Epistemic indefinites, number marking, and certainty

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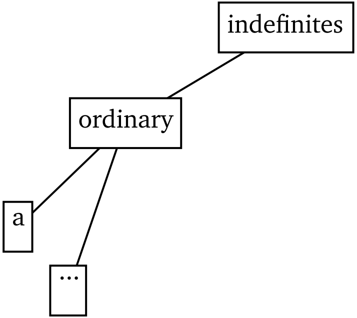
Outline

$\boxed{\text{indefinites}}$

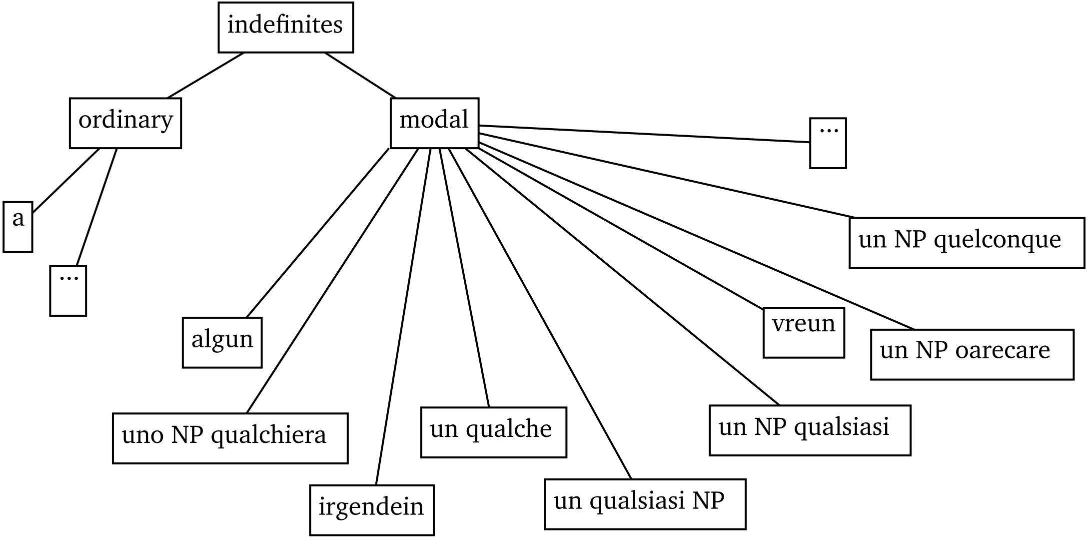
indefinites vary . . .

$\boxed{\text{indefinites}}$

ordinary . . .



modal . . .


indefinites
ordinary
modal
a
...
algun
uno NP qualchiera
irgendein
un qualche
un qualsiasi NP
un NP qualsiasi
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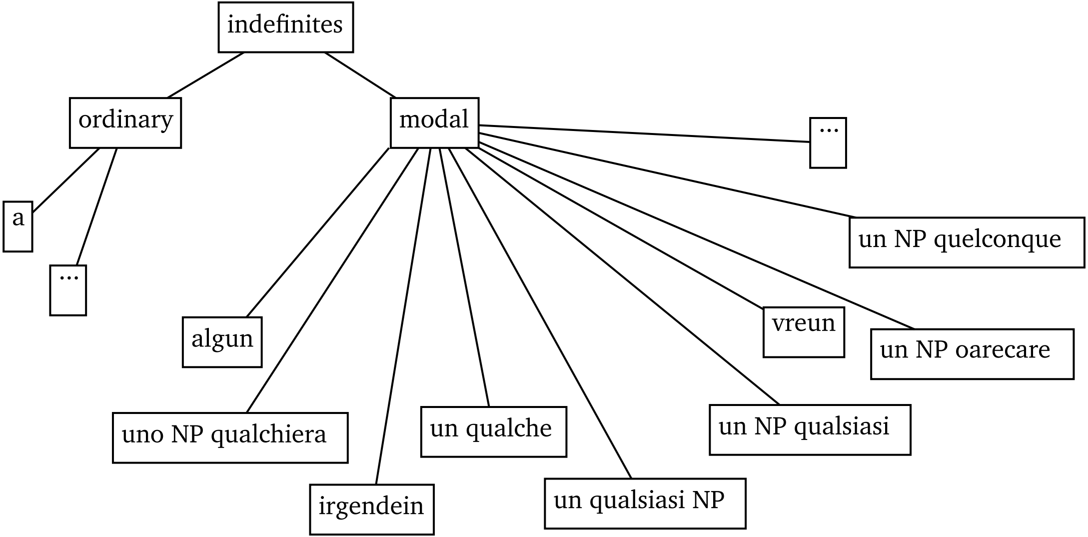
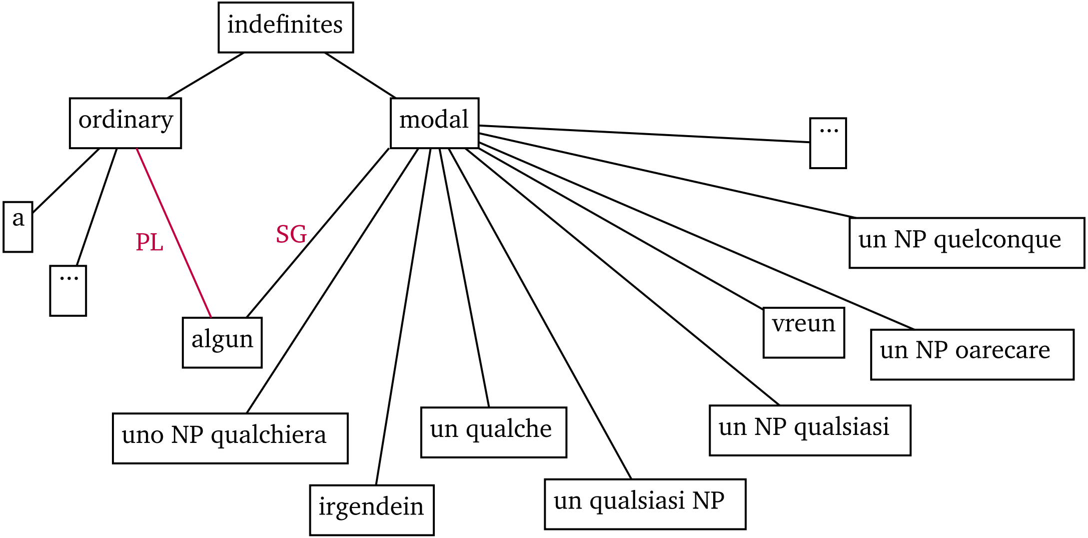
un NP oarecare
un NP quelconque
...

modal . . .

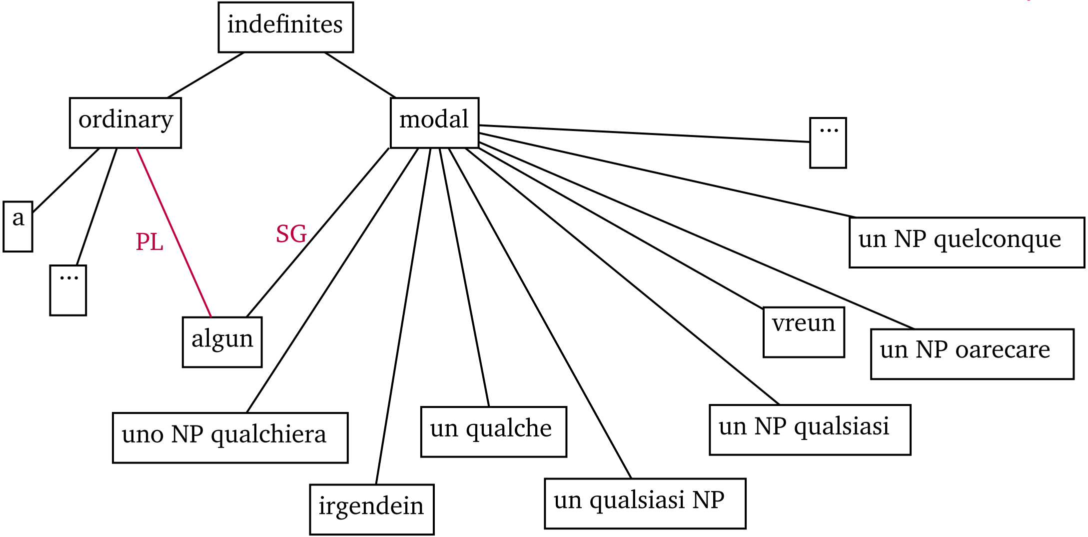


between-item variation by modal flavor, degrees of freedom, degrees of negativity [1–13]

modal and ordinary . . .

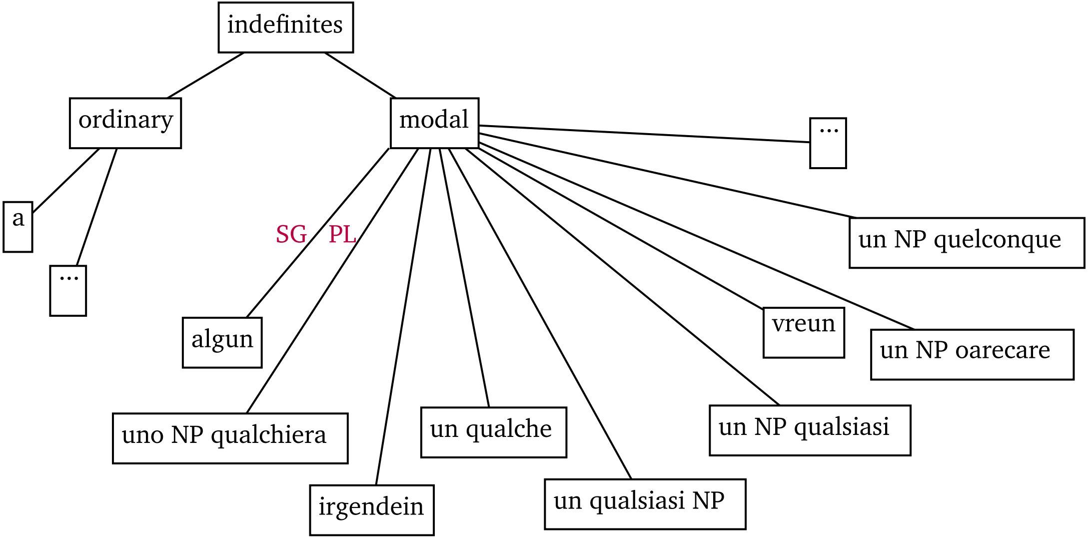


modal and ordinary . . .

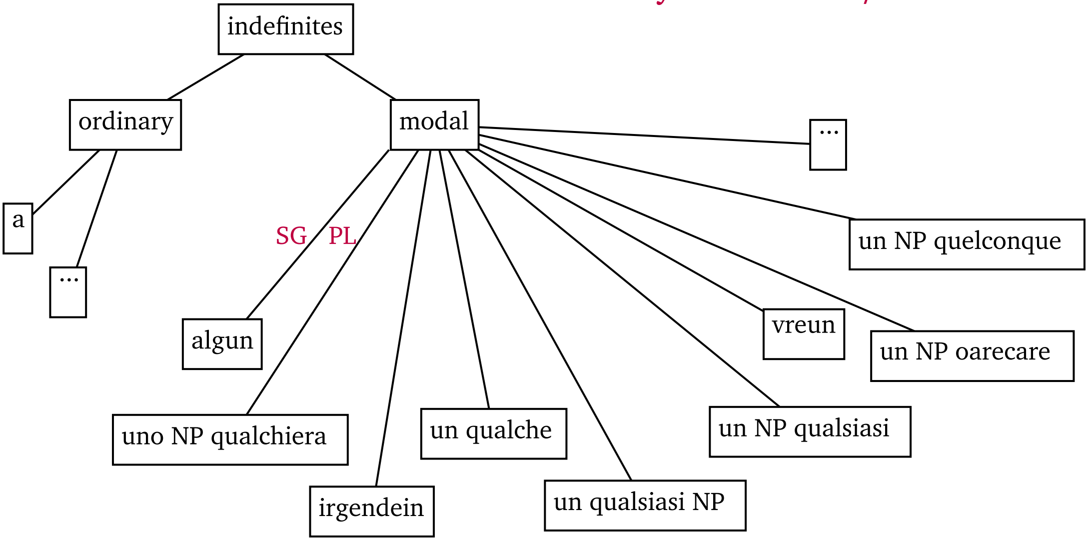


within-item variation *by number* [14–16]

today: ALGUN-SG/PL both modal

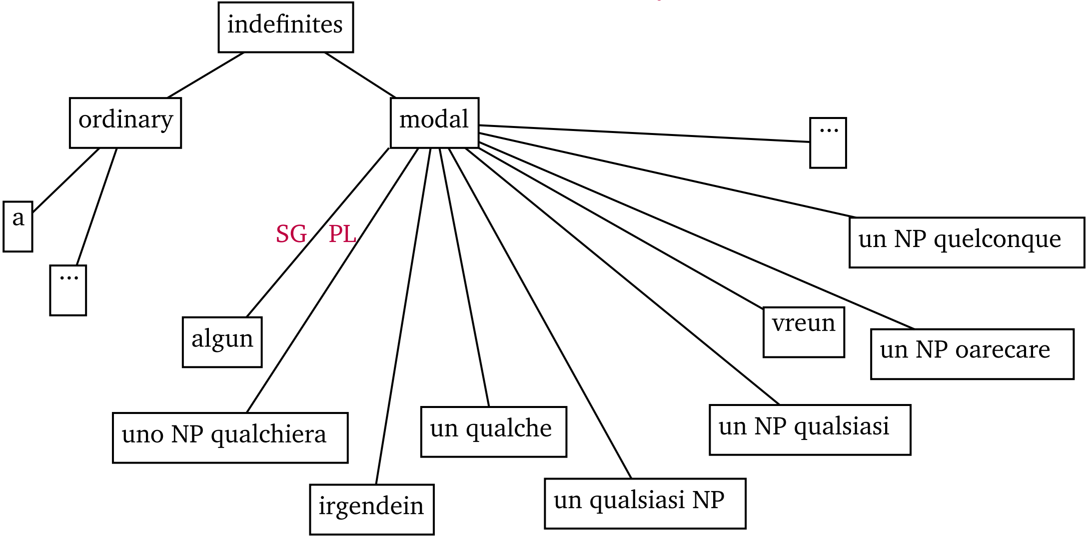


today: ALGUN-SG/PL both modal



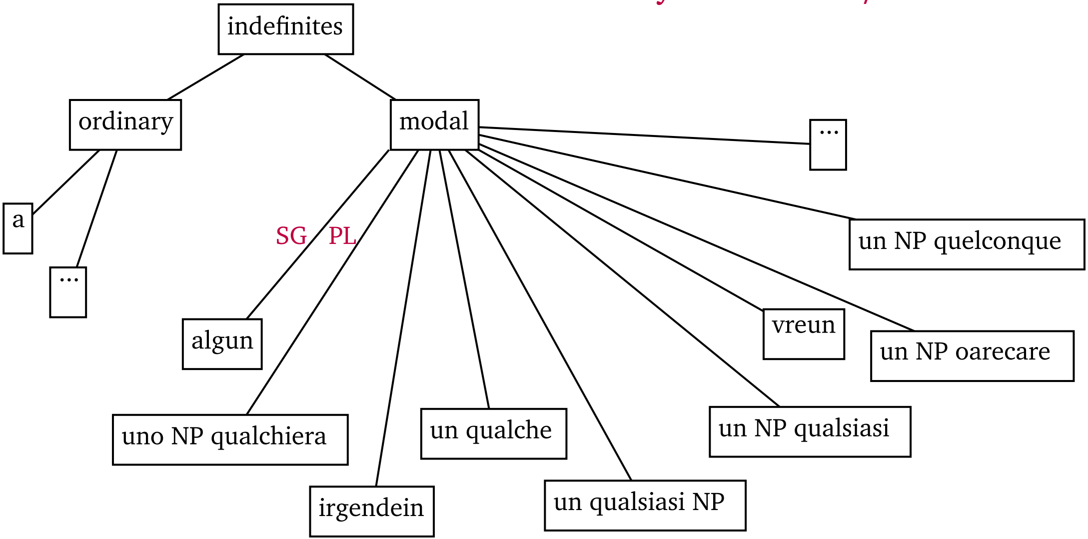
Across modal indefinites, variation by number is variation *within* number:
Both SG and PL can be compatible with specific *positive* certainty.

today: ALGUN-SG/PL both modal



In both SG and PL this arises in the same way: From exhaustification with just NonSgDA.

today: ALGUN-SG/PL both modal



Within-item variation comes from an indefinite number filter on specific positive certainty:
SG epistemic indefinites make it mean no free choice. PL do not. Hence the occasional contrast.

Outline

[6–8, 14–16]

(1)	María	se	casó	con	**algún**	médico,	# en concreto	con	el	doctor Smith.
	María	SE	married	with	ALGUN-SG	doctor	namely	with	the	doctor Smith

(2)	María	se	casó	con	**algún**	médico,	✓ pero	no	con	el	doctor Smith.
	María	SE	married	with	ALGUN-SG	doctor,	but	not	with	the	doctor Smith

(3)	María	vive	con	**algunos**	estudiantes,	✓ en concreto	con	Pedro	y	con	Juan.
	María	lives	with	ALGUN-PL	students,	namely	with	Pedro	and	with	Juan

- ALGUN-SG is an indefinite based on a domain that cannot be a singleton.
  - It competes with alternatives based on singleton subsets of the domain (SgDA).
    ⇒ partial free choice ✓
- ALGUN-PL additionally has a plurality requirement.
  - Illicit atom-based SgDA are contradictory. Illicit plurality-based SgDA are equivalent to licit non-singleton propositions. No actual SgDA competitors.
    ⇒ no free choice ✓

Challenge to the existing picture: German IRGEND-SG/PL

[9, 12]

(4) Maria hat **irgendeinen** Arzt geheiratet, # und zwar Dr. Smith.
Maria has IRGEND-SG doctor married and namely Dr. Smith

(5) Maria hat **irgendeinen** Arzt geheiratet, ✓ aber nicht Dr. Smith.
Maria has IRGEND-SG doctor married but not Dr. Smith

(6) Maria wohnt mit **irgendwelchen** Studenten zusammen, # und zwar mit Pedro und Juan.
Maria lives with IRGEND-PL students together, namely with Pedro and Juan

- IRGEND-SG is an indefinite based on a domain that cannot be a singleton.
  - It competes with alternatives based on singleton subsets of the domain (SgDA).
    ⇒ partial free choice ✓
- IRGEND-PL additionally has a plurality requirement.
  - Illicit atom-based SgDA are contradictory. Illicit plurality-based SgDA are equivalent to licit non-singleton propositions. No actual SgDA competitors.
    ⇒ no free choice ✗ ← we need partial free choice here as well!

Challenge to the existing picture: English SOME-SG/PL

[1–3]; Marty, Picat, and Mascarenhas (work in progress, p.c.)

(7) a. Mary married **some** doctor, ?? namely Dr. Smith.
b. **Some** agent stole the documents from the office. ✓ His name is Albert, and he's done this before.
c. Arnold, a physicist, is cooking. ✓ Therefore, **some** physicist is cooking.

(8) Mary married some doctor, ✓ but not Dr. Smith.

(9) Mary lives with some students, ? namely with Pedro and Juan.

- SOME-SG is an indefinite based on a domain that cannot be a singleton.
  - It competes with alternatives based on singleton subsets of the domain (SgDA).
    ⇒ partial free choice ✓/✗ ← yes but not quite…
    We need compatibility with not just specific *negative* but also specific *positive* certainty!
- SOME-PL additionally has a plurality requirement.
  - Illicit atom-based SgDA are contradictory. Illicit plurality-based SgDA are equivalent to licit non-singleton propositions. No actual SgDA competitors.
    ⇒ no free choice ✓/✗ ← yes but not quite…
    Without the continuation, this also suggests speaker ignorance or indifference!

Taking stock...

indefinite	number
ALGUN	SG
	PL
IRGEND	SG
	PL
SOME	SG
	PL

Taking stock. . .

indefinite	number	spec. neg. certainty 'one loser'
ALGUN	SG	✓
	PL	✓
IRGEND	SG	✓
	PL	✓
SOME	SG	✓
	PL	✓

Taking stock…

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

Taking stock...

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

There is between-item variation in the SG. How do we derive it?

Taking stock…

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

There is between-item variation in the SG. How do we derive it?

There is between-item variation in the PL. How do we derive it?

Taking stock. . .

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

There is between-item variation in the SG. How do we derive it?

There is between-item variation in the PL. How do we derive it?

There is sometimes within-item variation between SG & PL. How do we explain it?

Outline

Question:

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

How do we derive between-item variation in the SG?

Assumptions: Truth conditions and alternatives

(10) Jo called [epistemic indefinite] student.

a. $\exists x \in [\![\mathrm{SG}]\!]([\![{}^{*}\mathrm{student}]\!])[C(j,x)]$ (SG picks out the atoms) (assertion)

b. $\{\exists x \in D'[C(j,x)] \mid D' \subset [\![\mathrm{SG}]\!]([\![{}^{*}\mathrm{student}]\!])\}$ (DA)

c. $\{\forall x \in [\![\mathrm{SG}]\!]([\![{}^{*}\mathrm{student}]\!])[C(j,x)]\}$ (SA)

$\{\forall x \in D'[C(j,x)] \mid D' \subset [\![\mathrm{SG}]\!]([\![{}^{*}\mathrm{student}]\!])\}$ —DA (DSA)

Assumptions: Truth conditions and alternatives

$$
\begin{tikzcd}
a \quad\quad b \arrow[d] & \\
a \vee b & a \wedge b \arrow[l]
\end{tikzcd}
$$

Assumptions: Truth conditions and alternatives

a $\quad$ b $\quad$ c

$a \vee b$ $\quad$ $a \vee c$ $\quad$ $b \vee c$

$a \wedge b$

$a \vee b \vee c$ $\quad$ $a \wedge c$ $\quad$ $a \wedge b \wedge c$

$b \wedge c$

Assumptions: Exhaustification [9]

- Alternatives factored in via the silent $\perp$-based exhaustivity operator O:

$$\text{E.g., } \mathrm{O}_{\mathrm{DA}}(a \vee b) = (a \vee b) \wedge \neg a \wedge \neg b, \; = \perp \qquad \text{(G-trivial)}$$

$$\text{E.g., } \mathrm{O}_{\mathrm{SA}}(a \vee b) = (a \vee b) \wedge \neg(a \wedge b) \qquad (\rightsquigarrow \text{ traditional scalar implicature})$$

Assumptions: Exhaustification [9]

- For epistemic indefinites, O_{DA} is actually $\mathrm{O}_{\mathrm{ExhDA}}$:
  - ExhDA are obtained by prefixing a fully-grown DA with O:

    E.g., $(a \vee b)^{\mathrm{ExhDA}} = \{\mathrm{O}a, \mathrm{O}b\}$

  - O for ExhDA happens relative to DA of the same size or smaller and in a $\perp$-free way:

    E.g., for $\mathrm{O}_{\mathrm{ExhDA}} \Diamond(a \vee b \vee c)$:

    $\mathrm{O}\Diamond a = \Diamond a \wedge \neg\Diamond b \wedge \neg\Diamond c$

    $\mathrm{O}\Diamond(a \vee b) = \Diamond(a \vee b) \wedge \cancel{\neg\Diamond(a \vee c)} \wedge \cancel{\neg\Diamond(b \vee c)} \wedge \cancel{\neg a} \wedge \cancel{\neg b} \wedge \neg\Diamond c$

E.g., $\mathrm{O}_{\mathrm{ExhDA}}(a \vee b) = (a \vee b) \wedge \underbrace{\neg \underbrace{\mathrm{O}(a)}_{a \wedge \neg b}}_{a \rightarrow b} \wedge \underbrace{\neg \underbrace{\mathrm{O}(b)}_{b \wedge \neg a}}_{b \rightarrow a}, \; = (a \wedge b)$

Assumptions: Exhaustification [9]

- For epistemic indefinites, both the ExhDA and the SA are used by default:

$$\text{E.g., } \mathrm{O}_{\text{ExhDA+SA}}(a \vee b) = \underbrace{(a \vee b) \wedge \neg \mathrm{O}(a) \wedge \neg \mathrm{O}(b)}_{(a \wedge b)} \wedge \neg (a \wedge b), \; = \bot$$

Jo called [epistemic indefinite] student$_{\{a,b\}}$. (first try)

$$\xrightarrow{(a \vee b)} \boxed{\mathrm{O}_{\text{ExhDA+SA}}} \xrightarrow[\text{G-triviality}]{\perp}$$

Why is this grammatical, and how does it give rise to ignorance?

Ignorance is a silent modal effect.

Let's look at some sentences with modals ...

Jo may call [epistemic indefinite] student$_{\{a,b\}}$.

$$\xrightarrow{\Diamond(a \vee b)} \boxed{\mathrm{O}_{\text{ExhDA+SA}}} \xrightarrow[\text{Free Choice}]{\Diamond(a \vee b) \wedge \Diamond a \wedge \Diamond b \wedge \neg\Diamond(a \wedge b)}$$

Jo must call [epistemic indefinite] student$_{\{a,b\}}$.

$$\xrightarrow{\Box(a \vee b)} \boxed{\mathrm{O}_{\mathrm{ExhDA+SA}}} \xrightarrow[\text{Free Choice}]{\Box(a \vee b) \wedge \neg\Box a \wedge \neg\Box b}$$

Jo called [epistemic indefinite] student$_{\{a,b\}}$.

The literature says: Silent speaker-oriented epistemic necessity modal.

$$\xrightarrow{\Box_S(a \vee b)} \boxed{\mathrm{O}_{\text{ExhDA+SA}}} \xrightarrow[\text{epistemic Free Choice} \,=\, \text{ignorance}]{\Box_S(a \vee b) \wedge \neg\Box_S a \wedge \neg\Box_S b}$$

Epistemic states of interest

total ignorance	partial ignorance		no ignorance
‘no winner’	‘one loser’	‘one winner’	‘all winners’
e.g.,	e.g.,	e.g.,	e.g.,
w_1: x $\cancel{\text{y}}$ $\cancel{\text{z}}$	w_1: $\cancel{\text{x}}$ y $\cancel{\text{z}}$	w_1: x y $\cancel{\text{z}}$	w_1: x y z
w_2: $\cancel{\text{x}}$ y $\cancel{\text{z}}$	w_2: $\cancel{\text{x}}$ $\cancel{\text{y}}$ z	w_2: x $\cancel{\text{y}}$ z	w_2: x y z
w_3: $\cancel{\text{x}}$ $\cancel{\text{y}}$ z	w_3: $\cancel{\text{x}}$ y z	w_3: x y z	w_3: x y z

Jo called [epistemic indefinite] student$_{\{a,b\}}$.

$$\Box_S(a \vee b) \longrightarrow \boxed{O_{\text{ExhDA+SA}}} \longrightarrow$$

‘no winner’ ✓	‘one loser’ ✗	‘one winner’ ✗	‘all winners’ ✗*

Jo called [epistemic indefinite] student$_{\{a,b,c\}}$, but not Alice.

The literature, e.g., [7, 9]: ‘One loser’ comes from just SgDA!

$$\Box_S(a \vee b \vee c) \longrightarrow \boxed{O_{\text{ExhSgDA+SA}}} \longrightarrow$$

‘no winner’ ✓	‘one loser’ ✓	‘one winner’ ✗	‘all winners’ ✗*

SG epistemic indefinites that can use just SgDA: OK with ‘one loser’ scenarios.

(to appendix »)

Jo called Alice. So, she called [epistemic indefinite] student$_{\{a,b,c\}}$.

Proposal: ‘One winner’ comes from just NonSgDA!

$$\Box_S(a \vee b \vee c) \longrightarrow \boxed{\mathrm{O}_{\text{ExhNonSgDA+SA}}} \longrightarrow$$

‘no winner’ ✓	‘one loser’ ✗	‘one winner’ ✓	‘all winners’ ✗*

SG epistemic indefinites that can use just NonSgDA: OK with ‘one winner’ scenarios.

(to appendix »)

Jo called [epistemic indefinite] student$_{\{a,b,c\}}$.

Proposal: Just total ignorance comes from all the DA.

$$\Box_S(a \vee b \vee c) \longrightarrow \boxed{\mathrm{O}_{\mathrm{ExhDA+SA}}} \longrightarrow$$

'no winner' ✓	'one loser' ✗	'one winner' ✗	'all winners' ✗*

SG epistemic indefinites that must use all DA: OK only with total ignorance.

Answer:

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

How do we derive between-item variation in the SG?

Ability to prune DA!

Outline

Question:

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

How do we derive between-item variation in the PL?

Assumptions: Truth conditions and alternatives

(11) Jo called [epistemic indefinite] students.

a. $\exists x \in [\![\text{PL}]\!]([\![{}^*\text{student}]\!])[C(j,x)]$ (PL picks out atoms & pluralities) (assertion)

b. $\{\exists x \in D'[C(j,x)] \mid D' \subset [\![\text{PL}]\!]([\![{}^*\text{student}]\!])\}$ (DA)

c. $\{\forall x \in [\![\text{PL}]\!]([\![{}^*\text{student}]\!])[C(j,x)]\}$ (SA)

$\{\forall x \in D'[C(j,x)] \mid D' \subset [\![\text{PL}]\!]([\![{}^*\text{student}]\!])\}$ —DA (DSA)

Assumptions: Truth conditions and alternatives

$|D| = 2^{|AT|} - 1$; $|DA| = 2^{|D|} - 2$; $|\text{SgDA}| = |D|$; $|\text{NonSgDA}| = |DA| - |\text{SgDA}|$

ab

$a \qquad b$

$a \vee ab \quad a \vee b \quad b \vee ab$

$a \vee b \vee ab \longleftarrow \ldots$

Assumptions: Truth conditions and alternatives

$|D| = 2^{|AT|} - 1$; $|DA| = 2^{|D|} - 2$; $|\text{SgDA}| = |D|$; $|\text{NonSgDA}| = |DA| - |\text{SgDA}|$

abc

ab $\quad ac$ $\quad bc$

a $\quad b$ $\quad c$

$a \vee b,\ \ldots,\ a \vee ac,\ \ldots$

$\ldots$

$\downarrow$

$a \vee b \vee c \vee ab \vee ac \vee bc \vee abc \quad \longleftarrow \quad \ldots$

Jo called [epistemic indefinite] students$_{\{a,b,ab\}}$, but not Alice and Bob.

$$(a \vee b \vee ab) \longrightarrow \boxed{O_{\text{ExhSgDA+SA}}} \longrightarrow$$

‘no winner’ ✓	‘one loser’ ✗	‘one winner’ ✗	‘all winners’ ✗*

We don’t get compatibility with specific negative certainty / ‘one loser’…

(to appendix »)

Jo called Alice and Bob. So, she called [epistemic indefinite] students$_{\{a,b,ab\}}$.

$$\xrightarrow{(a \lor b \lor ab)} \boxed{O_{\text{ExhNonSgDA+SA}}} \longrightarrow$$

‘no winner’ ✓	‘one loser’ ✗	‘one winner’ ✗	‘all winners’ ✗*

We don’t get compatibility with specific positive certainty / ‘one winner’…

(to appendix »)

Jo called [epistemic indefinite] students$_{\{a,b,c,ab,ac,bc,abc\}}$, but not Alice and Bob.

$(a \vee b \vee c \vee ab \vee ac \vee bc \vee abc) \longrightarrow \boxed{\mathrm{O}_{\mathrm{ExhSgDA+SA}}} \longrightarrow$

‘no winner’ ✓	‘one loser’ ✗	‘one winner’ ✗	‘all winners’ ✗*

We don’t get compatibility with specific negative certainty / ‘one loser’…

(to appendix »)

What is happening?

Are SG and PL after all fundamentally different?

I think not. . .

If we make the elements in the previous domains logically independent, we get the same results as for SG.

[epistemic indefinite] students$_{\{a,b,ab\}}$ lifted a piano, but not Alice and Bob.

$$\xrightarrow{(a \vee b \vee ab)} \boxed{\mathrm{O}_{\mathrm{Exh}\mathrm{Sg}\mathrm{DA+SA}}} \longrightarrow$$

'no winner' ✓	'one loser' ✓	'one winner' ✗	'all winners' ✗*

Now we can get compatibility with specific negative certainty / 'one loser' scenario!

Alice and Bob lifted a piano. So, [epistemic indefinite] students$_{\{a,b,ab\}}$ lifted a piano.

$$(a \vee b \vee ab) \longrightarrow \boxed{\mathrm{O}_{\mathrm{Exh}\,\mathrm{NonSg}\,\mathrm{DA+SA}}} \longrightarrow$$

‘no winner’ ✓	‘one loser’ ✗	‘one winner’ ✓	‘all winners’ ✗*

Now we can get compatibility with specific positive certainty / ‘one winner’ scenario!

Thus, SG and PL are *not* fundamentally different…

We should be able to see this even without making the elements of the domain independent, but …we'd have to compute the results for larger domains …which would be difficult to do manually …unless we can find hacks.

Answer:

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

How do we derive between-item variation in the PL?

Ability to prune DA!

Outline

Question:

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

How do we explain occasional within-item variation between SG & PL?

Compatibility with specific positive certainty / ‘one winner’ comes in two shapes…

total ignorance	partial ignorance		no ignorance / total certainty	
‘no winner’	‘one loser’	‘one winner’-1	‘one winner’-2	‘all winners’
e.g.,	e.g.,	e.g.,	e.g.,	e.g.,
w_1: x $\cancel{\text{y}}$ $\cancel{\text{z}}$	w_1: $\cancel{\text{x}}$ y $\cancel{\text{z}}$	w_1: x y $\cancel{\text{z}}$	w_1: x $\cancel{\text{y}}$ $\cancel{\text{z}}$	w_1: x y z
w_2: $\cancel{\text{x}}$ y $\cancel{\text{z}}$	w_2: $\cancel{\text{x}}$ $\cancel{\text{y}}$ z	w_2: x $\cancel{\text{y}}$ z	w_2: x $\cancel{\text{y}}$ $\cancel{\text{z}}$	w_2: x y z
w_3: $\cancel{\text{x}}$ $\cancel{\text{y}}$ z	w_3: $\cancel{\text{x}}$ y z	w_3: x y z	w_3: x $\cancel{\text{y}}$ $\cancel{\text{z}}$	w_3: x y z

For SG, ‘one winner’ is always ‘one winner’-2 – a no free choice scenario.

For PL, ‘one winner’ can be either ‘one winner’-1 or ‘one winner’-2.

In SG, ‘one winner’ removes free choice. In PL, it does not.

?Some SG epistemic indefinites require that the *intended referent* is not plural.

Answer:

indefinite	number	spec. neg. certainty 'one loser'	spec. pos. certainty 'one winner'
ALGUN	SG	✓	#
	PL	✓	✓
IRGEND	SG	✓	#
	PL	✓	#
SOME	SG	✓	✓
	PL	✓	✓

How do we explain occasional within-item variation between SG & PL? **PL better preserves FC!**

Outline

Conclusion

- Partial free choice includes both specific *negative* and specific *positive* certainty.
- Epistemic indefinites vary with respect to both.
- This variation is present in both their SG and their PL variants.
- The literature has argued that specific negative certainty comes from just SgDA.
- I have argued specific positive certainty comes from just NonSgDA.
- This arises the same in SG and in PL epistemic indefinites.
- In SG, however, specific positive certainty may induce no free choice.
- An item that has specific positive certainty in PL but not SG may be simply an item that always wants at least a little bit of free choice.

Predictions

- On this analysis SOME-SG/PL and ALGUN-PL are not ordinary indefinites.
- In particular, they all obligatorily activate DA.
- This helps us derive another interesting fact about them, their PPIhood:

(12) Nobody read # some book.

(13) Nadie leyo # algunos libros.
nobody read ALGUN-PL books.

Outlook

- Condoravdi [17] reports that the ignorance or indifference effect of *wh-ever* phrases is always present with the singular but can disappear with the plural.

- Crnič [18] notes that Free Choice *any* can't be plural:

  (14) # *Mary is allowed to read any books*

- Chierchia (p.c.) notes that some epistemic indefinites lack a plural form (e.g., Italian *qualsiasi*).

Where do these all fit?

Thanks to Andreea Nicolae, Gennaro Chierchia, Anamaria Fălăuş.

Thank you!

Appendix: SG: specific negative certainty

(to main »)

$$(15)\quad \mathrm{O}_{\mathrm{ExhSgDA}}\Box_S(a \vee b \vee c)$$

$$= \underbrace{\Box_S(a \vee b \vee c) \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S a}_{\Box_S a \wedge \neg \Box_S b \wedge \neg \Box_S c}}_{\Box_S a \to \Box_S b \vee \Box_S c} \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S b}_{\Box_S b \wedge \neg \Box_S a \wedge \neg \Box_S c}}_{\Box_S b \to \Box_S a \vee \Box_S c} \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S c}_{\Box_S c \wedge \neg \Box_S a \wedge \neg \Box_S b}}_{\Box_S c \to \Box_S a \vee \Box_S b}}_{\text{verified, e.g., by } \Box_S \neg a \wedge \neg \Box_S b \wedge \neg \Box_S c}$$

Appendix: SG: specific positive certainty (to main »)

$$\text{(16) } \mathrm{O}_{\text{ExhNonSgDA}}\Box_S(a \vee b \vee c)$$

$$\underbrace{= \Box_S(a \vee b \vee c) \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S(a \vee b)}_{\Box_S(a\vee b)\wedge\neg\Box_S(a\vee c)\wedge\neg\Box_S(b\vee c)}}_{\Box_S(a\vee b)\to\Box_S(a\vee c)\vee\Box_S(b\vee c)} \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S(a \vee c)}_{\Box_S(a\vee c)\wedge\neg\Box_S(a\vee b)\wedge\neg\Box_S(b\vee c)}}_{\Box_S(a\vee c)\to\Box_S(a\vee b)\vee\Box_S(b\vee c)} \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S(b \vee c)}_{\Box_S(b\vee c)\wedge\neg\Box_S(a\vee b)\wedge\neg\Box_S(a\vee c)}}_{\Box_S(b\vee c)\to\Box_S(a\vee b)\vee\Box_S(a\vee c)}}_{\text{verified, e.g., by } \Box_S a \wedge \neg\Box_S/\Box_S\neg b \wedge \neg\Box_S/\Box_S\neg c}$$

(17) $\mathrm{O}_{\text{ExhSgDA}} \Box_S (a \vee b \vee ab)$

$$= \underbrace{\Box_S (a \vee b \vee ab) \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S a}_{\Box_S a \wedge \neg \Box_S b \wedge \neg \Box_S ab}}_{\Box_S a \rightarrow \Box_S b \vee \Box_S ab} \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S b}_{\Box_S b \wedge \neg \Box_S a \wedge \neg \Box_S ab}}_{\Box_S b \rightarrow \Box_S a \vee \Box_S ab} \wedge \neg \underbrace{\underbrace{\mathrm{O}\Box_S ab}_{\Box_S ab \cancel{\wedge \neg \Box_S b \wedge \neg \Box_S ab}}}_{\neg \Box_S ab}}_{\text{not compatible with ‘one loser’ scenario, only with ‘no winner’ ✗}}$$

Appendix: PL: specific positive certainty: 2 atom-domain (to main »)

(18) $O_{\text{ExhNonSgDA}} \Box_S (a \vee b \vee ab)$

$$\underbrace{= \Box_S(a \vee b \vee ab) \wedge \neg \underbrace{\underbrace{O\Box_S(a \vee b)}_{\Box_S(a \vee b) \wedge \neg \Box_S(a \vee ab) \wedge \neg \Box_S(b \vee ab)}}_{\Box_S(a \vee b) \rightarrow \Box_S(a \vee ab) \vee \Box_S(b \vee ab)} \wedge \neg \underbrace{\underbrace{O\Box_S(a \vee ab)}_{\Box_S(a \vee ab) \cancel{\wedge \neg \Box_S(a \vee b)} \wedge \neg \Box_S(b \vee ab)}}_{\Box_S(a \vee ab) \rightarrow \Box_S(b \vee ab)} \wedge \neg \underbrace{\underbrace{O\Box_S(b \vee ab)}_{\Box_S(b \vee ab) \cancel{\wedge \neg \Box_S(a \vee b)} \wedge \neg \Box_S(a \vee ab)}}_{\Box_S(b \vee ab) \rightarrow \Box_S(b \vee ab)}}_{\text{not compatible with 'one winner' scenario, only with 'no winner' ✗}}$$

Appendix: SG: specific negative certainty: 3 atom-domain (to main »)

Similar to PL: specific negative certainty: 2 atom-domain, just a lot more work, because there are 7 SgDA, each of which must be pre-exhaustified relative to the other SgDA.

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