjective *cool* specifies a temperature that is below this standard.

If directed motion verbs denote events of scalar change, we need to identify the ingredients of scales in the motion domain. We suggest that the relevant attribute whose values make up the scale is the location of a theme with respect to a "ground"—a reference object. In the motion domain, the predicates which lexi-

calize such scalar attributes without a notion of change are prepositions like *above, below, far*, and *near*, which also locate a theme with respect to a ground (Jackendoff 1983, Talmy 1983, Vandeloise 1991). Thus, these prepositional predicates parallel those in the change of state domain, such as the adjectives *cool* and *warm*, which also lexicalize a scalar attribute without a notion of change. The points constituting the scale in the motion domain are a set of contiguous locations which together form a path. The scales of change of state and change of location are then parallel in the sense that being at a position on a path is comparable to having a particular value for a scalar attribute with change of state verbs, and movement along the path is comparable to a change in the value of an attribute.

In order for the lexicalized path to constitute a scale, its points must be ordered. English directed motion verbs fall into subtypes according to the way that the ordering relation is established. With one class of verbs, including *ascend, descend, fall*, and *rise*, direction of motion is fully lexicalized by the verb and is with or against an external natural force—generally, the pull of gravity. For example, with *descend* the points on the path are ordered in the direction of gravity, while with *ascend* they are ordered against it.[6] There are other verbs which do not fully lexicalize direction of motion; rather, it must be determined externally from some other constituent in the sentence or from the context. The direction of motion of the theme may be determined deictically with *come* and *go*—a class of verbs which apparently only has two members crosslinguistically. With these verbs, the points on the path are ordered according to whether they get closer to or further from the "deictic center", which is often determined by context. Alternatively, the direction is determined with respect to a reference object with verbs such as *advance, arrive, depart, enter, exit, leave, reach, recede*, and *return*. Depending on the meaning lexicalized by the individual verb, the points on the path are ordered according to whether they are closer to or further away from this object; compare *arrive* and *enter* to *leave* and *exit*. The motion domain, then, contrasts with the change of state domain, where the ordering of the points on the scale is always lexicalized by the verb.

On our account, verbs like *cross* and *traverse*, which are often included in lists of directed motion verbs, are not verbs of scalar change. Although they lexically specify motion along a path defined by a particular axis of the ground, the direction of motion along this path is not lexically specified and, hence, they do not impose an ordering on the points on the path. For instance, the verb *cross* is equally applicable whether a traversal of the English Channel is from England to France or from France

[6]The discussion in Levinson (2008) of motion verbs in Yélî Dnye suggests that the ordering relation for motion verbs can be determined by other culturally-relevant external natural forces. In Yélî Dnye *ghîî* 'go down' is also used for motion down a watercourse or with the prevailing ocean winds, while *kee* 'go up' is also used for motion up a watercourse or against the prevailing ocean winds. That is, the two verbs *ghîî* and *kee* are apparently generalized, respectively, to mean motion with or against some force.

to England.[7]

The idea that change of state verbs and directed motion verbs are alike in being scalar finds support in several parallels in their scale structure. Both types of verbs fall into two classes: those associated with two-point scales and those associated with multiple-point scales (Beavers 2008). Two-point scales only have two values as they are associated with attributes that basically encode having or not having a particular property. A change of state verb with an associated two-point scale is *crack* and a directed motion verb with such a scale is *arrive*. Verbs lexicalizing changes involving a two-point scale are true achievements; presumably, the transition from one value to the other is conceptualized as instantaneous (Beavers 2008). Multiple-point scales are associated with attributes which can have many values. Within the class of change of state verbs, verbs with multiple-point scales are called "degree achievement" or "gradual change" verbs, and, as mentioned, they are often derived from gradable adjectives. The comparable directed motion verbs describe gradual traversals of a path; they include *advance, descend, fall, recede*, and *rise*. Multiple-point scales fall into two types: those with bounds—closed scales—and those without bounds (unless overtly specified)—open scales. In the change of state domain, this property distinguishes verbs which lexicalize a closed scale, like *empty* and *flat*, from those which lexicalize an open scale, like *cool* and *lengthen* (Hay, Kennedy, and Levin 1999, Winter and Rotstein 2004). In the motion domain, this property distinguishes between verbs that lexicalize a bounded path, such as *come* and *return*, from those that lexicalize an unbounded path, such as *descend* and *rise*.[8]

The notion of scalar change as defined here is not equivalent to the notion of gradable change found in discussions of gradable modifiers. Verbs such as *arrive, reach*, and *crack*, which are associated with two-point scales, do not lexicalize gradable changes in this other sense (they do not take gradable modifiers). We argue, however, that there is reason to classify verbs lexicalizing two-point scales along with those lexicalizing multiple-point scales since both sets of verbs display the complementarity with manner. The notion of scalar change captures what they have in common.

Further support for subsuming change of state and directed motion under a sin-

[7]Nevertheless, *cross* and *traverse* are also not manner verbs. We hope to explore the consequences of this observation in the future, noting simply that it suggests a more refined verb classification is necessary. It is possible that various verb classes can be defined with respect to how much the properties of their members diverge from those characterizing a scalar change and, thus, a result verb. Unlike true directed motion verbs, *cross* and *traverse* only lexicalize a path, but not an ordering along this path, while true manner of motion verbs lexicalize neither; see section 4.2.

[8]There are further differences among these verbs which we leave aside. For example, *arrive* and *enter* both involve a two-point scale, but only with *arrive* is one of these points inside the boundary defined by the reference object.

gle notion of scalar change comes from parallels in telicity patterns between change of state and directed motion verbs. Only verbs associated with a two-point scale are necessarily telic, whether in the change of state domain or the directed motion domain (Filip 2008, Rappaport Hovav 2008). Other verbs of scalar change are not necessarily telic, though they tend to be, especially if the scale has a bound (Hay, Kennedy and Levin 1999, Kennedy and Levin 2008, Levin and Rappaport 1995).

We illustrate this point first with change of state verbs. The verbs in (15), which are necessarily telic, are associated with two-point scales, while those in (16), which show variable telicity, are associated with multiple-point scales.

(15) a. The dam cracked at 6:00 am/*for two months.

b. The pipe burst at 6:00 am/*for two months.

(16) a. We cooled the solution for three minutes.

b. We cooled the solution in three minutes; it was now at the desired temperature.

In the motion domain, the verbs that are comparable to the change of state verbs with a two-point scale are those verbs with a point-like reference object which lexicalize a two-point path, that is, verbs like *arrive, depart, enter*, and *exit*. As the temporal modifiers in (17) show, these verbs are necessarily telic. Specifically, these verbs only allow the 'after X time' reading of an *in* phrase typical of achievements, rather than the 'take X time' reading found with accomplishments; these distinct readings arise because the former, being associated with two-point scales, are punctual, and the latter, being associated with multiple-point scales, are durative.

(17) We will arrive/enter/exit in/*for two minutes.

These verbs contrast with other directed motion verbs, which can show either telic or atelic uses (Levin and Rappaport Hovav 1995:173). Thus, *descend* and *fall* show the 'take X time' reading of an *in* phrase, reflecting a telic use, but they may also be modified by a *for* phrase, reflecting an atelic use.

(18) The plane descended in/for 20 minutes.

In addition, *descend* and *fall* can be found with either bounded or unbounded path PPs (Zwarts 2005), while verbs like *enter* cannot take unbounded path PPs.

(19) a. I descended towards a sandy area in the middle of the reef. (http://www.thelivingsea.com/Adventures/wilddolphins3.php)

b. A shooting star fell towards the city's crown of lights. (BNC: FS8)

c. *We will enter/arrive towards the house.

Those directed motion verbs that lexicalize a deictically determined direction are also not necessarily telic, as shown in (20), though they tend to be used telically.

(20) One of them came towards us and spotted that we were machine gunners. (http://www.aftermathww1.com/interviews1.asp)

Summarizing, we have argued that directed motion and change of state both fall under a semantic notion of scalar change. This unified analysis receives two types of support. First, verbs lexicalizing either directed motion or change of state never lexicalize manner, conforming to manner/result complementarity; second, both types of verbs show similar patterns of telicity.

4.2 Nonscalar changes

An important characteristic of a scalar change is its simplicity: it is a directed change in the values of a single attribute (Tenny 1994). A nonscalar change is any change that cannot be characterized in terms of an ordered set of values of a single attribute. There are a few verbs of nonscalar change such as *cross* and *traverse*, mentioned in section 4.1, which like verbs of scalar change involve a change in a single attribute, but unlike them fail to specify a particular direction of change in the values of this attribute. The vast majority of nonscalar changes deviate from scalar changes in another, more significant respect: they involve complex changes—that is, a combination of multiple changes—and this complexity means that there is no single, privileged scale of change.

What we have called manner verbs are verbs that lexicalize nonscalar changes which are complex in this sense; that is, manner verbs do not lexicalize a scalar change. For example, the verb *jog* involves a specific pattern of movements of the legs, one that is different, for example, from the pattern associated with *walk*. Furthermore, even though there is a sequence of changes specified by *jog*, collectively these changes do not represent a change in the values of a single attribute, nor is any one element in the sequence of changes privileged as being the necessary starting point of motion; that is, one can start jogging by moving one's left leg first or one's right leg first (cf. Dowty (1979:171) on the verb *waltz*). Furthermore, verbs of nonscalar change need not always be so specific about the precise changes they

involve. The verb *exercise*, for example, requires an unspecified set of movements, whose only defining characteristic is that they involve some sort of activity, typically physical, but on occasion mental.

This way of characterizing the difference between scalar and nonscalar change and the verbs lexicalizing these two types of change may provide some insight into why manners are so often associated with animates and results with inanimates. Human activities—the type of actions denoted by manner verbs—usually involve many cooccurring changes; these activities, then, do not qualify as scalar changes. Nevertheless, these activities are often carried out by an animate entity with the intention of producing a simple, i.e. scalar change, in a second, typically inanimate entity. Such a change is characteristic of result verbs. Thus, changes that are typically predicated of animates are nonscalar in nature, while those predicated of inanimates are very often scalar. Nevertheless, nonscalar changes may be predicated of inanimates, as with the verbs *flap, flutter*, and *rumble*, and scalar changes may be predicated of animates. Such scalar changes often involve the body, as in *Kim reddened* or *Tracy fainted*; they do not refer to intentional activities, which by their very nature are complex and, thus, nonscalar changes.

In summary, we have identified result verbs as verbs which lexicalize scalar change and manner verbs as verbs which lexicalize nonscalar change (and, specifically, complex change). What we described as a complementarity in the lexicalization of manner and result, then, is more accurately characterized as a complementarity in the lexicalization of scalar and nonscalar change.

5 A motivation for the lexicalization constraint

We now ask what motivates manner/result complementarity? We suggest that manner and result are meaning components that contribute to the complexity of a verb's meaning, and the lexicalization constraint which gives rise to manner/result complementarity reflects a constraint on the overall complexity of a verb's meaning.

As noted in section 2, by disallowing roots associated with multiple positions in event schemas, the lexicalization constraint only allows simple canonical realization rules such as in (7)-(11): that is, one-to-one associations of roots and positions in event schemas, each determined by a particular ontological categorization. If a root had more than one ontological category, then it would fall under more than one canonical realization rule, resulting in a violation of the lexicalization constraint. Thus, the lexicalization constraint has an important consequence: it ensures that a root has a single ontological category. Thereby, it indirectly constrains what can be a possible root, while keeping a root's meaning "simple" in some sense.

Thus, our understanding of complexity of meaning ties it to a root's ontological category: a root has only one ontological category even if the meaning components that determine its categorization are themselves very complex. As the existence of verbs like *exercise* attests, a root can involve many meaning components, yet still be associated with a single ontological category. In some sense, the actual "content" of the root does not matter.

Ontological categorization is only one possible measure of the complexity of verb meaning. Another possibility involves the number of lexical entailments and yet another the extent of real world knowledge associated with a verb. However, as we now show, these forms of potential "complexity" do not seem to be the issue.

Consider first measuring complexity in terms of the number of lexical entailments associated with a verb. The manner verb *tango*, which refers to the performance of a specific dance, must be associated with more detail—and, hence, more lexical entailments—than the verb *dance* itself. But from the perspective of the lexicalization constraint, *tango* is no more complex than *dance*: both are manner verbs. There seems to be no constraint on how detailed the content of the manner component can be.

An alternative way to measure complexity is in terms of the real world preconditions associated with the event denoted by a verb, which Goldberg (1998, this volume) refers to as "presuppositions". These can be extremely complex; for example, a felictious use of the verb *appeal* requires "the existence of a previous complex event involving a trial which resulted in a guilty verdict, and asserts a subsequent act of filing legal papers for the purpose of a retrial" (Goldberg 1998:43; also this volume). Yet it appears that such preconditions do not contribute to complexity from the perspective of the lexicalization constraint. We are unaware of any constraint on how complex the set of preconditions can be.

6 The lexicalization constraint in a larger context

As noted at the outset, in English manner/result complementarity is a lexicalization constraint. Both notions can be expressed in a VP, as shown in (21), with examples from both the change of state and change of location domains.

(21) a. Marie sponged the table clean.
b. An old woman hobbled in from the back.

However, as Levin and Rappaport Hovav (2006) point out, some languages contrast with English in enforcing manner/result complementarity with respect to a verb

and its complements. Thus, Romance languages do not allow telic path phrases with manner of motion verbs (Aske 1989, Green 1973, Talmy 1975, 1985, 1991, 2000), nor do they allow a result phrase with other types of manner verbs; Greek is the same (Giannakidou and Merchant 1998, Horrocks and Stavrou 2003). The intended content of such sentences must be expressed periphrastically, as the following translations into French of the examples in (21) illustrate.

(22) a. Marie a nettoyé la table avec une éponge.
Marie has cleaned the table with a sponge
'Marie cleaned the table with a sponge.'

b. Une vieille femme arriva en boitant de l'arrière-boutique.
an old woman arrived in limping from the back-store
(Vinay and Darbelnet 1958:105)

Here, too, there is a constraint that is shared by verbs in both the change of state domain and in the motion domain, suggesting that it may be related to manner/result complementarity. In Levin and Rappaport Hovav (2006), we speculate that perhaps there is a constraint on how complex a meaning can be encoded in a linguistic unit, with languages differing as to what the unit is.

Interestingly, another constraint that has been noted at the VP-level in English also appears to have a counterpart at the lexical level. This constraint involves the temporal structure of a clause: the event described in a clause can only have one measure—i.e. one scale in the context of our discussion—(Goldberg 1991:368, Tenny 1987:183-4, 1994:68, Filip 1999, Levin and Rappaport Hovav 1995). A variety of data has been adduced in support of this constraint. We exemplify it by showing that a secondary predicate cannot be combined with a verb to create a change that is instantiated in terms of both motion and state. Consider (23), which involves a directed motion verb and an XP denoting a state.

(23) The bag came open.

(23) cannot mean that the bag arrived and as a result of arriving became open—a reading that involves two changes—one a change of state and one a change of location. This sentence has two readings. On one, *open* is understood as a result state and *come* has been bleached of any directional sense; on the other, the verb retains its directional sense and *open* must be understood as a depictive predicate.

A similar constraint appears to hold at the lexical level. We are not aware of any verbs that can be analyzed as simultaneously describing a change of state and a change of direction. The question is whether this constraint follows from a constraint on the temporal structure of an event or whether it can be reduced instead to

our lexicalization constraint? Previous work addressing the VP-level constraint has assumed that an event by its very nature can only have one measure, and there is no reason to think that the same should not hold of the lexical level. Nevertheless, it is possible that the lexicalization constraint provides an alternative explanation for why an event cannot have more than one measure lexically. As noted in section 4.1, a given scale must be defined over some dimension; thus, it must involve either a change of state or a change of location. Assuming that these are two subtypes of result, then they would count as distinct ontological categories; thus, a root could not simultaneously lexicalize both types of change. The result is the observed lexical constraint.

7 Concluding remarks

We have presented evidence in support of positing manner/result complementarity and tried to explicate why such complementarity might arise. However, there are a handful of verbs which appear to lexicalize both manner and result. We mention several examples from the literature, sketching why we believe these dual characterizations are in error.

The verb *cut* has been said to lexicalize a manner component which specifies motion and contact (Guerssel et al. 1985). Two facets of *cut*'s behavior have been attributed to the manner component: it is found in the conative construction, and it cannot participate in the causative alternation, as shown in (24). Nevertheless, *cut* does appear to lexicalize a result, as (25) is a contradiction.

(24) a. she got the blade pulled out and started cutting at the tape on Alex ... (www.authorhouse.com/BookStore/ItemDetail?bookid=28127.aspx)

b. *The bread cut.

(25) Dana cut the rope/paper/cake, but it stayed in one piece.

Turning to the motion domain, as Fillmore (1982:32-33), Jackendoff (1985), and Kiparsky (1997:490) note, the verb *climb* apparently expresses both manner and direction in uses such as *Kelly climbed the tree* (clambering manner, upwards direction), contra manner/result complementarity.

We show that these two verbs are not actual counterexamples to manner/result complementarity in work in progress. Here we sketch the form our solution takes. We suggest that verbs that appear to lexicalize both manner and result actually only lexicalize one in any given use. Close scrutiny of the behavior of *cut* and *climb* reveals that there is no single, constant element of meaning which appears in every

use of these verbs. Rather, problematic verbs are polysemous and have independent manner and result senses. In particular, when a manner has a conventionally associated result, the result may get lexicalized in some uses of the verb, but only if the manner component drops out. Thus, with *climb* in precisely those uses in which the upward motion is lexicalized, such as *The plane climbed to 9000 feet*, the clambering manner is absent, as shown by the wider range of permitted subjects.[9]

In contrast, we propose that *cut* is basically a result verb; it does not lexicalize a specific manner as the following quote from Bohnemeyer (2007:159) shows: "Cut verbs, too, are rather flexible about the action performed and the instrument used (I can *cut* an orange using anything from a knife or axe to a metal string or laser beam, and I can do it by bringing the blade to bear on the fruit or by dropping the fruit onto the blade from sufficient height)." However, when a result verb has a conventionally associated activity, as *cut* does, the associated activity may get lexicalized in some uses of the verb, but only if the result drops out. For this reason, the conative use of *cut* as in (24a), which requires a lexicalized manner, does not entail the result.

A further potential counterexample to manner/result complementarity is posed by verbs such as *brush, chop, comb, grind*, and *mow*, which specify the activity of the agent, while entailing a change in the entity denoted by the direct object. For example, *mow* requires that the agent use a particular instrument (a manner), but it also entails a change in the patient as a result of the use of the instrument (a result). These verbs, then, specify changes in the entities denoted by both the subject and the object, but we argue that these changes are not scalar so that these verbs do not counterexemplify manner/result complementarity. They describe complex interactions between the entities denoted by their two arguments, so that the change in the object can be characterized only by concomitant reference to the subject's activity. For example, while both grinding and chopping meat may lead to the same result, they are different activities. For evidence that languages do not treat these verbs like verbs of scalar change, see Rappaport Hovav and Levin (2007).

Manner/result complementarity, then, provides a productive framework for explorations of what the meanings of verbs like *climb*, *cut*, and *mow* actually are. Thus, as this brief discussion of potential counterexamples reaffirms, manner/result complementarity is a significant observation about the lexicon with consequences for continued investigations of both individual verbs and classes of verbs.

[9]The verbs *dive*, *plunge*, and *soar* also show the same type of polysemy as *climb*. Interestingly, these verbs appear to maintain a "manner" residue in their directed motion uses; that is, examples such as *The prices soared/dove/plunge* suggest a quick rate of change in what is clearly not a true manner use of these verbs, given the inanimate subject. What matters, though, is that in the directed motion use, the preceived manner elaborates on a clearly scalar change; there is no sense of a complex change as in the true manner uses of these verbs. We believe that the rate of change is not lexicalized, but rather inferred because these verbs specify large changes along a scale in very short, almost instantaneous, periods of time.

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