

(Non)factivity and causal inference in evaluative adjective constructions

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1 Overview

Evaluative adjectives are associated with scalar properties:

- Examples (Wilkinson 1970, 1976, Norrick 1978, Fábregas et al 2013):
bold, brave, clever, considerate, crazy, cruel, foolish, generous, humble, kind, mean, nice, noble, polite, rude, selfish, silly, stupid, thoughtful, wise ...
- EAs are *dispositional* (describing *mental propensities*), involving a subjective judgement which can be made on the basis of indirect evidence (cf. Bierwisch 1989, Hurka 2006, Martin 2015, Demonte 2019, a.o.)
- EAs can occur alone in predicate position, or with infinitival complements (focused here on the structure in 1b)
 - (1) a. Feynman was stupid.
b. Feynman was stupid to dance on the table. [EAC]
- (1b) does not entail (1a) (Wilkinson 1970, Barker 2002, Kertz 2006, Oshima 2009, a.o.)

Evaluative adjective constructions (EACs):

- (2) x be ADJ to P ,
where x is an agent, P a one-place predicate, ADJ an evaluative adjective
- (3) Feynman was stupid / bold / foolish / rude to dance on the table.
 \sim *It was stupid / bold / foolish / rude of Feynman to ...*
- Non-evaluative adjectives occur in the same syntactic frame, but differ in their interpretation (Wilkinson 1970, 1976)
 - (4) a. Feynman was glad / content / eager to dance.
ADJ *characterizes attitude towards complement*
b. *It was glad / content / eager of Feynman to dance.

EACs have both **factive** and **implicative** interpretations

- (5) a. Feynman was stupid to dance on the table.
b. Feynman was not stupid to dance on the table.

- **Factive:** canonical (Wilkinson 1970, Barker 2002, Oshima 2009, a.o.)
 - *Entailed: Generalization* relating ADJ, P , x
(5a) → Dancing was stupid (of Feynman)
(5b) → Dancing was not stupid (of Feynman)
 - *Not at-issue: Prejacent* $P(x)$
(5a), (5b) → Feynman danced on the table.
- **Implicative:** less prominent (Karttunen et al 2014, Tonhauser et al 2020)
 - *Entailed: Prejacent* $P(x)$
(5a) → Feynman danced on the table.
(5b) → Feynman didn't dance on the table.
 - *Not at-issue: Generalization* relating ADJ, P , x
(5a), (5b) → Dancing was / would have been stupid.
- The contrast is clearest under negation (since the polarity of the prejacent changes), and seems to be context-sensitive
 - Karttunen et al (2014): selection depends on the *consonance/dissonance* of the generalization
 - Tonhauser et al (2020): selection is wholly determined by the *question under discussion*

Questions:

1. How are the two interpretations related? Why are both available? (Lexical ambiguity, context-sensitivity, repair?)
2. What is the content of the generalization (relative EA), and how is it related to absolute uses of EAs?

- (6) a. Feynman was brave / stupid to dance on the table [relative]
b. ↯ Feynman was brave / stupid [absolute]

3. Why is the factive reading more prominent than the implicative?

- **Today:** suggest characterizations of both readings that rely on a shared **causal generalization** and the **dispositional** (behavior-linked) nature of EAs
- This complicates the relationship between the readings (as compared to Tonhauser et al 2020), but hopefully offers a way forward on Question 3

2 Relative and absolute uses of EAs

Absolute uses of EAs assign persistent properties (propensities, dispositions) to individuals by default, while relative uses attribute temporary or situation-specific properties:

- Relative attributions can be made without the corresponding absolute being true:
 - (7) a. Feynman is smart, but he was stupid to dance on the table.
 - b. Feynman was stupid to dance on the table, but he isn't stupid.
- There is a reading of (8) which sounds contradictory, so the 'absolute' predication can also be used in the temporary sense; EACs don't have an absolute reading
 - (8) Feynman was stupid to dance on the table, but he wasn't (being) stupid.
- Martin (2015) notes something similar with perfective French EACs (but it's not clear that the English and French constructions are exactly parallel)
 - (9) *Elle a été idiote d'inviter son voisin, ??mais elle n'a pas*
 she has be.PP stupid to-invite.INF her neighbor, but she NEG-has NEG
 été idiote.
 be.PP stupid.
 'She was stupid to invite her neighbor, but she wasn't stupid.'
 ~ *She behaved stupidly in inviting her neighbor, but she didn't behave stupidly*
- *Question:* Is the non-persistent reading about an individual? behavior? an event?

EAs belong to a larger class of dispositional (behavioral) predicates which are known to alternate between eventive and stative readings (Goldsmith & Woisetschlaeger 1982, Fernald 1999, Fábregas et al 2013, Martin 2015, a.o.):

- (10) a. Alvin is polite. [characterizes individual]
- b. Alvin is being polite. [characterizes behavior]
- (11) a. Juno was fast (in her twenties). [stative]
- b. Juno was fast (in that race). [eventive]
- (12) a. *Ria était stupide / rapide.*
 Ria was-IMPF stupid / fast.
 Ria was disposed to be stupid / fast. [stative, habitual]
- b. *Ria a été stupide / rapide.*
 Ria was-PFV stupid / fast.
 Ria behaved stupidly / did something fast. [eventive]

- The individual-level vs. stage-level status of EAs has been investigated at length (see especially Fábregas et al 2013)

- Absolute uses tend to pattern with ILPs over SLPs
 - (13) a. There were people drunk / *stupid. [existential constructions]
 - b. I consider Feynman *hungry / brave. [complement of *consider*, *judge*]
 - c. Feynman arrived tired / *rude. [depictives]
- However, EAs pattern with SLPs in counting/quantificational contexts:
 - (14) a. Feynman was often *tall / stupid. [episodic adverb]
 - b. When Feynman is *tall / wise, he is very *tall / wise. [quantification]
- When the context is *episodic* (event-selecting) contexts, they diverge from both ILPs and SLPs:
 - (15) a. She was being *tall / *hungry / stupid. [progressive]
 - b. She was tall / anxious / polite. { * / * / } This happened yesterday.
- **Takeaway:** non-persistent uses of EAs seem to characterize behavior as manifesting a particular (mental) propensity
 - Fernald (1999) suggests that the relationship between stative and eventive uses of dispositional predicates is **evidential** (a form of coercion which applies in episodic contexts; see also de Swart 1998, Homer 2011, 2019, Nadathur 2023a)
 - Eventive uses describe behaviors of the type produced by the stative disposition; they provide evidence for the disposition (and constitute it if repeated with sufficient regularity)
 - (Alternatively, we might take the eventive reading as basic and derive the stative via habitual coercion)
- NB: EACs don't select for relative readings by virtue of eventive prejacent, since stative prejacent also get reinterpreted
 - (16) Feynman was smart to be a physicist.
He was smart to become one.
- **A caveat** (see also Martin 2015 on ADJ-*en* vs. ADJ-*de* in French): it's not clear that EACs treat the prejacent behavior *as* the manifestation of the EA
 - (17) a. Feynman was smart to solve the problem.
Deciding to solve the problem was smart
 - b. Feynman was smart in solving the problem.
The solving process manifested intelligence
- **Tentative conclusions:**
 - Absolute uses of EAs are a type of generic: when the agent is faced with a choice of actions, they tend to pick in a certain way
 - EACs describe instances in which the agent chose an action which aligns with a particular disposition: the evaluative assessment is based on (external, subjective) standards for the outcome

- (5a) Feynman was stupid to dance on the table.
Feynman chose to dance on the table, and dancing on the table was a worse outcome than not dancing
- (18) Sam was smart to buy a ticket.
She chose to buy a ticket, and buying a ticket was a better outcome than not buying a ticket.
- (19) Feynman was rude to dance on the table.
Feynman chose to dance on the table, and dancing on the table is ranked lower than not dancing according to societal norms for good behaviour.

3 Existing approaches to EACs

Two types of analysis for factive EACs:

1. **Non-modal/degree-based generalization** (Barker 2002): asserted content relates individual-event pair $\langle x, P \rangle$ to contextual standard for ADJ

(5a) \sim *Feynman's participation in a table-dancing event was above the contextual standard for positive stupidity*

2. **Modal generalization** (Oshima 2009): asserted content establishes epistemic modal relationship between $P(x)$ and transitory predication of ADJ

(5a) \sim *Feynman dancing provides evidence for his transitory stupidity*

- Both approaches predict non-entailment from EACs to absolute EAs
- The non-modal approach lends itself to a neater account of the factive/implicative alternation (Tonhauser et al 2020), but ...
- ... the modal generalization aligns better with the preceding view of relative EAs, as well as with recent work on **implicativity** (Baglini & Francez 2016, Nadathur 2023)

3.1 The non-modal analysis (Barker 2002)

Main idea: EAs (and other gradable adjectives) are *vague* predicates, potentially licensing both **descriptive** and **sharpening** (metalinguistic) entailments

- Barker's framework is *dynamic*: let C be a context set and \mathbf{d} a *delineation function* specifying standard (\sim POS) value for vague predicate α at world w
- **Absolute** uses of gradable predicates are functions from individuals to updates:

(20) $\llbracket \text{stupid} \rrbracket = \lambda x \lambda C. \{w \in C : w \in \mathbf{stupid}(\mathbf{d}(w)(\llbracket \text{stupid} \rrbracket), x)\}$
Update discards worlds where x does not meet local standard for stupidity

- *Descriptive*: informative about x 's intelligence (if standard is known)
- *Sharpening*: narrows candidates for the standard (if x 's intelligence level is known)
- **Relative** uses (factive EACs) are functions from individual-predicate pairs to updates

(21) $\llbracket \text{Feynman was stupid to dance on the table} \rrbracket$
 $= \lambda C. \{w \in C : w \in \mathbf{stupid}(\mathbf{d}(w)(\llbracket \text{stupid} \rrbracket), F, \llbracket \text{to dance} \rrbracket)\}$
 (Presupposes: $\llbracket \text{to dance} \rrbracket (F)$, sentience, volitionality/discretion)
Filter out worlds where standard is too high for F 's participation in complement event to count as stupid

- Barker's claim: EACs only have sharpening effects, no descriptive entailments¹
- As desired, no entailment from relative to absolute (or vice versa): (20) directly measures individual stupidity, while (21) measures event stupidity
- How can event and individual stupidity be related?

(22) Maybe Feynman was stupid to bluff. (cf. Condoravdi 2008)

a. <i>Stupidity of bluffing known, standard uncertain</i>	[sharpening]
b. <i>Standard known, stupidity of bluffing uncertain</i>	[descriptive]

- Contra Barker, (22b) seems like a plausible reading:
 The stupidity level of action P can be uncertain when it's not clear whether engaging in P leads to a better outcome than doing something else (e.g., $\neg P$)
- **Suggestion**: this makes sense if the relative claim doesn't assess the stupidity of the prejaacent event itself, but rather the stupidity of the individual in *choosing* this course of action over salient alternatives (e.g., not doing the prejaacent)
- Relative stupidity links (active) stupidity to a particular outcome: dancing is the *product* of stupidity

3.2 The modal approach (Oshima 2009)

Main idea: Relative EACs are about inferences based on observed behavior

- Oshima uses a construction grammar framework, so the semantics of the construction is treated as a whole

(23) Feynman was stupid to dance on the table.
Feynman danced, and from this we can infer transitory/non-persistent stupidity

a. <i>Presupposes: danced(F)</i>
b. <i>Asserts: $\Box_{\text{ep}}[\mathbf{danced}(F) \rightarrow (\mathbf{transitorily}(\mathbf{stupid}))(\mathbf{danced})(F)]$</i>

¹Comparative uses of gradable predicates, by contrast, are supposed to have only descriptive effects.

- Relative and absolute uses of EAs pick up on a previously-noted distinction between “essential” (ILP) and “transitory” uses of dispositional predicates (cf. Jespersen 1909, Goldsmith & Woisetschlager 1982, Fernald 1999, ...)

- (10) a. Alvin is polite \sim **polite**(A)
 b. Alvin is being polite \sim (**transitorily**(**polite**))(A)

- **Entailment puzzle:** EACs only invoke transitory EA attributions

- (24) a. Feynman was stupid to dance, but he wasn’t (a) stupid (person).
 b. Feynman was stupid to dance, #but he wasn’t being stupid.

- **A complication** (Martin 2015): the epistemic modal link is too permissive

- (25) *Feynman takes a pill that induces temporary stupidity (in order to avoid being eaten by a monster that only eats clever people*
 ?? Feynman was stupid to take those pills.

– Martin’s solution: tie the (transitory) stupidity to the pill-taking more directly, so that the prejacent *manifests* stupidity

- (26) $\llbracket x$ be ADJ to $P \rrbracket :=$
 $\Box_{\text{ep}}[\forall e[[P(e) \wedge \mathbf{Agent}(x, e)] \rightarrow \exists s[\text{ADJ}(s) \wedge \mathbf{Holder}(x, s) \wedge \mathbf{Manifest}(s, e)]]]]$

- This is close to, but not quite where we ended up before: here the (relative) stupidity is reified in the prejacent
- **Alternatively:** what (23) is lacking is causal directionality. We get this if we treat the transitory EA in an EAC as producing the prejacent behavior.

3.3 The projectivity puzzle

Building on Karttunen (2013), Karttunen et al (2014) describe and experimentally verify the existence of an **implicative** EAC reading alongside the factive one:

- (27) Factive EACs under negation:

- a. Piers Morgan wasn’t brave to take on Brett Lee; he was idiotic.
Morgan took on Lee and doing so wasn’t brave
 b. Feynman wasn’t stupid to dance wildly; he was distracting a spy.
Feynman danced and doing so wasn’t stupid

- (28) Implicative EACs under negation:

- a. I wasn’t stupid to go stumbling through the junkyard in the dark and get hurt.
I wasn’t stupid and (so) I didn’t go stumbling
 b. This is my first trip to Italy, so I wasn’t brave to venture out alone.
I wasn’t brave and (so) I didn’t go out

Tonhauser et al (2020) argue that the ambiguity approach is overcomplicating matters:

- **Key observation:** the prejacent (complement) and generalization associated with an EAC project in complementary distribution with one another

(28b) I wasn't brave to venture out alone in Italy.
Factive: prejacent projects, generalization negated
Implicative: prejacent negated, generalization projects

- **Proposal:** EACs generate two lexical entailments, but which one projects is entirely determined by the *question under discussion*

(21) x be ADJ to P (at time t):
a. Prejacent: $\exists e[P(x)(e) \wedge AT(t, \tau(e))]$
There is an event of x doing P at reference time
b. Generalization: $ADJ(t, P(x), \text{std}(ADJ))$
The degree to which x doing P is ADJ is higher than the contextual standard

- Hypothesis supported experimentally:

1. **E1.** Likelihood of generalization correlates inversely with prejacent projectivity

(22) *Question:* Did Jane call the police?
a. Jane was prank-calling. She wasn't smart to call the police.
b. Jane saw a man with a gun. She wasn't smart to call the police.

2. **E2.** At-issueness of generalization correlates inversely with at-issueness of prejacent

(23) *Question:* Did A answer B's question?
a. A: Jane was stupid to save / waste money.
b. B: Are you sure?
c. A: Yes, I am sure she saved / wasted money.

3.4 Interim summary

- Contra Barker, EACs do seem to have descriptive entailments: this leads to the view on which EA is measured in a choice between actions

(9) Maybe Feynman was stupid to bluff.
Whether or not his decision to bluff counts as stupid depends on quality of outcome vs. alternatives

- Martin's revision to the modal analysis also indirectly suggests a causal link from transitory EAs to prejacent:

(5a) Feynman was stupid to dance on the table.
Feynman's dancing is the result of being stupid

- Karttunen et al's approach to the alternation links both factive and implicative readings to modal generalizations, but gives up on a unified treatment
- Tonhauser et al's account does offer an elegant unification, but brings back the problem of relative stupidity (evaluated directly at event)
- If projectivity is fully context-determined, why is the factive reading more prominent?

4 Implicatives invoke a causal generalization

Adopting the Tonhauser et al approach means that on the implicative reading, EAs contribute only to the not at-issue content of the EAC:

- This evokes Karttunen & Peters (1979) treatment of *manage*:
 - (24) a. Feynman managed to solve the riddle.
asserts: Feynman solved the riddle.
presupposes: It was difficult/effortful for Feynman to solve the riddle.
 - b. Feynman didn't manage to solve the riddle.
asserts: Feynman didn't solve the riddle.
presupposes: It was difficult/effortful for Feynman to solve the riddle.
- This approach faces a number of challenges (Baglini & Francez 2016, Nadathur 2023b):
 - Pinning down the presuppositional content has been tricky: inferences of difficulty, unexpectedness, intention can all be denied
 - (25) a. Reznor won a CMAA without even trying.
 - b. Without intending to, you've managed to insult him.
 - c. Feynman easily managed to solve the riddle.
 - d. Bolt managed to win the race, as expected.
 - *Because*-modification diverges between implicative and complement, suggesting that the implicative asserts something about the complement's **cause** (Baglini & Francez 2016)
 - (26) a. I managed to buy the ring because it was cheap.
 - b. I bought the ring because it was cheap.
- Less bleached implicatives help clarify the division of labour:
 - (27) a. Morgan dared to enter the cave.
asserts: Morgan was daring (acted bravely)
presupposes: bravery was causally necessary/sufficient to enter the cave.
assertion + presupposition: Morgan entered the cave (due to bravery)

- b. Morgan didn't dare to enter the cave
entails: Morgan wasn't daring (didn't act bravely)
presupposes: bravery was causally necessary/sufficient to enter the cave.
assertion + presupposition: Morgan did not enter the cave (due to lack of bravery)

(28) **Proposal** (Nadathur 2023): $\text{IMPL}(x, P)$

presupposes: some action A (lexically associated with the main verb) is causally necessary and sufficient for $P(x)$ $\square_{\text{CAUS}}[A(x) \leftrightarrow P(x)]$

asserts: $A(x)$

- Applying this idea to the EA construction, we'd get something like this:

(5a) Feynman was stupid to dance on the table.

\sim *Being stupid caused Feynman to dance on the table.*

asserts: Feynman was stupid (chose stupidly).

presupposes: Choosing stupidly was causally necessary and sufficient for dancing on the table.

(5b) Feynman wasn't stupid to dance on the table.

\sim *Not being stupid caused Feynman to avoid dancing*

asserts: Feynman wasn't stupid (didn't choose stupidly)

presupposes: Choosing stupidly was causally necessary and sufficient for dancing on the table.

- The **causal generalization** which underlies implicative verbs forces a “transitory” (eventive) interpretation of the EA:
 - Compositionally speaking, the causal link between matrix and complement might be introduced by *to* (cf. von Stechow et al 2004)

$$(29) \quad \llbracket \text{to}_{\text{CAUS}} \rrbracket := \lambda P \lambda Q_{\text{eventive}} \lambda x. \square_{\text{CAUS}}[Q(x) \leftrightarrow P(x)]$$

5 Proposal, open issues

We've settled on a similar **event-causal generalization** relevant for both readings of EACs:

(30) **EAC generalization:**

$$\square_{\text{CAUS}}[\text{INST}(\text{ADJ}(x) \leftrightarrow P(x))],$$

where INST picks out an event/action manifesting ADJ

- There are two other inferences floating around: $\text{INST}(\text{ADJ}(x)), P(x)$
- Following Tonhauser et al (2020), the context determines what is *at-issue*²

²Prosodic focus on a lexical implicative can privilege a factive reading, even though the generalization is usually not at-issue:

- (1) Morgan didn't DARE to enter the cave, she wasn't even scared.

- **Factive** readings arise when $P(x)$ is given/established. In this case (30) must be asserted, and $\text{INST}(\text{ADJ}(x))$ follows as a ‘backwards’ causal inference.
 - (31) a. (5a): *Feynman danced + Being stupid was necessary/sufficient to dance on the table* \rightarrow Feynman was being stupid
 - b. (5b): *Feynman danced + It’s not the case that being stupid was necessary/sufficient to dance on the table* \rightarrow It’s not the case that Feynman was being stupid
- **Implicative** readings arise when $P(x)$ is not established. In this case, (30) is backgrounded, EAC asserts $\text{INST}(\text{ADJ}(x))$
 - (32) a. (5a): *Being stupid was necessary/sufficient to dance on the table + Feynman was being stupid* \rightarrow Feynman danced on the table.
 - b. (5b): *Being stupid was necessary/sufficient to dance on the table + Feynman was not being stupid* \rightarrow Feynman didn’t dance on the table.
- This unifies the two readings around a shared generalization, but is not as neat as the Tonhauser et al picture, since what’s asserted and presupposed don’t simply swap between the two readings
- **Question:** Why is the factive reading more prominent than the implicative one (esp. given the similarity to implicative verbs)?
- **Preliminary answer:** EACs tend to be used in contexts where the preadjacent is established because EA behavior is not directly observable. Instead, EA behavior is indirectly inferred based on an assessment of the observed results: in factive EACs, the speaker uses a link between the EA and the observed outcome to justify the relative attribution
- The effect is specific to EAs, which describe internal (mental) dispositions: other dispositional predicates don’t privilege the factive reading
 - (33) Ria was / was not quick to answer the question.
- (Factive) EACs presuppose a choice between ranked outcomes (cf. Condoravdi 2008):
 - (34) a. ??Ria has no choice but to sing, but she’ll be stupid to do it.
 - b. ??Feynman was stupid to cough involuntarily
 - c. #Whatever he does, he’ll be stupid to do it.
- At least in factive readings, the ‘evidential’ behavior licensing the EA attribution is a **mental action**, identified with the choice to realize $P(x)$ over a differently-rated alternative (minimally, $\neg P(x)$)