

## Unlikely imperfectives \*

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**Abstract** The event-in-progress reading of the English incremental-theme progressive (*Elena is drawing a circle*) displays vagueness effects, especially when the culmination of the event denoted by the progressive is unlikely. This paper explains these unexpected vagueness effects by adopting a modal theory of the progressive and a gradable theory of modality. It is then possible to explain vagueness effects in the progressive as a result of the same semantic phenomena that generate vagueness effects in gradable adjectives like *healthy*.

**Keywords:** semantics, progressive, imperfective, vagueness, social choice theory, modality, gradability

The event-in-progress reading of the English incremental-theme progressive, as in (1), displays vagueness effects.

- (1) a. Diana Nyad was swimming from Cuba to Florida.  
b. Clarence was wiping out the Roman army. (Landman 1992: 18)

These vagueness effects include susceptibility to the sorites paradox and the presence of borderline cases. Notably, though, the progressives in (1) intuitively involve unlikely events—swimming from Cuba to Florida in (1a) or wiping out the Roman army in (1b). And it seems as though this unlikeliness might have something to do with the progressive’s vagueness, since progressives such as (2) do not seem to display (or at least do not display as easily) vagueness effects.

- (2) Elena was drawing a circle.

I hope to vindicate these intuitions: whether a progressive displays vagueness effects correlates with how likely the progressive is to culminate. In order to accomplish this task, however, it will be necessary to make two moves. First, I adopt a modal theory of the semantics of the progressive, following Landman (1992);

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Portner (1998); Condoravdi (2009). Second, I adopt a gradable theory of modality, following Lassiter (2011). After accepting these premises, the semantics of the progressive resembles the semantics of gradable adjectives, including the split in vagueness effects between *relative* gradable adjectives (vague) and *absolute* gradable adjectives (not as vague) (Kennedy & McNally 2005; Kennedy 2007). It turns out that unlikely and likely progressives pattern after this split, and for the same reasons.

In section 1, I distinguish the linguistic phenomena at issue: vagueness effects in a certain reading of the English progressive. Section 2 presents prior analyses of the progressive, concentrating on modal accounts. I then adopt a gradable theory of modality. Finally, I relate this to the semantics of gradable adjectives, and demonstrate how the semantics of the progressive is, in this instance, like the semantics of gradable adjectives.

## 1 Vagueness effects in the English progressive

Portner (2011) defines the English progressive as “a periphrastic grammatical form used to say that some event is in progress, or ongoing, at the time indicated by the sentence’s tense.”<sup>1</sup> He notes that individual-level statives do not occur with the progressive as in (3).

(3) \* Ruth is knowing French.

With respect to other aspectual classes, like accomplishments as in (4), Portner describes several properties.

(4) Ruth was building a house.

First, sentences like (4) lack the *completion property*, which is an entailment from the progressive to the perfect (compare *John was smiling*  $\models$  *John has smiled*).<sup>2</sup> (This is the so-called *imperfective paradox*.) Second, while a past-tense progressive like (4) does not entail its perfect counterpart, it does entail a process that would result in a state of affairs describable by its perfect counterpart as long as the process is not interrupted. Thus, for example, the sentence in (4) combined with an assumption that the process denoted by (4) was not interrupted *does* entail the perfect. Portner calls this the *interruption principle*. Third, Portner notes that the semantics of the progressive is constrained by the *reasonableness principle*: a progressive sentence  $\text{Prog}(\phi)$  entails (or maybe implies) a modal sentence of the

<sup>1</sup> He also notes that the progressive may be used to indicate futurity, as in *Sam is coming to the party (tonight)*. Along with Portner, I set these uses aside for now.

<sup>2</sup> The presence or absence of the completion property has often been explained in terms of the “subinterval property” (Dowty 1979). As Portner (2011: 1243) explains, “An expression has the subinterval property iff, whenever it is true at an interval of time *i*, it is true of all (or more accurately, all long-enough) subintervals of *i*.”

sort “it was not too farfetched a possibility that  $\phi$ .”<sup>3</sup> Finally, the progressive may exhibit what Portner calls the *indeterminacy property*, but what I will call *description sensitivity*. The essence of description sensitivity is that the situation in (5) may be truthfully described by each of the sentences in (5a, 5b), though these sentences are incompatible with one another.

- (5) Suppose Sonia takes a flight scheduled to go to Boston, and it is hijacked to Bismarck, North Dakota. Either of the following might be true.
- a. Sonia was flying to Boston (when her plane was hijacked).
  - b. Sonia was flying to Bismarck (though she didn’t know it).

To Portner’s observations I add a novel one: some progressives are also subject to vagueness effects like *borderline cases* and the *sorites paradox*. As Condoravdi (2009: 14) has observed, “[T]he truth of [*Mary was wiping out the Roman army*] depends on . . . how much of the Roman army Mary has destroyed at the reference time in the world of evaluation.” That is, the slaughter of 10,000 soldiers probably licenses the progressive, but the slaughter of dozens probably does not. What about the slaughter of 300? Or 500? In my judgments, at least, I experience a lingering uncertainty in these latter scenarios. This uncertainty is the essence of a borderline case (Kennedy 2007), as traditionally associated with vague gradable adjectives like *expensive*, as in (6). A borderline case exists when it is possible to identify entities or events that the predicate is definitely true of and definitely false of, but there is a third set of entities or events for which it is difficult or impossible to make these judgments.

- (6) A \$5 cup of coffee is expensive. A \$1 cup of coffee is inexpensive. What about a \$2 or \$3 cup of coffee?

A sorites paradox for the progressive is also readily constructed, as in (7):

- (7) **Premise 1.** (At the reference time in the world of evaluation, Mary had killed 10,000 soldiers) Mary was wiping out the Roman army.  
**Premise 2.** Any event of “wiping out the Roman army” in which one less soldier was killed is still an event of wiping out the Roman army.  
**Conclusion.** (At the reference time in the world of evaluation, Mary had killed 1 soldier) Mary was wiping out the Roman army.

The paradoxical argument in (7)–from seemingly true premises to a seemingly false conclusion–is another hallmark of vague gradable adjectives (Kennedy 2007). For example, *expensive* is susceptible to the sorites paradox, as in (8).

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<sup>3</sup> For this principle to get off the ground, the real world must always count as a reasonable world. Thus, if Clarence succeeds, through superhuman strength, in wiping out the Roman army in the world of evaluation, the progressive *Clarence was wiping out the Roman army* must be true at some reference time in this world.

- (8) **Premise 1.** A \$5 cup of coffee is expensive (for a cup of coffee).  
**Premise 2.** Any cup of coffee that costs 1 cent less than an expensive one is expensive (for a cup of coffee).  
**Conclusion.** Therefore, any free cup of coffee is expensive.

Notably, though, not all progressives display vagueness effects. Consider the sentence in (9).

- (9) Nino is drawing a circle.

Intuitively, the second premise for the sorites argument is not valid (see 10), falsified by the distinction between an event in which at least some part of the circle has been drawn and an event in which no part of the circle has been drawn.

- (10) ?? **Premise 2.** Any event of “drawing a circle” in which 1 degree less (of an arc) is drawn is an event of drawing a circle.

Similarly, the sentence in (9) is true whether Nino has drawn  $\frac{1}{8}$ ,  $\frac{1}{16}$ ,  $\frac{1}{32}$ , ... of the circle. This reflects a lack of borderline cases. Yet it may be possible to ‘coerce’ vagueness effects in (9) by considering unlikely scenarios. For example, suppose that the circle is very large relative to Nino or that we are interested in pinning down the inception of the circle-drawing event in some sort of mental preparatory act (Grano 2011). In these cases, it seems to me that we encounter a similar line-drawing problem as with *Mary was wiping out the Roman army*, and therefore we resurrect vagueness effects.

Again, it is possible to draw a parallel to the domain of gradable adjectives. Not all gradable adjectives display vagueness effects, at least not without an interpretation relative to a special context. This is known as the distinction between *relative* (vague) and *absolute* (not vague) adjectives.<sup>4</sup> Absolute adjectives, like *empty*, resist the sorites premise, as in (11).<sup>5</sup>

- (11) ?? **Premise 2.** Any container with 1mL more liquid than an empty container is empty.

<sup>4</sup> Kennedy & McNally (2005); Kennedy (2007) develop an analysis of this distinction in terms of *scale structure*, arguing that the abstract scales of measurement for the properties encoded by absolute adjectives have different structures than the scales for properties encoded by relative adjectives. Other analyses conceive of this distinction as dependent on the type of context-sensitivity encoded by the adjectival semantics (Burnett 2014; van Rooij 2011). Further discussion is provided in section 4.

<sup>5</sup> For reasons that exceed the scope of this paper, the sorites sequence composed with *empty* must incrementally increase the property in question rather than incrementally decrease it (as with *tall*). It is also possible to find relative adjectives like *poor* in which the sorites sequence increases the relevant property (wealth). This complication does not affect the empirical distinction between relative and absolute adjectives.

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More generally, adjectives like *empty* seem to mark a clear division between the total absence of a property (like volume) and a minimal amount of the property (Kennedy 2007). This implies that these adjectives also lack borderline cases.<sup>6</sup>

I will suggest in section 4 that these parallels are more than just coincidence.

## 2 Theories of the progressive

In order to account for the vagueness observation, I adopt a modal theory of the progressive following Landman (1992); Portner (1998); Condoravdi (2009).<sup>7</sup> Portner (2011) contrasts modal accounts with purely extensional accounts (what he calls “event structure theories”). The most promising versions of the latter theories involve some sort of mapping between the domain of events  $E$  and the domain of individuals  $I$  (Krifka 1992; Szabó 2008; Hallman 2009), or even mappings between the domain of events and an abstract “degree of change” induced in the object (Beavers 2008; Kennedy & Levin 2008; Piñón 2008).<sup>8</sup>

Event structure theories are well-situated to accommodate vagueness effects in the progressive, but—without a modal component—they cannot explain why vagueness effects should hinge on judgments of likelihood. For example, Condoravdi (2009) extends Piñón 2008 to an analysis of the English progressive. (Condoravdi’s analysis incorporates both a modal component and an event-structural component; I focus on just the event-structural component here to illustrate why the modal component is necessary.) On this account, the progressive is interpreted relative to a contextually determined ‘standard’ for the degree of completion an event must reach before the progressive is true, as in (12).

(12)  $\text{PROG}(e, P)$  is true in  $w$  relative to  $c$  with contextual standard  $d_c$  iff for some  $d$ ,  $P(w, e, d)$  and  $d \geq d_c$

The condition in (12) says that “there must be a degree [of completion] that exceeds a contextually determined threshold and that satisfies  $P(w, e, d)$ , where  $P$  is the given event description,  $e$  is the event in question, and  $w$  is the evaluation world” (Grano 2011: 436). Thus, *Ruth was swimming across the Atlantic* is true only if the degree  $d$  to which Ruth has traversed the Atlantic is greater than some contextually

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<sup>6</sup> More evidence for the distinction between relative and absolute adjectives comes from definite descriptions. As Syrett, Kennedy & Lidz (2010) point out, when a subject is presented with two cups of varying heights, the request *pass me the tall one* is felicitous. However, when a subject is presented with two cups with varying amounts of liquid in them, the request *pass me the empty one* is infelicitous. The latter is felicitous when one of the cups is truly empty.

<sup>7</sup> As Sharvit (2003) points out, these “modal theories” are really hybrid extensional/intensional theories.

<sup>8</sup> Importantly, the theories of Beavers (2008); Kennedy & Levin (2008); Piñón (2008) do not purport to analyze the English progressive. Nevertheless, to the extent these theories may be extended to such an analysis, they are more similar to event structure theories than to modal theories.

determined standard of completion  $d_c$ . The similarity to degree-based accounts of gradable adjectives is clear. On these accounts, for example, the denotation of *tall* looks something like that in (13).<sup>9</sup>

$$(13) \quad \llbracket \text{tall} \rrbracket = \lambda x \lambda d . \text{tall}(x, d) \wedge d \geq d_c$$

In (13),  $d_c$  is the contextually determined degree of height an entity must possess to be considered *tall*. Therefore, event structure approaches like that in (12) promise to handle vagueness effects in the progressive in the same way that degree-theoretic accounts of gradable adjectives handle vagueness effects with predicates like *tall* (Kennedy 2007). This is an encouraging result!

Unfortunately, a contextually determined degree of completion does not explain the difference in vagueness effects between (14a) and (14b).

- (14) a. Mary was wiping out the Roman army.  
b. Nino was drawing a circle.

As suggested above, the intuitive explanation for the presence of vagueness effects in (14a) and their absence in (14b) has to do with *likelihood*: the completion of the process denoted by (14a) is unlikely, while the completion of the process denoted by (14b) is likely.<sup>10</sup> There is no analogue for this sort of judgment in the adjectival domain. Assertions of tallness do not seem to depend on how likely it is that we are in a context in which the entity is actually tall, or something similar.<sup>11</sup>

Instead, the semantics of the progressive must incorporate a modal element to capture vagueness effects.<sup>12</sup> Dowty (1979); Landman (1992); Portner (1998); Condoravdi (2009) all provide modal accounts of the semantics of the progressive, and I adopt Portner's (1998) modal framework here. Portner interprets a progressive sentence as in (15).

- (15) Prog( $\phi$ ) is true at a pair of an interval and world  $\langle i, w \rangle$  iff there is an event  $e$  in  $w$  such that  $i$  is  $e$ 's event time and in the 'best' worlds  $w'$  selected by a circumstantial modal base and an ordering source that favors worlds in which the relevant event is not interrupted by an 'outside' event, there is an interval  $i'$  which includes  $i$  as a non-final subinterval such that  $\phi$  is true at  $\langle i', w' \rangle$ .

The truth conditions in (15) are a mouthful, but they represent a sensible motivating intuition: the progressive is true if, in the normal course of events, the event would

<sup>9</sup> This denotation is adapted from Sassoon (2013), but I have altered it to resemble the formalism given by Condoravdi.

<sup>10</sup> Likelihood is not the whole story, however. After all, it is sensible to say *Mozart was composing the Requiem* though we know that there is a very low likelihood of Mozart completing it (in the actual world, at least). I address this complication below.

<sup>11</sup> But see Kamp 1975 for some thoughts along this line.

<sup>12</sup> For other criticisms of the event structure theory, see Portner 2011.

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have reached completion. (Technically, [Portner](#) invokes a circumstantial modal base and a “non-interrupted” ordering source.) In this respect, [Portner](#)’s theory shares the same motivation as all the other modal theories of the progressive that I’m aware of. For example, the ‘modal component’ of [Condoravdi](#)’s analysis interprets the progressive as a modal operator with a circumstantial modal base and “human necessity” ordering source favoring those worlds in which events proceed normally (as in 16b).

- (16) PROG( $e$ ,  $P$ ) is true in  $w$  relative to  $c$  with contextual standard  $d_c$  iff
- a. for some  $d$ ,  $P(w, e, d)$  and  $d \geq d_c$  **and**
  - b. there are  $e'$ ,  $d'$ , and  $w'$  such that  $e \subset_{nf} e'$ ,  $d \leq d'$ ,  $w' \leq_{o_i} w$ , and  $P(w', e', d')$

The second condition (16b) says that there must be a triple  $e'$ ,  $d'$ , and  $w'$  that also satisfies the event description  $P$ , such that  $e$  is a nonfinal substage of  $e'$ ,  $d$  is less than or equal to  $d'$ , and  $w'$  ranks higher than  $w$  relative to some ordering source  $o$ .

This dependence on some notion of ‘the normal course of events’ is a hallmark of modal theories of the progressive.<sup>13</sup> Without undertaking the Herculean (or maybe Sisyphean) task of explicating this notion, it is possible to use it in deriving the vagueness of the English progressive. The key is to interpret normality or reasonableness in terms of likelihood, but for this interpretation to work, we need a theory of modality compatible with judgements of likelihood. Describing such a theory is the project of the next section.

### 3 Gradable modality

Recent research has argued for the advantages of a gradable theory of modality over traditional theories like that of [Kratzer](#) (1981) ([Yalcin](#) 2010; [Lassiter](#) 2011; [Klecha](#) 2012). These advantages involve a better account of what [Lassiter](#) (2011) calls gradable epistemic modals: *possible*, *probable*, *likely* and *certain*. For example, an adjective like *likely* participates in comparatives, as in (17a), and otherwise behaves as a relative gradable adjective according to the tests established in [Kennedy & McNally](#) 2005, as in (17b) ([Lassiter](#) 2011: 436).

- (17) a. It is more likely that the White Sox will win than that the Cubs will win.  
b. i. # It is completely likely that the Bears will win this year.  
ii. # It is slightly likely that the Bears will win this year.  
iii. It is likely that the Bears will win, but it could be more likely.

<sup>13</sup> In addition to [Portner](#) and [Condoravdi](#)’s use of this notion, [Landman](#)’s (1992) semantics depends on “reasonable” continuations of events in progress.

But if gradable epistemic modals are relative adjectives, what scales are these adjectives associated with?

Lassiter argues that gradable epistemic modals are functions from propositions to points on a *scale of possibility*.<sup>14</sup> In particular, he first defines a *probability space* as in (18). The denotation of *likely* then appears as in (19), in analogy with the denotations of other relative gradable adjectives, like *tall*.

- (18) A *probability space* is a pair  $\langle W, prob \rangle$ , where  $W$  is a set of possible worlds and  $prob : \mathcal{P}(W) \rightarrow [0, 1]$  is a function from subsets of  $W$  to real numbers between 0 and 1 such that
- a.  $prob(W) = 1$  and
  - b.  $prob(\phi \cup \psi) = prob(\phi) \cup prob(\psi)$
- (19)  $\llbracket \text{likely}(\phi) \rrbracket = 1$  iff  $prob(\phi) > s$   
 “ $\phi$  is likely is true if  $\phi$ 's probability is greater than a contextually determined standard  $s$  on the scale of possibility.”

Thus, Lassiter's account provides a scalar analysis of modality using the machinery of gradable adjectival semantics. Moreover, this analysis is based on the semantics of *relative* gradable adjectives, meaning that it leaves room for vagueness effects. It is tempting, then, to integrate this approach to gradable modality with a modal theory of the progressive in order to account for vagueness effects in the progressive.

#### 4 The proposal

I adopt a modal theory of the progressive and a gradable theory of modality to account for vagueness effects in the progressive. The proposal is in (20).

- (20) a.  $\text{PROG}(\phi)$  is true at a pair of an interval and world  $\langle i, w \rangle$  iff there is an event  $e$  in  $w$  such that  $i$  is  $e$ 's event time,  $\phi$  is likely is true, and there is an interval  $i'$  such that  $\langle i', w' \rangle \in \phi$  and  $i'$  includes  $i$  as a non-final subinterval.
- b.  $\llbracket \text{Prog}(\phi) \rrbracket = \lambda \phi_{\langle t, t \rangle} \lambda i. \exists i' [i \subset_{nf} i' \wedge prob(\phi)(i) > s \wedge \phi(i')]$

The semantics in (20a) is Portner's (1998) semantics with an important addition:  $\phi$  is likely is true. The truth conditions in (20b) rephrase this semantics, where  $t$  is the type of intervals (Deo 2009). An example is provided in (21).

- (21)  $\llbracket \text{Nino is drawing a circle} \rrbracket = 1$  iff  $\exists i' [i \subset_{nf} i' \wedge prob(\text{Nino draw a circle})(i) > s \wedge (\text{Nino draw a circle})(i')]$

<sup>14</sup> See Lassiter 2011 for an argument cataloging the advantages that this approach has over that of Kratzer 1981.



In words, *Nino is drawing a circle* is true if and only if, first, the interval representing the time of the event-in-progress  $i$  is a non-final subinterval of an interval  $i'$ , second, *Nino draw a circle* is likely at  $i$ , and third,  $i'$  is an event time of a complete *Nino draw a circle* event (in a potentially non-actual world).

The semantics in (20b) resembles the semantics of gradable adjectives, as the underlined portions of (22a) (equivalent in relevant respects to (13)) and (22b) demonstrate.

- (22) a.  $\llbracket \text{tall} \rrbracket = \lambda x. \underline{\text{tall}(x)} > s$   
 b.  $\llbracket \text{Prog}(\phi) \rrbracket = \lambda \phi_{\langle t, t \rangle} \lambda i. \exists i' [i \subset_{nf} i' \wedge \underline{\text{prob}(\phi)(i)} > s \wedge \phi(i')]$

In principle, (22b) provides a way to account for vagueness effects using the same reasoning used to account for vagueness effects in gradable adjectives.

Without more, however, the semantics in (22b) predicts that all uses of the progressive will display vagueness effects. And as argued in section 1, this is not the case. Further, though I compared vague and non-vague progressives in analogy to relative and absolute adjectives, respectively, the strategy for distinguishing relative and absolute adjectives in the adjectival domain is not available here. To see why requires a short detour through the semantics of gradable adjectives.

On a degree-based account of gradable adjectives, degrees are formalized by a triple  $\langle D, <, \delta \rangle$  including the set of degrees  $D$ , an ordering on this domain  $<$ , and a dimension  $\delta$  that provides the property to be measured (for instance, cost in the case of *expensive*). Kennedy & McNally (2005) argue that gradable adjectives may differ as to the structure of  $D$ , and in particular whether  $D$  does or does not have maximal or minimal elements. For example, Kennedy & McNally identify a “typology” of scale structures based on a variety of linguistic tests, as in (23).

- (23) *A typology of scale structures* (Kennedy 2007: 33)
- |                  |                   |        |
|------------------|-------------------|--------|
| OPEN             | (tall, expensive) | ○————○ |
| LOWER CLOSED     | (bent, dirty)     | ●————○ |
| UPPER CLOSED     | (straight, flat)  | ○————● |
| (TOTALLY) CLOSED | (full, open)      | ●————● |

As Kennedy & McNally note, if the domain  $D$  associated with the gradable adjective contains at least one endpoint, the adjective tends to lack vagueness effects; otherwise, it displays them. Therefore, Kennedy (2007) concluded, the scale structure associated with the adjective, combined with a pragmatic principle that prefers endpoint-oriented interpretations, explains the difference between a relative adjective like *tall* and an absolute adjective like *straight*. In the first case, the standard-setting function  $s$  (as in 22a) identifies a context-dependent standard of comparison, but in the second case, the standard-setting function  $s$  identifies the relevant scalar endpoint.

The problem for the analysis of the progressive in (22b) is that there is no analogue to different ‘scale structures’ in the contrast between the sentences in (14a)

and (14b).

- (14) a. Mary was wiping out the Roman army.  
b. Nino was drawing a circle.

Presumably, both events have a natural ‘endpoint’: the culmination of the event, in which the incremental themes (*the Roman army* and *a circle*) have been totally affected by the processes encoded in the lexical verbs. Moreover, since the distinction between (14a) and (14b) (in terms of vagueness effects) seems to hinge on likelihood, and since the scale of likelihood is the same in each case (see (18) and (19)), the standard-setting function *s* in (22b) behaves the same in each case. In other words, there is no analogue to scale structure that can explain the difference between (14a) and (14b) in terms of the difference between *tall* and *straight*.<sup>15</sup>

Rather, an analysis that relativizes the interpretation of the progressive to multiple ‘sources’ of likelihood accounts for the distinction between (14a) and (14b). The intuition behind this approach comes from Portner’s (1998) discussion of the examples in (24a) and (24b).

- (24) a. Max was crossing the street.  
b. Max was walking into the path of an oncoming bus.

Both sentences in (24) describe the same event,<sup>16</sup> an event in which Max is struck by an oncoming bus. In Portner’s (1998: 779) words,

[(24a)] is true because we evaluate it with respect to a modal base which focuses on the event as a street-crossing, and so excludes consideration of the bus; . . . this means that the best worlds . . . are going to be ones where he crosses the street. In contrast, [(24b)] is true because we evaluate it with respect to a more global modal base which includes the fact that the bus is coming down the street; the best worlds compatible with this modal base will not be ones where Max crosses the street, but rather ones where he . . . [is] hit by the bus.

In a similar vein, Condoravdi explains that the different descriptions are true relative to different ordering sources. My modest addition to these proposals is this: multiple ordering sources play into the semantics of the progressive *in the same context*. This modification provides an explanation of vagueness effects in the progressive.

<sup>15</sup> Nor do other theories of the relative/absolute distinction in gradable adjectives provide purchase on an analysis of the difference between (14a) and (14b). Burnett (2014), for example, explains the difference between relative and absolute adjectives in terms of their comparison classes, but there is no evidence that (14a) and (14b) are interpreted with respect to something like a comparison class.

<sup>16</sup> Portner (1998) considers and rejects an account in which (24a) and (24b) describe different events, and I concur.

In the vocabulary of gradable modality, suppose that there is not one ‘scale of possibility,’ but many, and multiple scales may contribute at the same time to the semantics of the progressive. Intuitively, these different scales correspond to the different rankings of worlds induced by Portner’s different modal bases. Unlike Portner’s model, however, these different scales may contribute to the semantics of the same progressive sentence. I assume that which scales of possibility are relevant to the interpretation of a particular progressive and which are not depends on contextual factors.

The analogy to gradable adjectives further narrows our investigation: vagueness effects seem to be a product of how the standard is set by the standard-setting function  $s$ . Let the standard-setting function  $s$  be a *choice function* that picks the ‘best’ worlds from among all the relevant scales of possibility. Some of these worlds will be inconsistent with one another. For instance, per Portner’s description, a ‘best’ world for (24a) will be a world in which Max crosses the street, and a ‘best’ world for (24b) will be a world in which he doesn’t. If both ‘bests’ are selected by the standard-setting function  $s$  in a single progressive, how is the standard set? In order to avoid this scenario,  $s$  must choose from among the *aggregated* scales of possibility.

Let  $\succsim_{prob_i}$  be the ranking associated with each scale of possibility defined by a function  $prob_i$ , as in (18). The idea is that there are multiple functions  $prob_i$ , each associated with a particular scale of possibility that ranks worlds according to different modal bases (or different ordering sources, à la Condoravdi). The binary relation  $\succsim_{prob_i}$  is defined in (25).

$$(25) \quad w_1 \succsim_{prob_i} w_2 \text{ iff } prob_i(w_1) \geq prob_i(w_2)$$

The ‘profile’ of rankings looks something like (26), in which each scale of possibility induces a potentially different ranking on the set of possible worlds.

(26)

rank	$\succsim_{prob_i}$	$\succsim_{prob_j}$	...	$\succsim_{prob_n}$
1	$w_1$	$w_3$	...	$w_2$
2	$w_2$	$w_1$	...	$w_3$
3	$w_3$	$w_2$	...	$w_1$
⋮	⋮	⋮	⋮	⋮

Finally, let  $\succsim$  represent an *aggregated ranking* that produces a single ranking of worlds from the profile of rankings in (26). The choice function  $s$  may then be defined in (27): given a set of worlds  $S \subseteq W$  and an aggregated ranking  $\succsim$ ,  $s$  returns the best worlds according to  $\succsim$ .

$$(27) \quad s(S, \succsim) = \{w \mid \forall v [v \in S \rightarrow w \succsim v]\}$$

Given some plausible assumptions, aggregated rankings like  $\succsim$  may give rise to an intransitive ranking of worlds, leading to vagueness effects. It turns out that

for a finite number of rankings  $\succsim_{prob_i}$  and at least three worlds, there is no way to aggregate these rankings that satisfies certain plausible assumptions about how aggregation should work. This result is Arrow's Impossibility Theorem (Arrow 1963). Specifically, there is no aggregation function mapping (26) to the aggregated ranking  $\succsim$  respecting the following assumptions (modified for exposition):

(28) *Arrowian assumptions*

- a. The domain of the aggregation function may include all logically possible orderings on  $W$ ;
- b. if each  $\succsim_{prob_i}$  ranks a world  $w_j$  above a world  $w_k$ , then the aggregated ranking  $\succsim$  should rank  $w_j$  above  $w_k$ ;
- c. the relative ranking of any two worlds should depend only on those two worlds (as opposed to a third world);
- d. no one  $\succsim_{prob_i}$  always dictates the structure of the aggregated ranking  $\succsim$ ; and
- e.  $\succsim$  is a transitive, complete ordering of the relevant worlds.

Most of these assumptions are uncontroversial. For example, (28a) represents the intuition that there is no good reason to rule out certain rankings of worlds *a priori*, and (28b) represents the intuition that it would be odd if each  $\succsim_{prob_i}$  ranked  $w_j$  above  $w_k$ , but the aggregated ranking  $\succsim$  did not. Similarly, at least in some cases, one  $\succsim_{prob_i}$  should not control the outcome of the aggregated ranking  $\succsim$  (see (28d)).

Two of these assumptions merit more extended comment. First, the assumption in (28c) is equivalent to the assumption that each  $\succsim_{prob_i}$  imposes an *ordinal* rather than *cardinal* ranking on the relevant worlds. That is, each  $\succsim_{prob_i}$  is a measure of relative possibility. Second, the transitivity of  $\succsim$ , assumed in (28e), may be especially open to question. At least on some theories, vagueness is a failure of transitivity in the indifference relation ( $\sim$ ), defined in (29) (where  $\succ$  is the strict counterpart to  $\succsim$ ).

$$(29) \quad w_1 \sim w_2 \text{ iff } \neg(w_1 \succ w_2) \wedge \neg(w_2 \succ w_1)$$

Indeed, the sorites premise is often formulated in terms of the *Tolerance Principle*, as in (30) (Cobrerros, Egré, Ripley & van Rooij 2012; Burnett 2014).

$$(30) \quad \forall x \forall y [P(x) \wedge x \sim y \rightarrow P(y)]$$

In words, "If some individual  $x$  is  $P$ , and  $x$  and  $y$  are only imperceptibly different in respects relevant for the application of the predicate  $P$ , then  $y$  is  $P$  as well" (Cobrerros et al. 2012: 348). This is the familiar pattern behind the sorites paradox.

We now have the tools to explain vagueness effects in the progressive. The semantics of the progressive in (31) is sensitive to multiple scales of possibility

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simultaneously.<sup>17</sup>

$$(31) \quad \llbracket \text{Prog}(\phi) \rrbracket = \lambda \phi_{\langle t, t \rangle} \lambda i. \exists i' [i \subset_{nf} i' \wedge \text{prob}(\phi)(i) > s \wedge \phi(i')]$$

This provides an explanation for sentences like (32), which I take to be a variant on the progressive's description sensitivity (see (5) and the contrast between (24a) and (24b)).

(32) In one respect, Mary was wiping out the Roman army, but in another respect, she was not.

These multiple scales are aggregated into a single scale by the standard-setting function  $s$ , which selects the 'best' worlds according to the aggregated ranking. In order for this single scale to be defined, however, it is necessary to abandon one of the assumptions in (28). While assumptions (28a-28d) are defensible, abandoning the assumption of transitivity (28e) not only allows the aggregated scale to be defined; it also enables us to account for vagueness effects through the intransitivity of the indifference relation. This validates the second premise of the sorites paradox for certain progressives, as in (33) (repeated from (7)).

(33) **Premise 2.** Any event of "wiping out the Roman army" in which one less soldier was killed is still an event of wiping out the Roman army.

In other words, the standard-setting function  $s$  cannot distinguish between two very similar events. In progressives like *Mary was wiping out the Roman army*, this leads to both the sorites paradox and borderline cases—the vagueness effects.

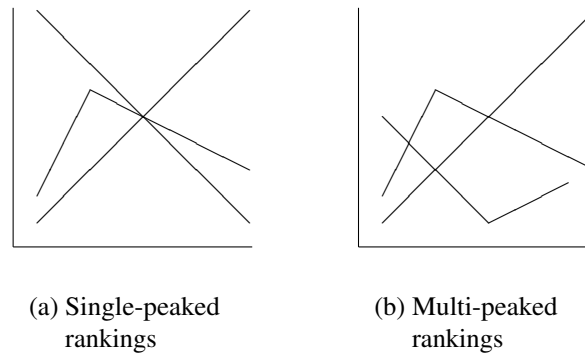
What about progressives that do not display vagueness effects? They don't abandon transitivity, as indicated by the seeming invalidity of the second premise of the sorites paradox in (34) (repeated from (10)).

(34) ?? **Premise 2.** Any event of "drawing a circle" in which 1 degree less (of an arc) is drawn is an event of drawing a circle.

As Sen (1970) shows, it is not always necessary to abandon the assumption of transitivity. If the scales of possibility largely 'agree' on the rankings of possible worlds, then it's possible to define a transitive aggregated ranking. If the scales of possibility differ wildly on their rankings of possible worlds, such an aggregated ranking is not possible without abandoning one of the assumptions in (28).

Sen's formal distinction is between so-called "multi-peaked" rankings and "single-peaked" rankings. Intuitively, single-peakedness limits the breadth of 'disagreement' that various ranking functions  $\succsim_{\text{prob}_i}$  can have about the rankings of elements in  $W$ . For example, in Figure 1(a), each line displays only one 'peak'. Interpreting Figure 1(a) as a preference ranking (along the y-axis) for three individuals

17 Technically, the choice function  $s$  may choose multiple worlds, in which case the term  $\text{prob}(\phi)(i) > s$  is evaluated with respect to  $\max\{\text{prob}(w) \mid w \in s\}$ . I will ignore this complication below.



**Figure 1** Single- and multi-peaked rankings

along the political continuum from liberal (left side of the  $x$ -axis) to conservative (right side of the  $x$ -axis), for example, it is clear that one person prefers liberal candidates most and conservatives least, one person prefers conservative candidates most and liberals least, and one person prefers moderates most (with nearly equal disdain for conservatives and liberals). But they all agree on one thing: the moderate candidate is not the *worst*. ‘Multi-peaked’ profiles, as in Figure 1(b) have no such locus of agreement.

Sen provided a way to capture this notion of disagreement through his “Condition of value restriction” (modified for my purposes in (35)).

(35) *Condition of value restriction*

In any triple  $(w_i, w_j, w_k)$  there is some alternative  $w_i$  such that all relevant scales of possibility agree that it is not worst, or agree that it is not best, or agree that it is not in the middle, i.e.

for all  $n$ :  $w_i \succ_{prob_n} w_j$  or  $w_i \succ_{prob_n} w_k$  or

for all  $n$ :  $w_j \succ_{prob_n} w_i$  or  $w_k \succ_{prob_n} w_i$  or

for all  $n$ : [ $w_i \succ_{prob_n} w_j$  and  $w_i \succ_{prob_n} w_k$ ] or [ $w_j \succ_{prob_n} w_i$  or  $w_k \succ_{prob_n} w_i$ ]

Sen then showed that, if every triple of rankings satisfies the condition in (35), the aggregation function escapes Arrow’s impossibility result.

The upshot is this: ‘unlikely’ progressives are those in which judgments of likelihood on the relevant scales of possibility vary wildly, and ‘likely’ progressives are those in which those judgments are apt to agree. In the latter case, it is possible to define an aggregated ranking without abandoning the assumption of transitivity; in the former case, this is *not* possible. Therefore, this account predicts vagueness effects in unlikely progressives and the absence of vagueness effects in likely progressives.

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For example, in the reading on which (36) is true, the domain of the standard-setting function *s* must draw from divergent scales of possibility.

(36) Mary was wiping out the Roman army.

In the normal course of events, the sentence in (36) would be false. But as Landman (1992: 15) puts it, “The problem is that our world is sometimes a miracle world,” in which (36) may be true. How should we evaluate likelihood in miracle worlds? Is the world in which Mary continues to cut down Roman soldiers with her gladius more or less likely than the world in which her gladius eventually breaks and Mary succeeds by garroting the poor bastards? It is unclear, and the semantics I’ve presented here respects this unclarity. The scales of possibility involved in (36) are multi-peaked, and therefore the aggregated ranking from which *s* draws its worlds is intransitive. This leads to vagueness effects.

In contrast, ‘familiar’ and ‘common’ processes, like those denoted by the progressive in (2), will generally admit only those likelihood rankings that agree on which worlds are best (or, at least, not worst).

(2) Elena was drawing a circle.

The scales of possibility will generally agree, I think, that the worlds in which Elena completes her circle in the familiar way are not the *worst* worlds. Then the scales of possibility involved in (2) are single-peaked, which means that the aggregated ranking of worlds is transitive and vagueness effects are not expected. Of course, it may be possible to coerce the progressive in (2) into an unlikely one—by assuming that the circle has the circumference of the equator, for instance—but then multi-peakedness will likely enter the picture again. The more scales of possibility a progressive invokes in its semantics, the more likely these scales disagree with each other on the rankings of the relevant worlds, and the more likely the progressive is to be vague.

## 5 Conclusion

The difference between single-peaked and multi-peaked scales of possibility explains the difference in vagueness effects between (14a) and (14b). This setup also answers what Landman (1992: 19) called the “juggling act” of the progressive: some notion of ‘the normal course of events’ is crucial in many cases to the semantics of the progressive, but not always. By letting the relevant scales of possibility vary with context, it is possible to account for this tension while explaining why vagueness effects tend to correlate with progressives evaluated relative to the *abnormal* course of events.

Moreover, this semantics (see (37)) retains the ability to explain the completion

property, the interruption principle, the reasonableness principle, and the progressive's description sensitivity (Portner 2011).

$$(37) \quad \llbracket \text{Prog}(\phi) \rrbracket = \lambda \phi_{\langle t, t \rangle} \lambda i. \exists i' [i \subset_{nf} i' \wedge \text{prob}(\phi)(i) > s \wedge \phi(i')]$$

Indeed, some of these explanations follow the lines drawn by Portner (1998): the completion property is explained by the fact that the progressive takes place during a non-final subinterval of  $\phi$  (this also handles the interruption principle), and description sensitivity falls out from interpretations relative to different scales of possibility (or modal bases, in Portner's terms). However, my explanation of the reasonableness principle is somewhat different. For a progressive like *Mary was wiping out the Roman army* to be true, it must be the case that the *Mary-wipe-out-the-Roman-army* worlds are more likely than the best worlds selected by the standard-setting function  $s$ . These worlds may or may not be reasonable, but they must be 'likely' on at least some underlying scales of possibility. In other words, by 'likely' I more nearly mean 'likely given certain assumptions.' This slight change in orientation provides the resources to analyze a sentence like (38).

(38) Mozart was composing his Requiem.

Of course, Mozart died before completing his Requiem, so  $\phi = \text{Mozart compose his Requiem}$  is intuitively *unlikely*. The solution to this seeming counterexample is the same as in the case of Max and the oncoming bus ((24a) and (24b)): the sentence in (38) is interpreted with respect to scales of possibility that ignore the event *Mozart dies*.

Finally, throughout this exploration of the progressive, I have used analogies to gradable adjectives to light the way. I would like to suggest one more: vagueness effects in the progressive and vagueness effects in multidimensional adjectives share the same source, the aggregation of judgments along a number of criteria. Multidimensional adjectives are adjectives like *healthy*, *similar*, etc. As the name suggests, multidimensional adjectives are interpreted with respect to multiple dimensions (Sassoon 2013). Whether Ruth is *healthy*, for instance, depends on a number of factors simultaneously, like blood pressure, heart function, and cholesterol levels (depending on the context of use). Sassoon (2013) also provides some tests like *respect*-modification to diagnose multidimensionality, as in (39).

- (39) a. i. Ruth is healthy *with respect to blood pressure*.  
 ii. Ruth is healthy *in every respect*.  
 iii. Ruth is healthy *except with respect to cholesterol*.  
 b. i. \*Ruth is tall with respect to her height.  
 ii. \*Ruth is tall in every respect.  
 iii. \*Ruth is tall except with respect to width.



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As I argued elsewhere, a multidimensional adjective like *healthy* also displays vagueness effects, and these vagueness effects can be traced to the aggregation of comparative judgments along each relevant dimension, as in (40) (Grinsell 2013).

(40)

rank	blood pressure	cholesterol	...	heart rate
1	John	Stephen	...	Sonia
2	Sonia	John	...	Stephen
3	Stephen	Sonia	...	John
⋮	⋮	⋮	⋮	⋮

A quick comparison between (40) and (26) illustrates that unlikely progressives and multidimensional adjectives face the same problems of aggregation. Instead of *dimensions*, progressives incorporate *scales of possibility*; instead of comparisons with respect to a property like blood pressure, progressives incorporate comparisons with respect to likelihood. But the problems of aggregating these judgments remain the same.<sup>18</sup> In particular, in some cases, the aggregated ranking (of entities or worlds) must be intransitive. From this intransitivity, vagueness follows.

**References**

Arrow, Kenneth J. 1963. *Social choice and individual values*. Yale University Press.

Beavers, John. 2008. Scalar complexity and the structure of events. In Johannes Dölling, Tatjana Heyde-Zybatow & Martin Schäfer (eds.), *Event structures in linguistic form and interpretation*, 245–265. Berlin: Mouton de Gruyter.

Burnett, Heather. 2014. A delineation solution to the puzzles of absolute adjectives. *Linguistics and Philosophy* 37(1). 1–39. doi:10.1007/s10988-014-9145-9.

Cobrerros, Pablo, Paul Egré, David Ripley & Robert van Rooij. 2012. Tolerant, classical, strict. *Journal of Philosophical Logic* 41(2). 347–385.

Condoravdi, Cleo. 2009. Measurement and intensionality in the semantics of the progressive. Handout, 5th workshop in discourse structure in honor of Carlota S. Smith, UT Austin.

Deo, Ashwini. 2009. Unifying the imperfective and the progressive: partitions as quantificational domains. *Linguistics and Philosophy* 32(5). 475–521. doi:10.1007/s10988-010-9068-z.

Dowty, David R. 1979. *Word Meaning and Montague Grammar: The Semantics of Verbs and Times in Generative Semantics and in Montague’s PTQ*. Springer. doi:10.1007/978-94-009-9473-7.

Grano, Thomas. 2011. Mental action and event structure in the semantics of ‘try’.

<sup>18</sup> This approach also provides a way to account for the relative/absolute distinction in gradable adjectives in terms of the multi-peaked/single-peaked distinction. See Grinsell 2013.

- In Neil Ashton, Anca Chereches & David Lutz (eds.), *Semantics and Linguistic Theory (SALT) 21*, 426–443. Ithaca, NY: CLC.
- Grinsell, Timothy Wood. 2013. Avoiding predicate whiplash: social choice theory and linguistic vagueness. In Anca Chereches (ed.), *Semantics and Linguistic Theory (SALT) 22*, 424–440. Ithaca, NY: CLC.
- Hallman, Peter. 2009. Proportions in time: interactions of quantification and aspect. *Natural Language Semantics* 17(1). 29–61. doi:10.1007/s11050-008-9038-y.
- Kamp, Hans. 1975. Two theories about adjectives. In *Formal Semantics of Natural Language*, 123–155. Cambridge: Cambridge University Press.
- Kennedy, Christopher. 2007. Vagueness and grammar: The semantics of relative and absolute gradable adjectives. *Linguistics and Philosophy* 30(1). 1–45. doi:10.1007/s10988-006-9008-0.
- Kennedy, Christopher & Beth Levin. 2008. Measure of change: The adjectival core of degree achievements. In *Adjectives and Adverbs: Syntax, Semantics and Discourse*, 156–182. Oxford: Oxford University Press.
- Kennedy, Christopher & Louise McNally. 2005. Scale structure, degree modification, and the semantics of gradable predicates. *Language* 81. 345–381. doi:10.1353/lan.2005.0071.
- Klecha, Peter. 2012. Positive and conditional semantics for gradable modals. In Ana Aguilar Guevara, Anna Chernilovskaya & Rick Nouwen (eds.), *Sinn und Bedeutung 16*, vol. 16, 363–376. Cambridge: MITWPL.
- Kratzer, Angelika. 1981. The notional category of modality. In Hans-Jürgen Eikmeyer & Hennes Rieser (eds.), *Words, Worlds, and Contexts*, 38–74. Berlin: Mouton de Gruyter.
- Krifka, Manfred. 1992. Thematic relations as links between nominal reference and temporal constitution. In Ivan A. Sag & Anna Szabolcsi (eds.), *Lexical Matters*, 29–53. Stanford: CSLI.
- Landman, Fred. 1992. The progressive. *Natural Language Semantics* 1(1). 1–32. doi:10.1007/BF02342615.
- Lassiter, Daniel. 2011. Gradable epistemic modals, probability, and scale structure. In Nan Li & David Lutz (eds.), *Semantics and Linguistic Theory (SALT) 20*, 197–215. Ithaca, NY: CLC.
- Piñón, Christopher. 2008. Aspectual composition with degrees. In Louise McNally & Christopher Kennedy (eds.), *Adjectives and Adverbs: Syntax, Semantics, and Discourse*, 183–219. Oxford: Oxford University Press.
- Portner, Paul. 1998. The progressive in modal semantics. *Language* 74. 760–787. doi:10.2307/417002.
- Portner, Paul. 2011. Perfect and progressive. In Claudia Maienborn, Klaus von Stechow & Paul Portner (eds.), *Semantics: An International Handbook of Natural Language Meaning*, vol. 2, 1217–1261. Walter de Gruyter.

Unlikely imperfectives

- van Rooij, Robert. 2011. Vagueness and linguistics. In Giuseppina Ronzitti (ed.), *Vagueness: A Guide*, 123–170. Springer.
- Sassoon, Galit W. 2013. *Vagueness, Gradability and Typicality: The Interpretation of Adjectives and Nouns*. Brill. doi:10.1163/9789004248588.
- Sen, Amartya K. 1970. *Collective Choice and Social Welfare*. North-Holland Publishing Co.
- Sharvit, Yael. 2003. Trying to be progressive: the extensionality of try. *Journal of Semantics* 20(4). 403–445. doi:10.1093/jos/20.4.403.
- Syrett, Krister, Christopher Kennedy & Jeffrey Lidz. 2010. Meaning and context in children’s understanding of gradable adjectives. *Journal of Semantics* 27(1). 1–35. doi:10.1093/jos/ffp011.
- Szabó, Zoltan Gendler. 2008. Things in progress. *Philosophical Perspectives* 22(1). 499–525.
- Yalcin, Seth. 2010. Probability operators. *Philosophy Compass* 5(11). 916–937. doi:10.1111/j.1747-9991.2010.00360.x.

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