

# Causal Necessity and Sufficiency in Implicativity

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## Abstract

Karttunen’s (1971) **implicative** verbs are notable for generating inferences over the truth-values of their complements. English *manage to X*, for instance, entails the truth of *X*; this entailment reverses with upstairs negation, and appears to be tied to the (somewhat elusive) presuppositional contribution of the implicative verb (Coleman 1975). Building on Baglini & Francez’s (2015) treatment of *manage*, and drawing heavily on implicative data from Finnish, I propose an account of implicatives which links the (lexical) presuppositional content of an implicative verb to the complement inferences via a model of causal necessity and sufficiency between propositions (cf. Schulz’s 2011 **causal entailment**). The proposed causal framework also provides a natural explanation (in terms of circumscription or pragmatic **exhaustive interpretation**; Schulz & van Rooij 2006) for the commonalities between implicatives like *manage* and weaker one-way implicatives (e.g. Finnish *jaksaa*=‘have strength to’), which entail their complements under one upstairs polarity and strongly implicate the reverse complement value under the other.

Complement-taking implicative verbs (Karttunen 1971) are of interest *vis a vis* the semantics-pragmatics interface due to the systematic inferences they generate over the truth-values of their complements. These rely heavily on contextual input for felicity and support. Using data from Finnish and English, I argue that the varying inferential patterns of implicatives (see 1-4) can be unified by backgrounding them in causality. Recent work on counterfactual conditionals demonstrates the importance of causal frameworks for modeling linguistically relevant notions of consequence and entailment (Schulz 2011, Kaufmann 2013); I show that causal necessity and sufficiency also underlie the lexical semantics of the implicative class.

Implicatives imply the truth or falsity of their complements under a given polarity in the upstairs clause. They differ from presupposition-triggering *factives* (Kiparsky & Kiparsky 1970) in that reversing upstairs polarity also reverses the implication. While the dual entailment pattern of *two-way* implicatives (1-2) can be realized under varying assumptions about the assertion/presupposition division of labour, an account which captures the commonality between two-way and weaker *one-way* implicatives (3-4) has so far been lacking. Crucially,

(3-4) entail their complements under only one polarity; the inference generated in the reverse direction is (at most) an implicature. I argue that incorporating a model of causal entailment provides a uniform semantic analysis of the assertive content of implicatives, while providing a presupposition-based view of the differences between one- and two-way predicates.

- (1)a. Hän **onnistu-i** kuitenkin pakenema-an. (1)b.  $\vdash$  *He fled.*  
 he.NOM succeed-PST.3sg however flee-3INF.ILL  
 He **managed** to flee. (lit: *He succeeded in fleeing.*)
- (2)a. Hän e-i **onnistu-nut** kuitenkin pakenema-an. (2)b.  $\vdash$  *He did not flee.*  
 he.NOM neg-3sg succeed-PP.sg however flee-3INF.ILL  
 He did not **manage** to flee. (lit: *He did not succeed in fleeing.*)
- (3)a. Hän **jakso-i** noust-a. (3)b.  $\nVdash$  *He rose.*  
 he.NOM have.strength-PST.3sg rise-INF ( $\leadsto$  *He rose.*)  
 He **was strong enough** to rise. (lit: *He had the strength to rise.*)
- (4)a. Hän e-i **jaksa-nut** noust-a. (4)b.  $\vdash$  *He did not rise.*  
 he.NOM neg-3sg have.strength-PP.sg rise-INF  
 He **was not strong enough** to rise. (lit: *He did not have the strength to rise.*)

Baglini & Francez’s (2015) novel approach to the implications of *manage* builds on Schulz’s (2011) framework for causal entailment. I extend and modify this proposal to handle implicatives as a class. Broadly, an implicative utterance  $I(X)$ , with implicative  $I$  and complement  $X$ , invokes as a contextual parameter a causal background (or *dynamics*; cf. Schulz) for the occurrence of  $X$ . The inferences in (1b-4b) are produced by the joint effect of presupposition invoked by the lexical content of  $I$ , and assertion over the causal structure for  $X$ .

**Background.** Given the entailments (1-2), the central question for two-way implicatives is what blocks the “unacceptable conclusion” that (1a-b) are logically equivalent (Karttunen). Using Schulz’s entailment model, Baglini & Francez claim that *manage to X* (a) presupposes the realization of a *causally necessary but insufficient situation* (or *catalyst*) for  $X$ , and (b) asserts that this situation *actually caused X* (or failed to, for utterances of *did not manage to X*). As anticipated by Karttunen, the non-equivalence of (1a-b) is captured via presupposition; felicity conditions for *manage to X* are not always met in situations verifying  $X$ . The required entailments are derived via the actual cause, the upshot of which is to specify whether  $X$ ’s truth-value agrees or disagrees with the catalyst’s. Since the catalyst is presupposed to obtain, the assertion of actual cause simply sets the value of  $X$  to either 0 or 1, depending on upstairs polarity.

Baglini & Francez use their proposal’s causal backbone to explicate some additional puzzles that have been associated with *manage*, such as (a) that the presupposition can variously appear to be of the effort, difficulty, or unlikelihood of realizing  $X$  (5P1-P3; Coleman 1975), and (b), that *because*-clauses modifying *manage*-sentences are interpreted differently than those modifying assertions of  $X$  (6; Karttunen). (5) is explained pragmatically by the contextual development of the dynamics; (6) is attributed to the fact that (6a)’s assertion is over the causal chain leading to  $X$ , rather than directly over  $X$ ’s truth.

(5) Solomon **managed** to build the temple.

P1 *Solomon attempted to build the temple.*

P2 *Temple-building was difficult (for Solomon).*

P3 *Solomon's building a temple was unlikely.*

(6)a. John **managed** to buy the ring because it was cheap.  $\rightsquigarrow$  *The low cost enabled him.*

(6)b. John bought the ring because it was cheap.  $\rightsquigarrow$  *The low cost motivated him.*

**Issues.** Several issues arise in extending this approach to other implicatives. The presupposition of a realized catalyst and the notion of actual cause are challenged by the existence of implicatives which are more specific as to the content of the background for their complements (e.g. Finnish *hennoa*, 7-8). These verbs invoke a particular attribute as required for the occurrence of  $X$  and suggest that it is crucially the presence or absence of this attribute that determines the truth value of  $X$ , rather than varying realization of a causal relationship.

(7)a. Hän **henno-i** tappa-a kissa-n. (7)b.  $\vdash$  *He killed the cat.*

he.NOM have.heart-PST.3s kill-INF cat-GEN/ACC

‘He had the heart to kill the cat.’

(8)a. Hän e-i **henno-nut** tappa-a kissa-a. (8)b.  $\vdash$  *He did not kill the cat.*

he.NOM neg-3s have.heart-PP.sg kill-INF cat-PART

‘He did not have the heart to kill the cat.’

Additionally, Baglini & Francez’s proposal cannot accommodate the existence of one-way implicatives, with associated inferential pattern (3-4) (e.g. Finnish *tarjeta*(=be warm enough), English phrasal *be smart enough*). Taken together, the effect of catalyst and actual cause enforces the dual entailment pattern in (1-2). In order to eliminate the positive-polarity entailment while maintaining the proposal for *manage* as it stands, we are forced to conclude that both the presuppositional and asserted content of one-way implicatives differs substantively from that of two-way predicates. Given the commonalities between the two subclasses (particularly as evidenced by the rich data available in Finnish), an account which forces the conclusion that one- and two-way verbs are semantically unrelated seems undesirable.

**Proposal.** In my modified account, all implicative verbs are taken to presuppose the existence of a causally necessary ancestor  $Y$  (propositional variable or finite set thereof) for their complement  $X$ .  $Y$  is tied to the lexical content of the implicative  $I$ : e.g., in (7-8)  $Y$  is concerned with “having (enough) heart” (or resoluteness). Crucially, the truth-value of  $Y$  is presumed *unresolved* in the discourse context. The assertion of an implicative statement  $I(X)$  simply resolves the value of  $Y$ . A positive utterance sets  $Y = 1$ , while a negative utterance sets  $Y = 0$ . As a consequence of the relationship between  $X$  and  $Y$ , the truth-value of  $X$  is then determined via causal entailment, rather than direct assertion.

This captures the behaviour of one-way implicatives. Setting  $Y = 0$  via an utterance of  $\neg I(X)$  forces the entailment that  $X = 0$ , generating the pattern in (4). On the other hand, setting  $Y = 1$  (in a positive implicative assertion) is insufficient to determine a value for  $X$ , so we avoid entailment in (3).

On my proposal, the critical difference between one- and two-way implicatives is that two-way implicatives (1-2, 7-8) additionally presuppose that the ancestor  $Y$  is causally sufficient for  $X$ . The presupposition of sufficiency means that  $Y = 1$  causes  $X = 1$ , completing the positive polarity entailment. Omitting this presupposition in the one-way case generates the desired pattern from (3-4) as described above.

**Consequences and outlook.** By building the lexical semantics of implicatives on causal entailment, I capture the empirical differences between one- and two-way predicates while providing a uniform account of their assertive contribution. I preserve Baglini & Francez’s causal explanation for Coleman’s “vanishing” presuppositions, as well as for Karttunen’s observations on adverbial modification. This approach also has the advantage of extending easily to the special case of polarity-reversing implicatives also described by Karttunen; examples include English *fail to* and Finnish *laiminlyödä* (=neglect to). In these cases, the implicative contributes the information that the specified ancestor  $Y$  is causally necessary for  $\neg X$ ; all other relationships remain the same.

Finally, my proposal offers a natural explanation of the observation that in many contexts one-way implicatives generate strong implicatures to the truth of their complements in the non-entailing polarity (see 3b; Karttunen 2012). I argue that these implicatures are connected to the well-known phenomenon of *conditional perfection* (Geis & Zwicky 1971), wherein a statement of the form *If P, then Q* is taken to convey that *Q if and only if P*. Here, a sufficient condition is strengthened to a necessary and sufficient one; the reverse happens with one-way implicatives. I argue that the “biconditional” implicature is generated in contexts where the speaker is expected to provide complete information regarding the occurrence of the consequent event ( $Q$  in the conditional,  $X$  in an implicative), or to mention all relevant conditions for the occurrence of this event (cf. pragmatic *exhaustive interpretation*; Groenendijk & Stokhof 1984, Schulz & van Rooij 2006). Broadly, then, this account shows that the intimate relationship between causality and consequence that is relevant to counterfactuality and conditionality is also central to linguistic inference and entailment beyond the domain of explicitly conditional semantics.

## References

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