Negative polarity items and *even*

1 Polarity items

Some *Negative Polarity Items* (NPIs) from Ladusaw (1979):

(1) a. * John has talked to *any* of the students.

b. ✓ John **hasn't** talked to *any* of the students.

(2) a. * Someone has arrived *yet*.

b. ✓ **No one** has arrived *yet*.

(3) a. * Mary thinks that she has *ever* insulted anyone.

b. ✓ Mary **doesn't** think that she has *ever* insulted anyone.

NPIs seem to be dependent on a *licensor*, which in the examples above is negation (in bold).

> "[Negative-polarity-dependency] is a feature which must be associated with members of a wide variety of syntactic categories: determiners (*any*), sentence adverbs (*yet*, *ever*), verb phrases (*lift a finger*), intransitive verbs (*budge*), transitive verbs (*faze*), and perhaps, modals (*need*, *dare*) and particles (*either*)." Ladusaw (1979, p. 168)

There are also so-called *Positive Polarity Items* (PPIs; or in Ladusaw, *Affirmative Polarity Items*), but we won't worry about them here.

(4) ***Someone/something* is a PPI:**
I didn't read *something* for class.

a. = There is something that I didn't read for class. $\exists$ > not

b. ≠ It's false that [I read something for class]. not > $\exists$

(5) **The relative position of the licensor and NPI matter:**

a. * *Anything*, I **didn't** read ___.

b. * *Anyone* **didn't** read the book.

Hypothesis 1: NPIs must be in the scope of negation.
This hypothesis is clearly wrong for many NPIs. For one, we would have to decompose licensors like *refuse* into *not agree*. But why not decompose *agree* into *not refuse*?

(6) Ladusaw (1979, p. 102):

a. John **refused** to eat *any* of the bagels.

b. * John agreed to eat *any* of the bagels.

c. John **didn't** agree to eat *any* of the bagels.

Even more problematic is that NPIs are licensed in some constructions which do not obviously involve negation at all:

(7) Chierchia (2013, p. 21) :

a. * If you visit Sienna, you should *ever* try homemade ricciarellis.

b. If you *ever* try homemade ricciarellis, you will become addicted.

c. * Everyone who visited Sienna *ever* ate homemade ricciarellis.

d. Everyone who *ever* ate homemade ricciarellis became addicted.

Hypothesis 2: NPIs are licensed in *downward-entailing* (DE) environments (Ladusaw, 1979, following work by Gilles Fauconnier and Janet Fodor).

(8) **Upward-entailing:**

Someone read (at least) one article

⇐ Someone read (at least) two articles

⇐ Someone read (at least) three art's...

(9) **Downward-entailing (DE):**

No one read (at least) one article

⇒ No one read (at least) two articles

⇒ No one read (at least) three articles...

Intuition: (Many) NPIs pick out the *lowest* point on a scale, which is the hardest to satisfy, and say, "even THAT point is true." (We will return to this intuition later.)

DE-ness is not a property of entire sentences. It is a property of functions of sets. Ladusaw gives the following general definition:

(10) δ is downward-entailing iff $\forall X \forall Y \left[X \subseteq Y \rightarrow \left[\delta(Y) \left\{ \begin{matrix} \rightarrow \\ \subseteq \end{matrix} \right\} \delta(X) \right] \right]$

We can think of quantificational determiners (type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle$) as taking two set-type arguments, so we want to test them independently.

(11) **"Subset" relations between predicates:**

λx_e . x is a good father

$\supseteq \lambda x_e$. x is a father

$\supseteq \lambda x_e$. x is a man...

(12) **The restrictor of *every* is DE:**

Every man is mortal.

⇒ Every father is mortal.

⇒ Every good father is mortal...

(13) **The nuclear scope of *every* is not DE:**

Everyone who applied for this program is a man.

$\not\Rightarrow$ Everyone who applied for this program is a father.

$\not\Rightarrow$ Everyone who applied for this program is a good father...

Hypothesis 2 predicts that NPIs are possible in the restrictor of *every* but not its scope (7c–d).

Exercise: Which of these quantifiers are DE in their restrictor (A)? In their scope (B)?

(14)
a. $a/some(A)(B) = 1$ iff $A \cap B \neq \emptyset$

b. $no(A)(B) = 1$ iff $A \cap B = \emptyset$

c. $exactly\text{-}two(A)(B) = 1$ iff $|A \cap B| = 2$

d. $less\text{-}than\text{-}five(A)(B) = 1$ iff $|A \cap B| < 5$

e. $at\text{-}least\text{-}five(A)(B) = 1$ iff $|A \cap B| \geq 5$

f. $not\ all(A)(B) = 1$ iff $A \setminus B \neq \emptyset$

We can also check DE-ness for other set-like types, like intensions ($\langle s, t\rangle$):

(15) **"Subset" relations between intensions:**

λw . I read at least one article in w

$\supseteq \lambda w$. I read at least two articles in w

$\supseteq \lambda w$. I read at least three articles in w...

(16) **Conditional clauses are downward-entailing:**

If I read at least one article, I will pass the class.

$\Rightarrow$ If I read at least two articles, I will pass the class.

$\Rightarrow$ If I read at least three articles, I will pass the class. ...

(17) **The *consequent* clause of a conditional is not downward-entailing:**

If Bill is a good student, he will read at least at least one article.

$\not\Rightarrow$ If Bill is a good student, he will read at least at least two articles.

$\not\Rightarrow$ If Bill is a good student, he will read at least at least three articles. ...

Hypothesis 2 predicts that NPIs are possible in conditional clauses but not in their consequent clauses (7a–b).

Negation is a common licensor, simply because it flips entailment relations and can create downward-entailing environments.

Strong NPIs:

Note that some NPIs (so-called strong NPIs) really require a licensing negation (Hypothesis 1) and DE-ness is insufficient. See for example English *in weeks*:

(18) Chierchia (2013, p. 213–215):

a. * John saw Mary *in weeks*.

b. John didn't see Mary *in weeks*.

c. * If John has seen Mary *in weeks*, he will be upset.

d. * Less than five students have seen me *in weeks*.

e. * Every person who has seen Mary *in weeks* is upset with her.

2 *Even*

Another expression that cares about scales and entailment is *even*. (Fauconnier (1975) is credited with first making this connection between *even* and NPIs.)

Even, like *also* and *only*, is a focus-sensitive operator in English. Like *only*, it can appear as an adverb or attaching closer to the focus.

(19) a. Alex even took the TURTLE to school. *adverb even*

b. Alex took even the TURTLE to school. (=a) *constituent even*

(20) Alex even took the turtle to SCHOOL. (≠19a,b)

(21) Alex took the $[\text{turtle}]_F$ to school.

Prejacent proposition: Alex took the turtle to school.

Focused constituent: turtle

Alternatives to "turtle": frog, pig...

Alternative propositions: Alex took the *frog* to school, Alex took the *pig* to school...

even: the prejacent proposition "Alex took the turtle to school" was *less likely* than the alternative propositions, e.g. "Alex took the frog to school," "Alex took the pig to school"..., but the prejacent is nonetheless true.

(22) **A basic definition for *even*:**[1]

$$\left[\!\left[\; even \quad \alpha_t \; \right]\!\right] = 1 \iff [\![\alpha]\!]^o = 1$$

Presupposition: $\forall p \in [\![\alpha]\!]^f \left[p \neq [\![\alpha]\!]^o \rightarrow [\![\alpha]\!]^o <_{\text{likely}} p \right]$

How do we compute $p <_{\text{likely}} q$ for p and q of type t? We can do this using the intensions of p and q, of type $\langle s, t \rangle$.

[1]*Even* might also introduce an *additive* presupposition, that one of the non-prejacent alternatives is true, just like *also*. But we'll ignore that here.

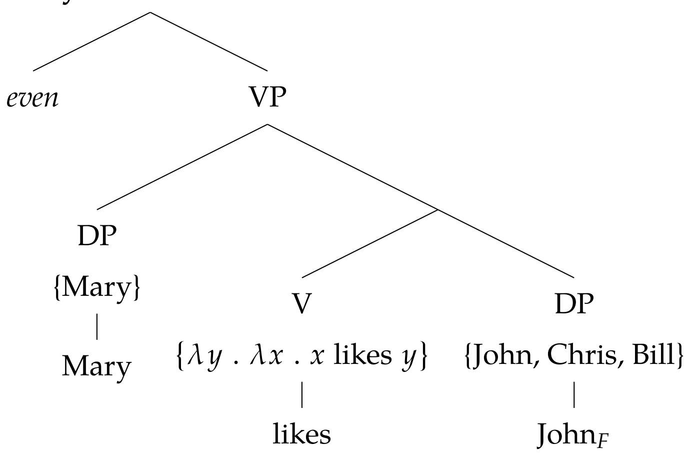
(23) **A more formal definition for *even*:**

$$\left[\!\left[\, even \quad \alpha_{\langle s,t \rangle} \, \right]\!\right]^{w} = 1 \iff [\![\alpha]\!]^{o}(w) = 1$$

<u>Presupposition:</u> $\forall p \in [\![\alpha]\!]^{f} \left[p \neq [\![\alpha]\!]^{o,w'} \rightarrow \left| \left\{ w'' : [\![\alpha]\!]^{o}(w'') \text{ true} \right\} \right| < \left| \{ w''' : p(w''') \text{ true} \} \right| \right]$

Here we measure "likelihood" by the number of worlds where each alternative is true.[2]

(24) **A toy LF for in-situ focus association:**



Exercise: Let's compute this.

3 Using *even* to explain negative polarity items

Notice that with minimizer NPIs, we can explicitly add an *even* (Heim, 1984):

(25) a. * He *lifted a finger*.

b. He **didn't** (even) *lift a finger*.

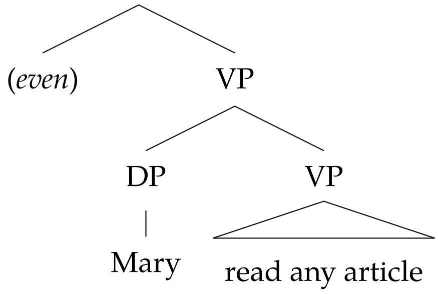
Idea: (Some) NPIs are indefinites which have a requirement that they associate with a (possibly covert) *even* (Heim, 1984; Lee and Horn, 1994; Lahiri, 1998, a.o.).

(26) $[\![\text{read } \textit{any} \text{ article}]\!]^{o} = \lambda x_e \, . \, x$ read (at least) one article

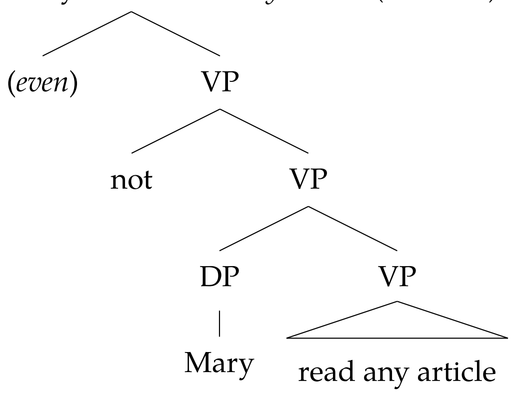
(27) $[\![\text{read } \textit{any} \text{ article}]\!]^{f} = \left\{ \begin{array}{l} \lambda x_e \, . \, x \text{ read (at least) one article,} \\ \lambda x_e \, . \, x \text{ read (at least) two articles,} \\ \lambda x_e \, . \, x \text{ read (at least) three articles} \end{array} \right\}$

[2]This treatment intuitively makes sense, but is non-standard, because it's not clear whether we can really count possible worlds, which may be infinite.

(28) * Mary read *any* article (for class).



(29) Mary **didn't** read *any* article (for class).



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