Course information

- Negative Polarity Items and related phenomena
- Presentation and final paper

Plan for today

- Entailment and entailment-reversal
- The Condition: environments vs. operators
- Case studies: Interfering non-monotone quantifiers; so-called negated DPs

An initial paradigm

Any has a more restricted distribution than certain other determiners (say, *a, every*).

(1) a. Mary did *(not) read any book.
    b. Mary {*often/rarely} read any book.

(2) Every student who read any book ate (*any) chocolate.

Some other expressions have more or less the same distribution as *any*, say, *(even) a single book*, though this comes apart in some environments (e.g., the restrictor of *every*)

(3) %Every student who read (even) a single book ate chocolate.

Yet other expressions have more or less the opposite distribution, say, *almost every*, though complementarity may not hold in all environments (e.g., the restrictor of *every*, where both *any* and *almost every* are acceptable; cf. Spector 2014)

(4) a. Mary did (*not) read almost every book.
    b. Mary {often/*rarely} read almost every book.

(5) Every student who read almost every book ate chocolate.

Standard tasks

- Provide a descriptive generalization of when an *any*-DP is acceptable.
- Provide an explanation of this generalization.

(We will focus primarily on *any* in the course. See below for some discussion of *almost*.)

Getting at the relevant representations

Existential vs. universal quantification (e.g., esp., Ladusaw 1979)

(6) a. Candidate 1: $[\![\text{any}]\!] = [\![\text{a}]\!] = \lambda P.\lambda Q.\ \exists x(P(x) \wedge Q(x))$
b. Candidate 2: $[\![\text{any}]\!] = [\![\text{every*}]\!] = \lambda P.\lambda Q.\ \forall x(P(x) \rightarrow Q(x))$

(7) John didn't read any book.
a. Candidate 1: [neg [[any book] [λx [John read x]]]]
b. Candidate 2: [every* book] [λx [neg [John read x]]]

(8) a. Fact: for all P, $\neg\exists xPx \leftrightarrow \forall x\neg Px$
b. Candidate 1 ⇔ Candidate 2

(9) Every student who read any book ate chocolate.
a. Candidate 1: [every [student [λx [any book] λy [x read y]]]]] [ate chocolate]
b. Candidate 2: [every* book][λy[every [student [λx[x read y]]]]][ate chocolate]

(10) a. Fact: for all P, q, where x is not free in q, $(\exists x(Px)) \rightarrow q \leftrightarrow \forall x(Px \rightarrow q)$
b. Candidate 1 ⇔ Candidate 2

Other quantifiers: rarely

(11) John rarely read any book.

(12) a. [rarely$_C$ [any book] [λx [John read x]]]
b. [every* book] [λx [rarely$_C$ [John read x]]]

(13) $\text{card}(\{t \in C \mid \exists x(\text{book } x \wedge \text{John read } x \text{ at } t\}) < d_{st}$ (observed)
$\overset{\Rightarrow}{\not\Leftarrow}$ $\forall x(x \text{ is a book} \rightarrow (\text{card}(\{t \in C \mid \text{John read } x \text{ at } t\}) < d_{st}))$ (not observed)

But perhaps *rarely* decomposes (= *usually not*; *pace* Ladusaw 1979):

(14) [usually$_C$ [[every* book] [λx [not [John read x]]]]]

Other quantifiers: fewer than 5 boys

(15) Fewer than 5 students read any book.

(16) $\text{card}(\lambda x.\ \text{student } x \wedge \exists y(\text{book } y \wedge x \text{ read } y)) < 5$ (observed)
$\overset{\Rightarrow}{\not\Leftarrow}$ $\forall y(\text{book } y \rightarrow \text{card}(\lambda x.\ \text{student } x \wedge x \text{ read } y) < 5)$ (not observed)

Decomposition does not obviously help here (cf., e.g., Hackl 2000; Heim 2008).

Trapping effects

(17) Fewer than 10 presidents$_i$ read any books about themselves$_i$.

(18) John didn't want to marry any plumber. [de dicto]

(19) There isn't any book here. [definiteness effect]

Further support for the relevance of the LF (cf., e.g., Progovac 1994)

(20) A professor with any interest is not available.

(21) a. A professor with any interest seemed not to be available.
b. *A professor with any interest$_i$ seemed to herself$_i$ not to be available.

(22) a. [seem [not [[a professor with any interest] be available]
b. *[a professor with any interest] λx [x seem to herself$_x$ [not x be available]

(23) A professor with any interest seemed to fewer than 5 students to be available.

(24) a. [seem to fewer than 5 students [[a prof with any interest] be available]]
b. *[a prof with any interest] λx [x seem to fewer than 5 students [x be avail.]]

Some attention to surface form is needed nonetheless:

(25) *Any professor seemed not to be available. (e.g., Uribe-Etxebarria 1995)

Another issue: interaction with Quantifier Raising

(26) <*>A professor with any interest (seemed to have) read fewer than 5 books.

Better example (by Danny Fox, due to a potential confound involving the limited scope interactions of indefinites with certain other quantifiers, raised by Keny Chatain):

(27) a. A flag with stripes is hanging from fewer than 5 windows.
b. *A flag with any stripes is hanging from fewer than 5 windows.

The Condition: Schema

(28) a. LF: [OP [... any ...] ...]
b. OP $\in$ {neg, every, fewer than 5, fewer than 5 students}

(29) **The Condition** (schema, holds at LF):
A DP headed by *any* is acceptable if and only if **it** stands in relation **R** to **X**.

The Condition: Negative, Affective, etc., Operators

(30) a. **R** = be c-commanded by
b. **X** = negation

Finding negation (cf. discussion of *rarely, fewer than 5 students* above)

(31) a. [every student VP] = [[NOT [SOME$_N$ student]] VP]
b. $[\![\text{NOT}]\!] = \lambda Q_{((et)t)}.\lambda P_{(et)}.\ \neg Q(P)$
c. $[\![\text{SOME}_N]\!] = \lambda P_{(et)}.\lambda Q_{(et)}.\ \exists x(Px \wedge \neg Qx)$

(32) a. [NOT [SOME$_N$ student who read any book]] [ate chocolate]
b. *[NOT [SOME$_N$ student]] [ate any chocolate]

But a parallel analysis can be provided for *some*. A more adequate predictor is needed.

Entailment-reversal

(33) a. John read a book.
b. $\substack{\nRightarrow \\ \Leftarrow}$ John read a (Russian) book (slowly).

(34) a. John did not read a book.
b. $\substack{\Rightarrow \\ \nLeftarrow}$ John did not read a (Russian) book (slowly).

(35) a. John often read a book.
b. $\substack{\nRightarrow \\ \Leftarrow}$ John often read a (Russian) book (slowly).

(36) a. John rarely read a book.
b. $\substack{\Rightarrow \\ \nLeftarrow}$ John rarely read a (Russian) book (slowly).

(37) a. Every student read a book.
b. $\substack{\nRightarrow \\ \Leftarrow}$ Every student read a (Russian) book (slowly).

(38) a. Every student who read a book ate chocolate.
b. $\substack{\Rightarrow \\ \nLeftarrow}$ Every student who read a (Russian) book (slowly) ate chocolate.

How to capitalize on this suggestive pattern?

Operators

Cross-categorial definition of entailment ($\Rightarrow$)

(39) a. For p, q of type t: $p \Rightarrow q$ iff $p = 0$ or $q = 1$.
b. For f, g of conjoinable type $\sigma\tau$: $f \Rightarrow g$ iff for every x of type σ, $f(x) \Rightarrow g(x)$.

(40) a. t is a conjoinable type.
b. if τ is a conjoinable type, then for all types σ, $(\sigma\tau)$ is a conjoinable type.

(41) a. IP: $[\![$John read a Russian book$]\!] \Rightarrow [\![$John read a book$]\!]$
b. VP: λx. $[\![$a Russian book$]\!]$(λy. x read y) $\Rightarrow$ λx. $[\![$a book$]\!]$(λy. x read y)
c. DP: $[\![$a Russian book$]\!] \Rightarrow [\![$a book$]\!]$

Entailment-reversing, entailment-preserving, non-monotone functions

(42) A function f of type $(\sigma\tau)$ is entailment-reversing (downward-entailing) iff for all x, y of conjoinable type σ: if $x \Rightarrow y$, then $f(y) \Rightarrow f(x)$.

(43) A function f of type $(\sigma\tau)$ is entailment-preserving (upward-entailing) iff for all x, y of conjoinable type σ: if $x \Rightarrow y$, then $f(x) \Rightarrow f(y)$.

(44) A function f of type $(\sigma\tau)$ is non-monotone iff f is neither entailment-reversing nor entailment-preserving, that is, iff for some x, y, z, u of conjoinable type σ: $x \Rightarrow y$ and $f(x) \not\Rightarrow f(y)$, and $z \Rightarrow u$ and $f(u) \not\Rightarrow f(z)$.

Illustrations

(45) $[\![$not$]\!]$ is entailment-reversing. (modus tollens)
For all p, q of type t, if $p \Rightarrow q$, then $[\![$not$]\!](q) \Rightarrow [\![$not$]\!](p)$.

(46) $[\![$every$]\!]$ is entailment-reversing. (transitivity)
For all P, Q, R of type (et), if $P \Rightarrow Q$, then $[\![$every$]\!](Q)(R) \Rightarrow [\![$every$]\!](P)(R)$.

(47) $[\![$every student$]\!]$ is not entailment-reversing.
$[\![$every student$]\!]([\![$arrived$]\!]) \not\Rightarrow [\![$every student$]\!]([\![$arrived early$]\!])$

(48) $[\![$every student$]\!]$ is entailment-preserving. (transitivity)
For all P, Q, R of type (et), if $P \Rightarrow Q$, then $[\![$every$]\!](R)(P) \Rightarrow [\![$every$]\!](R)(Q)$.

(49) $[\![$between 4 and 8 students$]\!]$ is non-monotone.
$[\![$between 4 and 8 students$]\!]$(λx. $[\![$a Russian book$]\!]$(λy. x read y))
$\not\Leftarrow$ / $\not\Rightarrow$ $[\![$between 4 and 8 students$]\!]$(λx. $[\![$a book$]\!]$(λy. x read y))

(50) **The Condition** (preliminary, operator-based)
A DP headed by *any* is acceptable if and only if **it** is **c-commanded** by an expression that denotes an **entailment-reversing (ER) function.**

The Condition: Entailment-Reversing Environments

Entailment-reversing environments

Function-based (or position-based) statement (cf. Homer 2008)

(51) A constituent C is ER with respect to a subconstituent Q of type σ iff λx_σ. $[\![C[Q/t_\sigma]]\!]^{g[t\to x]}$ is an ER function. (A constituent C[Q/t_σ] is identical to C except that Q is replaced by a variable t of the same type as Q.)

Substitution-based statement (cf. Gajewski 2011)

(52) A constituent C is ER with respect to a subconstituent Q iff for every Q' such that $[\![Q']\!] \Rightarrow [\![Q]\!]$, $[\![C]\!] \Rightarrow [\![C[Q/Q']]\!]$. (A constituent C[Q/Q'] is identical to C except that Q is replaced by Q'.)

Illustration

(53) $[\![$[$_{DP}$ every student [λx [any book [λy [x read y]]]]]$]\!]$ is ER wrt *any book*.

(54) $[\![$[$_S$ [every student [λx [any book [λy [x read y]]]]] arrived]$]\!]$ is ER wrt *any book*.

(55) **The Condition** (preliminary, environment-based)
A DP headed by *any* is acceptable if and only if **it** is **dominated** by **a constituent that is ER with respect to it.**

What's coming up next?

- Do the two conditions have to be further constrained?
  - Do we need to admit a constraint pertaining to locality? For this, we will look at the effects of embedded non-monotone quantifiers.

  - Are there any restrictions on what the constituent has to be in the case of the environment-based characterization? For this, but mainly as a warm-up for next section, we will probe the behavior of *any* (and *almost*) in structures with so-called negated DPs.

- What is the relation between the two characterizations of the Condition?

  - Are the two statements of the Condition (or their updated variants) distinguishable? Are they independent? For this, we will first investigate the distribution of *any* in the scope of modified numeral quantifiers. (We will also get at the above question by doing that.)

Non-monotonicity: a tentative argument for environments?

(56) Mary didn't point between 4 and 8 recruiters to any students.

(57) a. *[neg [between 4 and 8 rec's [λy any students λx Mary point y to x]]
b. [neg [any students [λx between 4 and 8 rec's [Mary point y to x]]

(58) Distinguishing scenarios:

a. Mary pointed to each of her 3 students 2 recruiters (that is, altogether 6 recruiters were pointed to students). (57-a) ✗, (57-b) ✓; (56) <✓>

b. Mary pointed to each of her 3 students 5 recruiters (that is, altogether 15 recruiters were pointed to students). (57-a) ✓, (57-b) ✗; (56) <✗>

Contrast with sentences in which movement is blocked:

(59) *Mary didn't introduce between 4 and 8 students$_i$ to any of their$_i$ partners.

This is expected on the environment-based Condition:

(60) ⟦(57-a)⟧ is not, but ⟦(57-b)⟧ is, ER with respect to *any books.*

But it is not expected on the operator-based Condition:

(61) [not] c-commands [any book] in both (57-a) and (57-b).

A modification of the operator-based characterization is needed. For example (we will ignore the modification until we get to intervention):

(62) **The Condition** (revised, preliminary)
A DP headed by *any* is acceptable if and only if it is c-commanded by an ER operator that doesn't c-command an NM operator that would c-command *any.*

Important caveat. These facts perhaps only apparently advantage the environment-based approach. Consider the following sentence:

(63) She didn't wear any earrings to every party. (Linebarger, 1987)

(64) a. [not [any earrings λx [she wore x to every party]]]
b. *[not [[any earrings λx she wore x] to every party]]
c. [every party λy [not [any earrings λx she wore x to y]]]

(65) [I think that to every party she wore a different pair of earrings, and it is common knowledge that she wore earrings to at least one party:]
<#>I doubt that she didn't wear any earrings to every party.

(66) a. *She didn't introduce every person$_i$ to any of their$_i$ admirers.
b. *Not every student read any book.

Accordingly, the assumption that will capture this state of affairs may well subsume the facts with non-monotone quantifiers. Stay tuned (and check Chierchia 2013).

So-called negated DPs: identifying licensing environments

See, e.g., Collins 2017a,b for some recent discussion.

(67) Not every student who read any book arrived.

(68) Candidate structures:
a. *[[$_{DP}$ [$_D$ not every] student [wh λx [any book] λy x read y]] arrived]
b. [[$_{DP}$ not [$_{DP}$ every student [wh λx [any book] λy x read y]]] arrived]
c. [$_S$ not [$_S$ [every student [wh λx [any book] λy x read y]] arrived]]

Unavailable parse

(69) $[\![$not every$]\!]$ = $\lambda P.\lambda Q.\ \neg\forall x(P(x) \rightarrow Q(x))$

(70) a. $[\![$not every$]\!]$ is not an ER function.
b. [[not every] student [wh λx [any book] λy x read y]] ([arrived]) is not ER with respect to [any book].

Available parses

(71) $[\![$every$]\!]$ is an ER function.

(72) [every student [wh λx [any book] λy x read y]] is ER wrt [any book]:
For all Q, Q ⇒ $[\![$any/a book$]\!]$,
$[\![$[every student [λx [any book] λy x read y]]]$]\!]$

⇒ ⟦[every student [λx Q λy x read y]]]⟧

That is,

For all Q and R, Q ⇒ ⟦any/a book⟧,
⟦[every student [λx [any book] λy x read y]]]⟧(R)
⇒ ⟦[every student [λx Q λy x read y]]]⟧(R)

(And, therefore, [[every student [wh λx [any book] λy x read y]] arrived]
is also ER wrt [any book].)

What about negated modified numeral quantifiers?

(73) <>Not fewer than 5 students read any book.

(74) Candidate structures (no decomposition of the modified numeral):
a. *[[not fewer than 5] students] [λx [any book [λy [x read y]
b. *[not [fewer than 5 students]] [λx [any book [λy [x read y]
c. [not [[fewer than 5 students [λx [any book [λy [x read y]

Could *not* end up being in a configuration resembling that in (74-c) by movement – one on which we have two ER operators c-commanding *any book*? To get at this question, compare (73) with (75):

(75) <?*>No fewer than 5 students read any book.

Finally, note that the reverse may be expected if we had an expression whose distribution under (non-auxiliary) negation and *fewer than* quantifiers were the reverse of that of *any.* (A DP-internal construal of *no* may be needed in (77).)

(76) <*>Not fewer than five students almost arrived.

(77) <>No fewer than five students almost arrived.

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