



Implicative verbs

Finnish & English implicatives generate inferences over their complements (Karttunen 1971):

- (1) a. Hän **onnistu-i** kuitenkin pakenema-an.
he.NOM succeed-PST however flee-3INF.ILL
- b. He **managed** to flee.
- c. \vdash He fled.

The inference reverses with upstairs negation:

- (2) a. Hän ei **onnistu-nut** kuitenkaan pakenema-an.
he.NOM neg succeed-PP however flee-3INF.ILL
- b. He didn't **manage** to flee.
- c. \vdash He didn't flee.

Goal: capture the desired entailments, but avoid the conclusion that (1a) \equiv (1c).

The role of presupposition

Implicatives I carry **presuppositions**; their complements X do not (Karttunen):

- (1b) He **managed** to flee. (1c) He fled.
P: *Fleeing was difficult* P: *Fleeing was difficult*

Crucially: $I(X)$ conditions X on the lexical presuppositions of I .

I 's presuppositions block (i), but allow (ii)-(iii):

- (i) $X \not\vdash I(X)$ (ii) $I(X) \vdash X$ (iii) $\neg I(X) \vdash \neg X$

Causal dependence

Baglini & Francez's (2015) insight:
The relationship between an implicative's presuppositions and its complement is one of **causal dependence**.

Their proposal: $manage(X)$

- a. presupposes a *causally necessary but insufficient catalyst* C for X
- b. asserts that C *actually caused* X in context

Causal necessity and sufficiency are defined via **causal entailment** (Schulz 2011):

- o a **dynamics** D represents causal relationships between propositions P ; a function F determines the value of a variable from its causal ancestors
- o a **situation** is an assignment of propositions to the values $\{0, 1, \text{undetermined}\}$
- o an **operator** τ_D calculates immediate causal consequences of a situation s

A set of literals Σ **causally entails** ϕ in D ($\Sigma \models_D \phi$) if $\phi = 1$ is a consequence of iterative applications of τ_D to the situation $\Sigma = 1$.

- o C is **causally necessary** X iff $\neg C \models_D \neg X$
- o C is **causally sufficient** for X iff $C \models_D X$

Some complications

Presupposing a **causally necessary** but **insufficient** factor C gets us inferences (i)-(iii) for $I = manage$:

- (i) X doesn't presuppose C , so we can't conclude $I(X)$
- (ii) $I(X)$ presupposes $C = 1$ and asserts $C = X$, so $X = 1$
- (iii) $\neg I(X)$ presupposes $C = 1$ and asserts $C = \neg X$, so $X = 0$.

BUT: if C is insufficient for X , and $I(X) \vdash X$, X must have a independent causal ancestor Y (or set) that suffices in context. Y must be false in assertions of $\neg I(X)$.

- o this works with $manage$'s variable presuppositions: effort, difficulty, unlikelyhood (cf Coleman 1975)
- o it doesn't work for attribute-specific Finnish examples (3-6) which presuppose a crucial attribute that apparently *determines* X
- o additionally, entailments (i) and (ii) must hold: we cannot account for the weaker inference pattern of *one-way implicatives* (7-8), but Finnish data prompt a unified account

Proposal

Causal dependence underlies implicativity:
 $I(X)$ backgrounds causal dependence of complement X on a prerequisite Y lexically presupposed by I .

An utterance $I(X)$ with dynamics D :

- i. presupposes the existence of an *unresolved causal prerequisite* Y for X
 Y is **necessary** for X : $\neg Y \models_D \neg X$
- ii. asserts that Y holds in context ($Y = 1$)
 $\neg I_{1,2}(X)$ asserts $Y = 0$
- iii. Two-way implicatives I_2 additionally presuppose Y 's **sufficiency** for X :
 $Y \models_D X$ in context

Supporting evidence

When a non- Y prerequisite is left open, two-way I_2 (cf 4) are infelicitous:

A hunter had lost track of whether he had fired all of his bullets. He put his gun down to get some food, planning to check after eating. While both hands were in his pack, he saw a bear coming towards him. #Hän ehti ampuu karhun.

There is no such problem for one-way I_1 (cf 7):

- (9) Hän **jaksoi** nousta, mutta päätt-i sitä vastaan.
... , but decide-PST he.PART against.ILL
'He had strength to rise, but chose not to.'

Data from Finnish: Two-way (I_2) and one-way (I_1) implicatives

Two-way I_2	Presupp	Example $I(X)$	Ent/Impl
ehtiä <i>have.time</i>	X needs time	(3) Hän eht-i ampu-a karhu-n. he.NOM have.time-PST shoot-INF bear-GEN/ACC 'He had time to shoot the bear.'	\vdash He shot the bear.
		(4) Hän ei ehti-nyt ampu-a karhu-a. he.NOM neg have.time-PP shoot-INF bear-PART 'He didn't have time to shoot the bear.'	\vdash He didn't shoot the bear.
hennoa <i>have.heart</i>	X needs resolve	(5) Hän henno-i tappa-a kissa-n. he.NOM have.heart-PST kill-INF cat-GEN/ACC 'He had the heart to kill the cat.'	\vdash He killed the cat.
		(6) Hän ei henno-nut tappa-a kissa-a. he.NOM neg have.heart-PP kill-INF cat-PART 'He didn't have the heart to kill the cat.'	\vdash He didn't kill the cat.
One-way I_1			
jaksoa <i>have.strength</i>	X needs strength	(7) Hän jakso-i nousta-a. he.NOM have.strength-PST rise-INF 'He had strength to rise.'	$\not\vdash$ He rose. \rightsquigarrow He rose.
		(8) Hän ei jakso-nut nousta-a. he.NOM neg have.strength-PP rise-INF 'He didn't have strength to rise.'	\vdash He didn't rise.

Consequences of the proposal:

If implicative I lexically presupposes prerequisite Y ...

- We get the desired inferences:**
 - (i) X alone does not invoke Y , so $X \not\vdash I(X)$
 - (ii) $I(X)$ sets $Y = 1$:
- if $I = I_1$, we get nothing more
- if $I = I_2$, we have $Y \models_D X$, so $X = 1$ and $I(X) \vdash X$
 - (iii) $\neg I(X)$ sets $Y = 0$:
- for any I , $\neg Y \models_D \neg X$ gives $X = 0$ and $\neg I(X) \vdash \neg X$
 - We predict implicatures on I_1 :**
 - o $I_1(X)$ presupposes Y as a prerequisite for X
 - o reasoning about speaker choice may implicate Y is the *only* prerequisite, yielding sufficiency in context
 - o the circumscriptive reasoning recalls *conditional perfection* (Geis & Zwicky 1971).
 - We can account for polarity-reversing implicatives $I-$:**
 - (10) He **neglected** to fix the tap.
 \vdash He did not *fix* the tap.
 - (11) He didn't **neglect** to fix the tap.
 \vdash He did *fix* the tap.
- Either (a) or (b), along with (c):
(a) $I-$ holds Y is necessary for $\neg X$
(b) $I-$ holds $\neg Y$ is necessary for X
(c) two-way $I-$ adds sufficiency

Outlook & Questions

- o how do the differences between one- and two-way implicatives arise?
- o some I_1 show variable implicative- or factive-type implicatures; does this relate to "factive" variability (e.g. *be lucky to X*; Karttunen 2014)?
- o implicative inferences resemble the **actuality entailments** of ability modals (Bhatt 1999, Hacquard 2009); can the latter also be accounted for by causal dependence?