Implicative inferences and causality in *enough* and *too* constructions[*]

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Abstract

This paper proposes a new account of the aspect-dependent implicative behavior of *enough* and *too* constructions (E&T). Against Hacquard (2005)'s claim that E&T are inherently complement-entailing, I propose that they simply attribute a capacity to their subjects, but do not force complement entailment. Actualization under perfective is driven by 'actualistic' aspectual coercion (Homer, 2011), which applies only to a specific set of stative predicates. This aligns perfective E&T with recent treatments of implicatives (Baglini & Francez, 2016; Nadathur, 2016), and opens up a new approach to the longstanding puzzle of actuality entailments on ability modals (Bhatt, 1999).

1   Implicative inferences

Implicative verbs entail the truth of their complements, reversing this entailment under negation. The relationships in (1a-1b) suggest a false equivalence between the matrix and embedded propositions; Karttunen (1971) proposes that this equivalence is precluded by presuppositions of necessity and sufficiency associated with use of the implicative.

(1)   a. Morgan managed to solve the riddle.   ⊢ *Morgan solved the riddle.*
       b. Morgan did not manage to solve the riddle.   ⊢ *Morgan did not solve the riddle.*

Karttunen also identifies a set of predicates that are 'optionally' implicative, in that they defeasibly implicate truth values for their complements. *Enough* and *too* (E&T) constructions are of this type. Like the entailments in (1), the inferences in (2) reverse with matrix negation.

(2)   a. Juno was fast enough to win the race.   ⤳ *Juno won the race.*
       b. Juno was too slow to win the race.   ⤳ *Juno did not win the race.*

Defeasibility suggests a pragmatic analysis, but this is complicated by the fact that E&T inferences in French are governed by grammatical aspect (Hacquard, 2005). In the imperfective, *être assez rapid/e* patterns with (2a). In the perfective, however, we get full entailment.[1] The same contrast arises with *be too slow* (*être trop lent/e*), *modulo* negation (see 2b).

(3)   a. *Juno était assez rapide pour gagner la course, mais elle n'a jamais gagné.*
           'Juno was-IMPF fast enough to win the race, but she never won.'

       b. *Juno a été assez rapide pour gagner la course, #mais elle n'a pas gagné.*
           'Juno was-PFV fast enough to win the race, #but she did not win.'

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[1]French marks perfective aspect with the *passé composé*, which is a compound of the auxiliary *avoir*(=*have*) with the past participle of the main verb. For ease of readability, I gloss *passé composé* simply as PFV.

[Hacquard](#) proposes that E&T implicativity is not optional: like *manage*, E&T constructions presuppose necessary and sufficient conditions and 'at base' entail their complements. To address defeasibility in (3a), [Hacquard](#) appeals to the generic interpretation associated with imperfective aspect (Bhatt, 1999). As she points out, however, imperfective marking does not have the same effect on true implicatives: *réussir*(=manage) entails regardless of aspect.

(4)   a.   *Juno réussissait à gagner la course, #mais elle n'a jamais gagné.*
         'Juno manage-IMPF to win the race, #but she never won.'

     b.   *Juno a réussi à gagner la course, #mais elle n'a pas gagné.*
         'Juno manage-PFV to win the race, #but she didn't win.'

'Optional' implicativity in E&T constructions thus presents two challenges. First, how does aspect derive the entailment contrast in (3a-3b)? Second, if E&T constructions are true implicatives, why are entailments absent (2)-(3a), while *manage* entails across the board? If E&T contructions are not implicatives, what accounts for the perfective entailments?

This paper presents a new proposal for E&T constructions, which addresses these challenges. I take as a starting point the idea that 'true' implicativity is built on relations of causal dependence (Nadathur, 2016). On this analysis, an implicative verb presupposes the existence of a *causally necessary and sufficient* event for the truth of its complement. It asserts whether or not the precondition was satisfied.

I propose that there are two main differences between implicatives and E&T constructions. First, E&T constructions in general presuppose only necessary preconditions. They take on the additional causal sufficiency presupposition of implicatives in a particular subset of cases, when the matrix clause describes an exercisable capacity (e.g., *be fast*). Secondly, while implicative verbs assert the occurrence of a causing event, E&T constructions 'at base' assert only the possibility of this causing event. Given these differences, the inferential patterns in (1)-(4) are predicted straightforwardly by the selectional restrictions of perfective and imperfective aspect.

2   Modality, necessity, and sufficiency

2.1   Degree comparatives with a necessity condition

E&T constructions are analyzed as a type of degree comparative, in which an actual degree is compared to a degree associated with the possibility of the complement proposition (Bierwisch, 1987; Meier, 2003; von Stechow et al., 2004; Schwarzschild, 2008).

(5)   a.   Juno is fast enough to win the race.
         Juno is as fast in the real world as she is in some world where she wins the race.
         (Her speed makes winning the race possible.)

     b.   Juno is too slow to win the race.
         Juno is slower in the real world than she is in any world where she wins the race.
         (Her speed makes winning the race impossible.)

In the spirit of von Stechow et al.'s analysis, I treat *enough* as an equative combined with a universal modal, and *too* as a comparative operator with an existential modal.

(6)   a. $[\![\text{enough}]\!]^w :=$
         $\lambda Q_{est}\lambda P_{dest}\lambda x_e.\{d : \forall w' \in \text{ACC}(w)[Q(x)(w') \rightarrow P(d)(x)(w')]\} \subseteq \{d : P(d)(x)(w)\}$
     b. $[\![\text{too}]\!]^w :=$
         $\lambda Q_{est}\lambda P_{dest}\lambda x_e.\{d : \exists w' \in \text{ACC}(w)[Q(x)(w') \ \& \ P(d)(x)(w')]\} \subset \{d : P(d)(x)(w)\}$

Positive gradable adjectives relate individuals to degrees on a particular scale. Negative adjectives are defined in opposition to their positive poles.

(7)   a. $[\![\text{fast}]\!]^w := \lambda d \lambda x. \text{SPEED}(x)(w) \geq d$
      b. $[\![\text{slow}]\!]^w := \lambda d \lambda x. \text{SPEED}(x)(w) < d$

Ignoring tense for the moment, this gives us the following interpretations for (2a)-(2b):[2]

(8)   a.   Juno be fast enough to win the race $= [\![\text{enough}]\!]^w([\![\text{win-race}]\!])([\![\text{fast}]\!])([\![\text{Juno}]\!])$
           $\equiv \{d : \forall w' \in \text{ACC}(w)[\text{win}(j)(w') \rightarrow \text{SPEED}(j)(w') \geq d]\} \subseteq \{d : \text{SPEED}(j)(w) \geq d\}$
      b.   Juno be too slow to win the race $= [\![\text{too}]\!]^w([\![\text{win-race}]\!])([\![\text{slow}]\!])([\![\text{Juno}]\!])$
           $\equiv \{d : \exists w' \in \text{ACC}(w)[\text{win}(j)(w') \ \& \ \text{SPEED}(j)(w') < d]\} \subset \{d : \text{SPEED}(j)(w) < d\}$

The sets under comparison are all intervals – of the form $[0, n]$ in (8a), and $[n, \infty)$ in (8b). We compare maximal elements in (8a): the maximum speed that Juno has in the real world is at least as great as the maximal speed she has in the race-winning world where she is slowest. Her speed thus makes winning the race possible. (8b) compares miminal elements: the minimum degree of speed that Juno does not have is less than the minimum degree she has in any of the race-winning worlds. Thus, Juno needs to be faster than she is for winning to be possible.

   We would like to rule out contexts where it is *a priori* impossible that Juno wins, since this renders (2a-2b) infelicitous. Under the present semantics, this situation will return true from (8a) and (8b). We take *enough* and *too* to presuppose that there is at least one accessible world in which Juno wins the race. Since she has a speed in every world, this is equivalent to (9).

(9) $\exists d : \forall w' \in \text{ACC}(w)[Q(x)(w') \rightarrow P(d)(x)(w')]$

Since it is nonempty, $\{d : \forall w' \in \text{ACC}(w)[Q(x)(w') \rightarrow P(d)(x)(w')]\}$ has a maximum element, which is the minimum speed that Juno must have if it is possible for her to win. Condition (9) therefore mandates the existence of a degree of speed that is necessary for the realization of the E&T complement; it does not, however, mandate the existence of a sufficient condition.

2.2   Modal flavour

Meier (2003) suggests that implicative inferences for English E&T constructions can be explained by the choice of accessibility relation.[3] For instance, (10) asserts Amira's age is asserted to be such that it is possible for her to drink legally. But since we do not assume that people necessarily act on their legal abilities, no inference is predicted.

(10)   Amira was old enough to drink. $\not\rightsquigarrow$ *Amira drank.*

(11)   a.   Morgan was clever enough to solve the riddle. $\rightsquigarrow$ *Morgan solved the riddle.*
       b.   Morgan was not clever enough to solve the riddle. $\rightsquigarrow$ *Morgan solved the riddle.*

   On the other hand, (11) selects a circumstantial accessibility relation, which guarantees that worlds are self-accessible. Meier's idea is that we get implicative inferences just in case the context selects for a *totally realistic* accessibility relation, which only contains the actual world. In order for solving the riddle to be possible in this case, it must take place in the real world, deriving the implicative reading of (11a). This won't work in general, because the same presupposition holds for (11a) and its negation. For (11b) to be felicitous, Morgan must solve the riddle in the real world. But this contradicts the inference we wish to derive.

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[2]These semantics derive the duality *enough* and *too*. I therefore focus on *enough* in what remains.
[3]For the purposes of this paper, I make the simplifying assumption that different modals are simply represented by different accessibility relations, rather than spelling out the full apparatus of Kratzer (1981).

2.3 Necessary and sufficient conditions

As things stand, we cannot account for the perfective data. (3b), like (8a), establishes that Juno's speed made it possible for her to win, but does not necessitate that she actually won.

(3b) *Juno a été assez rapide pour gagner la course, #mais elle n'a pas gagné.*
      'Juno was-PFV fast enough to win the race, #but she did not win.'

We will derive the complement entailment if the necessary condition on Juno's win is also a sufficient one – that is, if meeting the necessary condition is enough to guarantee winning. Hacquard (2005) therefore replaces (9) with (12), which presupposes that there is a unique degree d that is both necessary and sufficient for the realization of the E&T complement.

(12) $\iota d : \forall w' \in \text{Acc}(w)[Q(x)(w') \leftrightarrow P(d)(x)(w')]$

The necessary condition, as above, is represented by the minimum degree d_{nec} such that $\exists w' \in \text{Acc}(w) : \text{ADJ}(x)(w') \geq d \,\&\, Q(x)(w')$. The sufficient condition is given by the minimum degree d_{suff} such that $\forall w' \in \text{Acc}(w) : \text{ADJ}(x)(w') \geq d_{\text{suff}} \to Q(x)(w')$. In general, we have $d_{\text{nec}} \leq d_{\text{suff}}$, so (12) guarantees $d_{\text{nec}} = d_{\text{suff}}$. Thus, (6a) reduces to (13), and (8a) to (14).

(13) $[\![\text{enough}]\!]^w := \lambda Q \lambda P \lambda x. P(\iota d : \forall w' \in \text{Acc}(w)[Q(x)(w') \leftrightarrow P(d)(x)(w')])(x)(w)$

(14) Juno be fast enough to win the race.
      $\equiv \text{SPEED}(j)(w) \geq (\iota d : \forall w' \in \text{Acc}(w)[\text{win}(j)(w') \leftrightarrow \text{SPEED}(j)(w') \geq d])$

As long as Acc is reflexive, the entailment follows. None of this is changes for Hacquard with the addition of perfective aspect, which she treats simply as existential closure over time.

   The interesting case is the imperfective (3a). Following Bhatt (1999), Hacquard associates imperfective aspect with a genericity operator. GEN quantifies over normal worlds, and the presuppositions get pushed into GEN's restriction (Schubert & Pelletier, 1989). From this we get that Juno has the necessary and sufficient speed to win the race in all normal worlds where such a speed exists, but we cannot draw any conclusions about the real world.

(15) $[\![\text{GEN}]\!]^w := \lambda Q_{st}[\forall w' \in \text{Norm}(w)Q(w')]$

(16) GEN(Juno be fast enough to win the race)
      $\equiv \forall w \in \text{Norm}(w^*)[(\iota d : \text{win}(j)(w) \leftrightarrow \text{SPEED}(j)(w)) \to \text{SPEED}(j)(w) \geq d]$

Hacquard (2005) points out that this analysis aligns E&T constructions with implicative verbs: like implicatives, E&T constructions presuppose the existence of a necessary and sufficient condition for their complements, and inform us as to whether or not this condition was met.[4]

   The main difference between implicatives and E&T constructions is the modal component. E&T constructions, as we have seen, can appeal to deontic and circumstantial modalities (as well as to epistemic ones), but implicative verbs seem to be restricted to circumstantial modality. This difference, however, does not predict a difference with respect to entailment under imperfective marking: if GEN/IMPF suspends complement entailments for circumstantial E&T, it should do the same for implicatives. But, as (4a) shows, this is not the case.

(17) GEN(Juno manage to win the race)
      $\forall w' \in \text{Norm}(w)[\exists Q_{set} : [Q(j)(w') \leftrightarrow \text{win-race}(j)(w')] \to Q(j)(w')]$

(4a) *Juno réussissait à gagner la course, #mais elle n'a jamais gagné.*
      'Juno managed-IMPF to win the race, #but she never won.'

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[4]This aligns with Karttunen (1971)'s original proposal, though it deviates from the later, 'standard' account (see Karttunen & Peters, 1979). *Modulo* a causal component, the proposal in Nadathur (2016) shares the structure of Karttunen (1971) and Hacquard (2005).

2.4   The sufficiency problem

As given in (12), the E&T sufficiency condition faces two problems: in deontic cases, it is too strong, but in circumstantial cases it is (conceptually) not strong enough!

Consider how presupposition (12) is realized in (10):

(10)   Amira was old enough to drink.
          presupposes: $\iota d : \forall w \in \text{DEON}(w^*)[\text{drive}(J)(w) \leftrightarrow \text{AGE}_w(J) \geq d]$

(10) presupposes that there is an age d such that, in all worlds where the laws are like ours, and are not violated, being d-old necessitates that Amira drinks. This can be satisfied in two ways. Either the context establishes that the only thing holding her back is the legal issue, or there is a law that requires one to drink after reaching a certain age. In the first case, Amira will drink in the real world. The second case never occurs. Consequently, (10) is predicted to be felicitous just in case Amira drinks in the real world. This prediction is incorrect:

(18)   *Amira a été assez grande pour boire de l'alcool, mais elle n'a l'a jamais bu.*
          'Amira was-PFV old enough to drink alcohol, but she never drank it.'

The problem extends to any E&T construction with a deontic flavour.

Next consider (19). The necessity presupposition was not enough to guarantee entailment. Adding (12) fixed this, but – intuitively speaking – it should not have done so!

(19)   *Juno a été assez rapide pour gagner la course.*
          presupposes: $\iota d : \forall w \in \text{CIRC}(w^*)[\text{win}(J)(w) \leftrightarrow \text{SPEED}_w(J) \geq d]$

The problem is this: *being d-fast*, unlike *being d-old*, can be *latent*. *Being d-fast* involves having the capacity to do things at speeds of at least d, but does not require a manifestation of the speed. Clearly, however, there is no speed d such that simply having the capacity to do things d-fast will guarantee a win. Being d-fast can only ensure Juno's success in the event that she exercises her speed. The problem of (19) generalizes to any other exercisable capacity: *be brave enough*, *be strong enough*, *be loud enough*, etc.

In summary: E&T constructions cannot uniformly carry sufficiency presuppositions, since this makes the wrong predictions for the deontic case. On the other hand, a sufficiency presupposition is needed to derive the entailments in (3b), but this must specifically presuppose that *manifesting* the necessary speed d is a sufficient condition for P.

3   Proposal

The discussion in §2 motivates the following proposal:

(20)   Let S be a proposition of the form $S = x$ *be* ADJ *enough to* Q, where x is an individual, ADJ a relation between individuals and degrees, and Q a property of individuals. Evaluated with respect to a world w:

   (I) S presupposes a degree d_{nec} that is necessary for the possibility of $Q(x)$:

   $$\exists d_{\text{nec}} : \forall w' \in \text{ACC}(w)[\text{ADJ}(x)(w') < d_{\text{nec}} \rightarrow \neg Q(x)(w')]$$

   (II) S asserts that x has least d_{nec} of ADJ in w:

   $$[\![S]\!]^w = \text{ADJ}(x)(w) \geq d_{\text{nec}}$$

(III)   When ADJ represents an exercisable capacity, S backgrounds:

$$\forall w' \in \text{ACC}(w)[\text{DO-ADJ}(x)(d_{\text{nec}})(w') \vartriangleright_{\text{CAUS}} Q(x)(w')]$$

where DO-ADJ$(x)(d)(w)$ is a manifestation of d-ADJ by x in w, and $\vartriangleright_{\text{CAUS}}$ is the causal sufficiency operator.[5]

Claims (20.I-II) are just the semantics established in §2.1. The presupposition (20.I) is equivalent to (9).[6] As per §2.4, we omit Hacquard (2005)'s sufficiency presupposition. Claim (20.III) establishes the causal relation that is backgrounded by ADJ, when ADJ represents an exercisable capacity.[7] It follows from (20.I-III) that S will behave like a true implicative utterance just in case ADJ is an exercisable capacity, and S entails DO-ADJ(x)(d) for some degree d.

Proposal (20) captures the inferential behavior in (2)-(3), as well as the non-implicativity of examples like (10) and (18). The French aspectual contrast arises only with exercisable capacities, and is explained in terms of the contrast between latent (stative) attributions of d-adj and an eventive manifestation DO-ADJ$(x)(d)$. The difference between implicative verbs and E&T constructions is attributed to the activation of the sufficiency presupposition (20.III): implicatives are always eventive, while E&T constructions are not.

3.1   Sufficient cause

Proposal (20) establishes the connection between E&T constructions and implicative verbs. On this analysis, E&T constructions do exhibit *true* implicativity, insofar as complement entailments (where they arise) are derived by the same underlying causal structure.[8] Developing an analysis that aligns with that of implicatives is a strong motive for postulating a causal component in the semantics of E&T constructions, but it does not inherently provide evidence for the claim. In this section, I present three pieces of evidence that support to the causal analysis.

Examples like (2) are easily reconciled with a causal interpretation: being fast is naturally understood as a cause of winning races. That this is the correct interpretation of the matrix-complement connection is supported by the oddness of an example like (21).

(21)   (?)Juno was loud enough to win the race.

Here, the E&T complement describes a capacity that is not usually involved in race-winning. Making sense of (21) forces us to imagine a chain of causation leading from being loud to race-winning. If, for instance, we imagine that the only runner faster than Juno is very sensitive to noise, and so Juno might force her to slow down by screaming, (21) is improved.

The same point is reinforced when we modify E&T constructions with *because*-clauses:

(22)   a. ?Because it was cheap, Morgan was smart enough to buy the ring.

         b. Because it was empty, Marie was strong enough to lift the fridge.

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[5]I refer to Baglini & Francez (2016), Nadathur (2016) for formal definitions of causal necessity and sufficiency; the *causal dynamics* framework (Schulz, 2011) used for implicatives can be imported for E&T as well.

[6]$\exists d : \forall w' \in \text{ACC}(w)[Q(x)(w') \rightarrow \text{ADJ}(x)(w') \geq d]$ if and only if $\exists d_{\text{nec}}$ such that $d_{\text{nec}} = \text{MAX}\{d : \forall w' \in \text{ACC}(w)[Q(x)(w') \rightarrow \text{ADJ}(x)(w') \geq d]\}$.

[7]A precise representation, both for exercisable capacities ADJ$_{\text{cap}}$, and for their manifestations, DO-ADJ$_{\text{cap}}(x)(d)(w)$ is left for future work. Roughly, we would like a manifestation to be an event e such that ADJ$(x)(d)$ holds over the runtime $\tau(e)$ of e, and such that e does not satisfy the subinterval property.

[8]Schwarzschild (2008) also offers a paraphrase of *too* constructions that links the matrix adjective to the possibility/impossibility of the E&T complement as a reason or cause.

([22a](#)) is odd because it suggests that the ring's price had an effect on Morgan's intelligence. In other words, the *because*-clause is interpreted as modifying an existing causal chain between intelligence and ring-buying. ([22b](#)), on the other hand, is fine. The fridge's emptiness affects its weight, and this impacts the causal connection between strength and fridge-lifting.[9]

As a final point in support of the causal analysis of E&T constructions involving exercisable capacities, consider the structure of the course of events leading from being fast to winning a race. If this involves an initial process (e.g. running) that culminates in the causal consequence (winning) – that is, if the event structure underlying ([2](#)) resembles an *accomplishment* – the implicative inference is supported. If the context supports, instead, a temporal separation between being fast and the conclusion of the race, the accomplishment structure will be broken. In this case, we predict implicative entailments to go away, although implicatures may still arise. Marques ([2012](#)) provides data from Portugese that supports this idea:

(23)   *No último encontro, ele foi humilhado o suficiente para agora recusar o convite para um novo encontro (mas parece que já se esqueceu, porque está a pensar aceitar.)*
'In the last meeting, he was-PFV humiliated enough to now refuse the invitation for a new meeting (but it appears that he already forgot, since he is planning to accept).'

The requirement of an accomplishment structure supports the idea that a causal chain is involved in producing E&T entailments.

3.2   Implicativity and aspectual coercion

Proposal ([20](#)) holds that E&T constructions entail their complements just in case they entail manifestations of d_{nec}-ADJ. Perfective aspect ensures the desired manifestation.

(24)   a. *Juno a été assez rapide pour gagner la course.*   ⊢ *Juno won the race.*
          'Juno was-PFV fast enough to win the race.'

       b. *Juno n'a été pas assez rapide pour gagner la course.*   ⊢ *Juno did not win the race.*
          'Juno was-PFV not fast enough to win the race.'

(25)   a. *Juno était assez rapide pour gagner la course.*   ⊬ Juno won the race.
          'Juno was-IMPF fast enough to win the race.'

       b. *Juno n'était pas assez rapide pour gagner la course.*   ⊬ Juno did not win the race.
          'Juno was-IMPF not fast enough to win the race.'

Before combining with tense and aspect, ADJ$(x)(d)$ represents a stative predicate (of events).[10] The perfective, however, selects for eventive predicates (Dowty, [1986](#)), providing existential closure over an event which is bounded within a reference time.

(26) $[\![\text{PFV}]\!] := \lambda R_v \lambda t. \exists e[R(e) \ \& \ \tau(e) \subseteq t]$

Statives can only combine with perfective aspect via *aspectual coercion*, which maps them to a compatible predicate type (Moens & Steedman, [1988](#); de Swart, [1998](#)). ([27](#)) is an example of *inchoative* coercion, which maps the stative predicate to its initiation.

(27)   *Jupiter a aimé Europa.*   → *Jupiter fell in love with Europa.*
          'Jupiter loved-PFV Europa.'

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[9]Note, also, that replacing *empty* in ([22b](#)) with *full* again results in oddness, in this case because full things are typically assumed to be heavier than less full ones. This should not work in Marie's favour.

[10]That is, it satisfies the subinterval property: whenever ADJ$(x)(d)$ holds of an eventuality e, it also holds of every subeventuality $e' \sqsubseteq e$.

Homer (2011) identifies another type of coercion, which he calls *actualistic*. It takes a stative and returns a pragmatically-determined eventive predicate which coincides temporally with an event in the denotation of the original stative.[11]

(28)   *Jean a eu du tact.*   = PST(PFV(ACT(Jean have tact)))   → *Jean acted tactfully.*
       'Jean had-PFV tact.'

Predicates involving exercisable capacities are prime candidates for actualistic coercion. Unlike individual-level properties like *be tall*, *have tact* and *be fast* are necessarily associated with actions: the encoded capacity is the capacity to perform an action characterized by the matrix adjective. ACT maps ADJ$(x)(d)$ to such an action.

The combination of PFV and ACT in (24a) entails that Juno did something with speed d_{nec} within the reference time. This activates the sufficiency condition (20.III), deriving complement entailment. (24b) entails a manifestation of speed strictly less than d_{nec}, precluding complement realization. Thus, actualistic coercion ensures not only the implicative entailment, but also requires entails that Juno actually did something, even in the negative case. This is as desired: like negative implicative assertions, negative E&T are associated with the inference that some attempt was made to achieve the E&T complement.[12]

Imperfective aspect locates reference time within the situation time of an eventuality. It selects for statives. Assuming no other operators, the combination of past and imperfective in (25a) locates the reference time within the a situation of Juno having the capacity to do things at speed d_{nec}. No action is entailed, and no implicative inference arises.

(29) $\llbracket \text{IMPF} \rrbracket := \lambda R_v \lambda t . \exists e[R(e) \ \& \ \tau(e) \supset t]$

This is not the only possible use of imperfective aspect: it can also represent the progressive (PROG) or habitual/generic (HAB/GEN). The predictions change in these cases. PROG selects for eventive predicates (processes). Actualistic coercion applies, returning an in-progress event in which Juno manifests speed d_{nec}. The absence of an implicative entailment here follows from the accomplishment structure of E&T constructions noted in the preceding section. This is simply an instance of the *imperfective paradox*: in general, progressive descriptions of accomplishments can be true without entailing their results (*baking a cake* does not entail that a cake was baked; Dowty, 1979). I refer to Hacquard (2005) for the generic case.[13]

These points carry over to the negative imperfective case (25b). If we cancel the negative entailment by claiming the truth of a punctual event of race-winning, we are forced to reinterpret the matrix assertion either progressively or generically. In the former case, the imperfective paradox applies, this time to an ongoing manifestation of speed less than d_{nec}. In the latter, we necessarily interpret the race-winning event as abnormal – Juno is ordinarily not fast enough, but something unusual occurred in the case at hand.

What about English? It turns out that past-tense attributions of exercisable capacities are systematically ambiguous between eventive and stative readings:

(30)   Juno was fast.   → *eventive:* Juno did (something) fast/quickly.
                                 → *stative:* Juno had the capacity do (something) fast/quickly.

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[11]Homer (2011) introduces actualistic coercion to derive *actuality entailments* (Bhatt, 1999), from perfectively-marked ability modals to the realization of their complements. I believe that ACT is more constrained in its output than Homer suggests, but will leave this discussion for future work.

[12]Actualistic coercion seems to be the default for exercisable capacity attributions under perfective marking, but it is not the only possibility. The introduction of an adverbial modifier like *suddenly/soudain* can privilege an inchoative interpretation, which would not entail a manifestation: thus, *Juno a soudain été assez rapide pour gagner la course* is predicted not to entail that Juno won the race.

[13]Under the current proposal, nothing mandates that Juno exercise speed d_{nec}, even in those normal worlds where she has the capacity.

Contexts which privilege the eventive will (defeasibly) activate the E&T sufficiency condition, leading to implicative inferences. This cannot be an entailment, because English never *entails* the eventive reading. Overt cancellation of the complement proposition will force a stative, progressive, or generic interpretation of the main clause. This provides some evidence for the reality of covert aspectual operators in languages like English.

(31) Juno was fast enough to win the race, but ...   *stative:* ...she did not race.
                                        progressive: ...she suddenly twisted her ankle and had to stop.
                                        generic: ...unexpectedly, she did not run at her full speed.

3.3   Managing and doing

Finally, proposal (20) provides an explanation for the difference between implicatives and E&T constructions with respect to implicative entailment in the imperfective. The key point, again, is that E&T assertions are not inherently eventive. Implicative assertions are.

(3a) *Juno était assez rapide pour gagner la course, mais elle n'a jamais gagné.*
       'Juno was-IMPF fast enough to win the race, but she never won.'

(4a) *Juno réussissait à gagner la course, #mais elle n'a jamais gagné.*
       'Juno manage-IMPF to win the race, #but she never won.'

An implicative directly asserts the truth of the causing event. Unlike E&T constructions, this is not immediately compatible with imperfective aspect: the main clause of (4a), for instance, must produce a generic or habitual interpretation. Roughly, this consists of regular instances – across worlds or times – in which the causing event occurs in situations where it is both necessary and sufficient for the complement event.

   This means that in all normal situations (or worlds), Juno wins the race. We predict this to be compatible with the denial of any one particular instance of race-winning, but not with the claim that she *never* won, as in (4a). (3a) is acceptable, on the other hand, because we only require that Juno have the capacity for speed d_{nec} in all normal situations where manifesting this speed is both necessary and sufficient for winning the race. There need not be any such situation in which she actually acted on this capacity.[14]

4   Conclusion

This paper proposes to explain Hacquard (2005)'s data on implicative entailments from perfectively-marked E&T constructions in terms of an underlying causal structure shared with implicative verbs. Independently-motivated aspectual contrasts on certain types of property attributions are recruited to explain the 'optional' quality of E&T implicativity. Specifically, where implicative assertions always assert the truth of a causing event, E&T constructions minimally assert the possibility of such an event. When this possibility is realized, the implicative inference follows, but not otherwise; this accounts for the difference between implicative and E&T assertions in the imperfective as well as in aspectually-unmarked languages.

   A number of questions remain for further investigation. For instance, how does the presupposition of causal sufficiency arise when an E&T matrix predicate and complement are linked by causal necessity? Why is there no parallel sufficiency presupposition when the E&T

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[14]It is worth noting that, in English, *manage* is at best marginally compatible with the progressive. I am not certain if these facts are the same in French, but the account given here would predict this to be the case.

relationship is a deontic (or epistemic) one? The link between exercisable capacities, causes, and the accomplishment structure underlying E&T assertions suggests a broader link between causality and concepts of disposition and ability. Looking ahead, this suggests a role for an implicative-style semantic structure in the longstanding puzzle of actuality entailments (Bhatt, 1999) from perfectively-marked ability modals to the realization of their complements.

References

Baglini, R. & Francez, I. 2016. The implications of managing. *Journal of Semantics* 33, 541–560.

Bhatt, R. 1999. Ability modals and their actuality entailments. In K. Shahin, S. Blake & E.-S. Kim (eds.), *Proceedings of the West Coast Conference on Formal Linguistics*, vol 17, pp. 74–87, Stanford: CSLI.

Bierwisch, M. 1987. Semantik der Graduierung. In M. Bierwisch & E. Lang (eds.), *Grammatische und konzeptuelle Aspekt von Dimensionsadjektiven*, vol 16 of *Studia Grammatica*, pp. 91–286, Akademie-Verlag.

de Swart, H. 1998. Aspect shift and coercion. *Natural Language and Linguistic Theory* 16, 347–385.

Dowty, D. 1979. *Word Meaning and Montague Grammar: The Semantics of Verbs and Times in Generative Semantics and in Montague's PTQ*. Dordrecht: Reidel.

Dowty, D. 1986. The effects of aspectual class on the temporal structure of discourse: semantics or pragmatics. *Linguistics and Philosophy* 9, 37–61.

Hacquard, V. 2005. Aspects of *too* and *enough* constructions. In *Proceedings of Semantics and Linguistic Theory*, vol 15.

Homer, V. 2011. French modals and perfective. In M. Washburn, K. McKinney-Bock, E. Varis, A. Sawyer & B. Tomaszewicz (eds.), *Proceedings of the West Coast Conference on Formal Linguistics*, vol 28, pp. 106–114, Somerville, MA: Cascadilla Press.

Karttunen, L. 1971. Implicative verbs. *Language* 47, 340–358.

Karttunen, L. & Peters, S. 1979. Conventional implicature. In Oh & Dinnen (eds.), *Syntax and Semantics*, pp. 1–56, New York: Academic Press.

Kratzer, A. 1981. The notional category of modality. In H.-J. Eikmeyer & H. Rieser (eds.), *Words, Worlds, and Contexts: New Approaches in Word Semantics*, de Gruyter.

Marques, R. 2012. Covert modals and (non-)implicative readings of *too/enough* constructions. In W. Abraham & E. Leiss (eds.), *Covert Patterns of Modality*, pp. 238–266, Cambridge Scholars Publishing.

Meier, C. 2003. The meaning of *too*, *enough* and *so . . . that*. *Natural Language Semantics* 11, 69–107.

Moens, M. & Steedman, M. 1988. Temporal ontology and temporal reference. *Computational Linguistics* 14, 15–28.

Nadathur, P. 2016. Causal necessity and sufficiency in implicativity. In M. Moroney & J. Collard (eds.), *Proceedings of Semantics and Linguistic Theory 26*, pp. 1002–1021.

Schubert, L. & Pelletier, F. 1989. Generically speaking, or, using discourse representation theory to interpret generics. In G. Chierchia, B. Partee & R. Turner (eds.), *Properties, Types and Meaning*, vol II, Springer.

Schulz, K. 2011. If you'd wiggled A, then B would've changed. *Synthese* 179, 239–251.

Schwarzschild, R. 2008. The semantics of comparatives and other degree constructions. *Language and Linguistics Compass* 2.

von Stechow, A., Krasikova, S. & Penka, D. 2004. The meaning of German *um zu*: necessary condition and *enough/too*. Workshop on Modal Verbs and Modality, handout.