The plural core of distributive conjunction: Cross-linguistic support for a non-classical meaning

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Distributive and cumulative readings of sentences containing conjunctions of individual-denoting phrases:

(1) *Ada and Bea*

Cross-linguistic evidence that the cumulative reading is the basic one. The conjunction operator `COORD` universally expresses plurality formation.

Analytical problem: Many languages have conjunction structures restricted to the distributive reading. How do we derive their semantics from a plural meaning for conjunction?

New proposal (informal) based on the plural projection theory of cumulativity.
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   (1) *Ada and Bea*

2. Cross-linguistic evidence that the **cumulative reading** is the basic one. The conjunction operator COORD universally expresses **plurality formation**

   Flor et al. 2017, to appear

3. Analytical problem: Many languages have conjunction structures **restricted to the distributive reading**.
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2 An analytical problem

3 Analysis, part 1: Plural projection (informally)

4 Analysis, part 2: Distributive conjunctions and plural projection (informally)
Cross-linguistic evidence for a plural meaning of COORD

An analytical problem

Analysis, part 1: Plural projection (informally)

Analysis, part 2: Distributive conjunctions and plural projection (informally)
What is the lexical meaning of **COORD**?

**Cumulative truth conditions** (Langendoen 1978, Scha 1981)

(2) *Ada and Bea fed the two pets.*

‘Each of Ada and Bea fed at least one pet and each pet was fed by at least one of Ada and Bea.’

With indefinites containing numerals or degree expressions, we observe an ambiguity:

(3) *Ada and Bea fed exactly four pets.*

- **a.** SCENARIO 1: Ada fed 4 pets. Bea fed 4 other pets.
- **b.** SCENARIO 2: Ada fed 1 pet. Bea fed 3 other pets.

**Reading 1:** *distributive* – Predicate holds of each conjunct.

**true** in SCENARIO 1, **false** in SCENARIO 2

**Reading 2:** *cumulative* – Predicate holds of entire ‘group’ / ‘plurality’.

**false** in SCENARIO 1, **true** in SCENARIO 2

**Note:** We disregard genuinely collective scenarios as they behave differently in some languages.

**Our question**

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Which reading reflects the lexical meaning of COORD?
Plural hypothesis (Link 1983 a.o.)

- **COORD** in individual conjunction denotes the sum-operation $+ \;$ on individuals – individual conjunctions denote **pluralities**

\[
(4) \quad [[Ada [COORD + Bea]]] = ada + bea
\]

- Background assumption: The domain $D_e$ contains both atoms and **pluralities** formed via sum-operation $+$

\[
(5) \quad [the\ two\ girls] = ada + bea
\]

- This directly gives us the **cumulative reading** of the sentence (assuming that the predicate can primitively hold of pluralities)

\[
(6) \quad fed\ exactly\ four\ pets(ada + bea)
\]

$\Rightarrow$ the cumulative reading reflects the **basic meaning** of **COORD**

- The distributive reading of the sentences is **derived by additional operations**. They apply the predicate to each atomic part of the plurality expressed by the conjunction (see Link 1987 a.o.)
Plural hypothesis (Link 1983 a.o.)

- **COORD** in individual conjunction denotes the sum-operation + on individuals – individual conjunctions denote pluralities

\[(4) \ [ [ Ada [COORD+ Bea ]] ] = ada + bea\]

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- The distributive reading of the sentences is derived by additional operations. They apply the predicate to each atomic part of the plurality expressed by the conjunction (see Link 1987 a.o.)
Plural hypothesis (Link 1983 a.o.)

- \textsc{coord} in individual conjunction denotes the sum-operation $+$ on individuals – individual conjunctions denote \textit{pluralities}

\[(4)\quad \llbracket [ Ada [\textsc{coord} + Bea ]] \rrbracket = \text{ada} + \text{bea}\]

- Background assumption: The domain $D_e$ contains both atoms and \textit{pluralities} formed via sum-operation $+$

\[(5)\quad \llbracket \text{the two girls} \rrbracket = \text{ada} + \text{bea}\]

- This directly gives us the \textit{cumulative reading} of the sentence (assuming that the predicate can primitively hold of pluralities)

\[(6)\quad \text{fed exactly four pets(ada + bea)}\]

$\Rightarrow$ the cumulative reading reflects the \textit{basic meaning} of \textsc{coord}

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\[(4) \quad \square [ Ada [\text{COORD} + \text{Bea}]] = \text{ada} + \text{bea}\]

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\[(6) \quad \text{fed exactly four pets}(\text{ada} + \text{bea})\]

\[\Rightarrow \quad \text{the cumulative reading reflects the basic meaning of COORD}\]

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Intersective hypothesis (Partee & Rooth 1983, Winter 2001 a.o.)

- Starting point: sentential conjunction \( \text{COORD}_t \) – connective \( \wedge \) from classical propositional logic

- Generalization to denotation of \( \text{COORD} \) for other types ending in \( t \), including quantifiers

\[
\begin{align*}
(7) \quad [\text{COORD}(e,t)] &= \lambda P(e,t) \cdot \lambda Q(e,t) \cdot \lambda P(e,t) \cdot [\text{COORD}_t] (P(P))(Q(P))
\end{align*}
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- To apply this to individuals, we shift them to quantifiers via an operator \( \uparrow \)

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\begin{align*}
(8) \quad [[ \uparrow Ada ] [ \text{COORD} \wedge [\uparrow Bea]]] &= \lambda P_{et} \cdot P(\text{ada}) \wedge P(\text{bea})
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- This intersective meaning of conjunction directly gives us the **distributive** reading of the sentence

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\begin{align*}
(9) \quad \text{fed exactly four pets(ada) } \wedge \text{fed exactly four pets(bea)}
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\( \Rightarrow \) the distributive reading reflects the **basic meaning** of \( \text{COORD} \)

- The cumulative reading requires an **additional operator**, which retrieves the plurality \( \text{ada} \oplus \text{bea} \) from the quantifier conjunction (see Winter 2001 a.o.)
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- Generalization to denotation of $\text{COORD}$ for other types ending in $t$, including quantifiers.

\[(7) \quad \llbracket \text{COORD} \langle \langle e, t \rangle, t \rangle \rrbracket = \lambda P \langle \langle e, t \rangle, t \rangle \cdot \lambda Q \langle \langle e, t \rangle, t \rangle \cdot \lambda P \langle e, t \rangle \cdot \llbracket \text{COORD}_t \rrbracket (P(P))Q(P))\]

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**Cross-linguistic predictions of the two hypotheses**

Is one of the two hypotheses *cross-linguistically* valid?

If so, one reading would correspond to a ‘bigger’ structure cross-linguistically. This containment relation should be morphosyntactically transparent in some languages. The reverse containment pattern should not be found.

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Methodology

• We are using the Terraling database
  • open ended, open source database
  • linguists answer yes/no questions on their native languages

• Our group, current stage: data for 24 languages from 10 major language families
  http://test.terraling.com/groups/8

• The first part of our study focusses on
  • iterative conjunction strategies (more than 2 conjuncts permitted)
  • with individual-denoting conjuncts
  • occurring in subject position

• The predicates must contain a numeral or a degree expression – so that we can distinguish between readings.

  (10)  *Ada and Bea fed exactly four pets.*

• Participants must identify the relevant sentences in their language and then check whether they are true or false in particular scenarios.

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• Our group, current stage: data for 24 languages from 10 major language families
  http://test.terraling.com/groups/8

• The first part of our study focusses on
  • iterative conjunction strategies (more than 2 conjuncts permitted)
  • with individual-denoting conjuncts
  • occurring in subject position

• The predicates must contain a numeral or a degree expression – so that we can distinguish between readings.

(10) Ada and Bea fed exactly four pets.

• Participants must identify the relevant sentences in their language and then check whether they are true or false in particular scenarios.

(11) SCENARIO 1: Ada fed four pets. Bea fed four other pets.
To identify the semantic contribution of conjunction, we need to distinguish it from other potential sources of distributivity.

Many theories assume distributivity operators $\text{OP}_{\text{pred}}$ that apply to the predicate:

\[
[[\text{Ada and Bea}] \ [\text{OP}_{\text{pred}} \ [\text{fed exactly four pets}] ]]
\]

Evidence from our Terraling study suggests that $\text{OP}_{\text{pred}}$ is available cross-linguistically, but may be overt or covert in a given language. There is no overt evidence for corresponding ‘cumulativity operators’. The cumulative reading of the predicate is basic.

This leads to the following typology:

\[
\begin{array}{c|cc}
\text{meaning of conjunction} & \text{without } \text{OP}_{\text{pred}} & \text{with } \text{OP}_{\text{pred}} \\
\hline
\text{plural} & \text{cumulative} & \text{distributive} \\
\text{intersective} & \text{distributive} & \text{distributive}
\end{array}
\]

Consequence: To diagnose the meaning of a given conjunction, we have to test whether a cumulative reading is available. The distributive reading is universally available and therefore uninformative for us.
Predicate-level distributivity operators

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\[(14) \quad \text{meaning of conjunction} \quad \text{without } \text{OP}_{\text{pred}} \quad \text{with } \text{OP}_{\text{pred}}
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Semantic typology of conjunction strategies

• For each language, we identify pairs of
  • ‘unmarked’ strategy C1: \([C_1 \text{ A COORD B } [P]]\)
  • ‘marked’ strategy C2: \([C_2 \text{ A COORD B } \mu [P]]\)

• C2 contains all the markers found in C1, plus an additional marker \(\mu\) within the coordinate structure.

Predictions of the hypotheses

• If the plural meaning is basic across languages:
  It should be possible that C1 has a cumulative reading and C2 lacks it, but not the other way around.

• If the intersective meaning is basic across languages:
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Our Terraling sample confirms the prediction of the plural hypothesis.
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Our Terraling sample confirms the prediction of the **plural hypothesis**.
**Generalization (Flor et al. 2017, to appear)**

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<tr>
<th>Language</th>
<th>[[C_1 \text{ A COORD B }] [P]]</th>
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<td>cumulative: A und B</td>
<td>cumulative: A und auch B</td>
</tr>
<tr>
<td>Polish</td>
<td>cumulative: A i B</td>
<td>*cumulative: i A i B</td>
</tr>
<tr>
<td>Hungarian</td>
<td>cumulative: A és B</td>
<td>*cumulative: A is (és) B is</td>
</tr>
<tr>
<td><strong>not attested</strong></td>
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- We find languages where C1 may be cumulative, while C2 is purely distributive.

(16) **C1**: [A (i) B i C] zarobili dokładnie sto euro.

    A i B i C earn.PST.PL.M exactly hundred euros.Gen

    ‘A, B and C each/between them earned exactly 100 euros.’

(17) **C2**: [i A i B i C] zarobili dokładnie sto euro.

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- Crucially, the reverse asymmetry is unattested in our sample.

**Conclusion**

Based on our sample: The plural meaning of COORD is the basic one.
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Based on our sample: The plural meaning of `COORD` is the basic one.
1 Cross-linguistic evidence for a plural meaning of COORD

2 An analytical problem

3 Analysis, part 1: Plural projection (informally)

4 Analysis, part 2: Distributive conjunctions and plural projection (informally)
• We saw that \texttt{COORD} has a \textbf{plural lexical meaning} cross-linguistically.

• But how can we derive the semantics of purely distributive conjunctions on the basis of this meaning?

\begin{equation}
\begin{array}{c}
\\quad [i \ A \ i \ B \ i \ C] \ zarobili \ dokładnie \ sto \ euro. \\
\quad ‘A,B and C each earned exactly 100 euros.’ \\
\end{array}
\end{equation}

\textbf{Polish}

• Step 1: Even ‘purely distributive’ strategies with additional markers behave like plurals in some contexts.

⇒ \textbf{Even distributed conjunctions have plurality formation at their core.}

• Step 2: This restricted plural-like behavior is shared by conjunctions of quantifiers e.g. in German.

⇒ \textbf{We can think of the extra markers } \mu \textbf{ as performing a shift from individuals to quantifiers.}

• Step 3: Notion of quantifier pluralities that predicts the distributivity requirement in (18).


⇒ \textbf{We can maintain a plural meaning for \texttt{COORD} across the board and still derive the behavior of distributive conjunctions.}
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\textbf{(18)} \[ [i \; A \; i \; B \; i \; C] \text{zarobili dokładnie sto euro.} \]
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\[ \text{‘plural projection’ semantics (Schmitt 2019, Haslinger & Schmitt 2018, 2019)} \]

\[ \Rightarrow \text{We can maintain a plural meaning for } \texttt{COORD} \text{ across the board and still derive the behavior of distributive conjunctions.} \]
• We saw that \textsc{coord} has a plural lexical meaning cross-linguistically.

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\[i \text{ } A \text{ } i \text{ } B \text{ } i \text{ } C\] \text{zarobili dokładnie sto euro}.
\end{equation}

\begin{quote}
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\end{quote}

\begin{quote}
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Background: Syntax of distributive conjunctions

- We motivated the claim that distributive conjunctions consist of two (abstract) parts: cumulative COORD\(+\) and extra markers that enforce distributivity.

- In many languages, these markers are conjunction particles on each conjunct. (Szabolcsi 2015, Mitrović & Sauerland 2016)

\[(19)\text{ Polish}\]
\begin{align*}
\text{a. } & A (i) B i C \quad \text{cumulative, distributive} \\
\text{b. } & i A i B i C \quad \text{distributive}
\end{align*}

\[(20)\text{ Hungarian (Szabolcsi 2015)}\]
\begin{align*}
\text{a. } & A B \text{ és } C \quad \text{cumulative, distributive} \\
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- Syntactic assumption, following Szabolcsi 2015, Mitrović & Sauerland 2016

\[(21)\]

\[
\begin{array}{c}
\mu \\
A \quad \text{COORD}\(+) \\
\mu \\
B
\end{array}
\]

Problem

If COORD expresses plurality formation, how can we derive the denotation of distributive conjunctions compositionally from this structure?
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& \quad \text{b. } A \ \text{is} \ B \ \text{is} \ (\text{és}) \ C \ \text{is} \quad \text{distributive}
\end{align*}

- Syntactic assumption, following Szabolcsi 2015, Mitrović & Sauerland 2016

\begin{align*}
(21) & \quad \text{Syntactic assumption diagram}
\end{align*}

\begin{figure}[h]
\centering
\begin{tikzpicture}
  \node (A) {A} child {node (B) {COORD} child {node (C) {B}}};
  \node (D) at (A -| C) [below, yshift=-1.5em] {$\mu$};
  \node (E) at (A -| B) [below, yshift=-1.5em] {$\mu$};
\end{tikzpicture}
\end{figure}

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If $\text{COORD}$ expresses plurality formation, how can we derive the denotation of distributive conjunctions compositionally from this structure?
Step 1: Distributive conjunctions have a plural core

Cumulativity asymmetries

Some ‘distributive conjunctions’ behave like pluralities in certain syntactic positions.

(22) Na szczęście dwie organizatorki poinformowały i Ada i Bea.
    to-the fortune two organizers informed i Ada i Bea
    ‘Fortunately, the two organizers called Ada and Bea.’

(23) SCENARIO: O1 called Ada. O2 called Bea.

Polish i A i B
- is purely distributive relative to structurally lower plural expressions
- but permits a cumulative reading relative to structurally higher plural expressions – in this configuration it behaves like a plural!

Same asymmetry found in several languages (e.g. German, Hungarian, Japanese, Estonian)
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Some ‘distributive conjunctions’ behave like pluralities in certain syntactic positions.

(22) *Na szczęście dwie organizatorki poinformowały i Adę i Beę.*

‘Fortunately, the two organizers informed I Ada I Bea’

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Polish *i A i B*

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- but permits a cumulative reading relative to structurally higher plural expressions – in this configuration it behaves like a plural!

Same asymmetry found in several languages (e.g. German, Hungarian, Japanese, Estonian)
Step 1: Distributive conjunctions have a plural core

Cumulativity asymmetries

Some ‘distributive conjunctions’ behave like pluralities in certain syntactic positions.

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    to-the fortune two organizers informed i Ada i Bea
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Same asymmetry observed for **singular universal quantifiers** in English (*every*) and German (*jed-*) (Schein 1993, Kratzer 2000, Zweig 2008, Champollion 2010, Haslinger & Schmitt 2018)

Crucially, when we conjoin German *jed-* DPs using COORD, the asymmetry persists.

(24) *Die zwei Mädchen haben jeden Hund und jede Katze in diesem Ort gefüttert.*
the two girls have every dog and every cat in this town fed

‘The two girls fed every dog and every cat in this town.’

fully **cumulative**: girls cumulatively fed the sum of all pets

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**Quantifier conjunction**

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In both cases, we want to force a **distributive reading** of the conjunction in subject position – despite its **plural** lexical meaning.

**Next steps**

- The conjuncts including µ-particles behave like universal quantifiers.
- We could model this by analyzing µ as a type-shifter that maps individuals to quantifiers.
  
  Mitrović & Sauerland 2016
- But if COORD always expresses an operation relating to plurality formation, we also need a notion of **pluralities of quantifiers**.
Step 3: Pluralities of quantifiers

Problem

Existing plural-based analyses of conjunction

- either fail to extend to quantifiers at all
- or predict that quantifier conjunctions should always permit cumulative readings wrt. structurally lower plurals.

What we will do next


- We will have a look at the system in general (informally) (Schmitt 2019, Haslinger & Schmitt 2018)
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Cross-linguistic evidence for a plural meaning of COORD

An analytical problem

Analysis, part 1: Plural projection (informally)

Analysis, part 2: Distributive conjunctions and plural projection (informally)
Plural projection: Ontology

- **All semantic domains contain pluralities** – individuals, predicates, quantifiers . . .
- **Sum operation** $+$ defined for any type.

\[(26) \quad D_e = \{ \text{Ada, Bea, Ada+Bea . . . } \},\]
\[D_{\langle e, t \rangle} = \{ \lambda x.\text{smoke}(x), \lambda x.\text{dance}(x), \lambda x.\text{smoke}(x) + \lambda x.\text{dance}(x) . . . \}\]

- Sums correspond one-to-one to nonempty sets of atomic domain elements.
- Expressions that denote sums of type $a$ in other theories will denote **plural sets** – sets of pluralities.

For every type $a$, the corresponding plural sets have type $a^*$.

\[(27) \quad D_{e^*} = \{ \text{[ ]}, \text{[Ada]}, \text{[Bea]}, \text{[Ada+Bea]}, \text{[Ada, Bea]}, \text{[Ada, Ada+Bea]}, \text{[Bea, Ada+Bea]}, \text{[Ada, Bea, Ada+Bea]} \} \]

$D_{\langle a, t \rangle}$ and $D_{a^*}$ are disjoint, but have the same algebraic structure.
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$D_{(a,t)}$ and $D_{a^*}$ are disjoint, but have the same algebraic structure.
Some denotations

Plural definites and indefinites denote plural sets of type $e^*$

(28) $\llbracket \text{the two girls} \rrbracket = \llbracket \text{Ada and Bea} \rrbracket = [\text{Ada} + \text{Bea}]$

(29) $\llbracket \text{two pets} \rrbracket = [\text{Carl} + \text{Dean}, \text{Carl} + \text{Eric}, \text{Dean} + \text{Eric}]$

The lexical meaning of $\text{COORD}$ cross-categorially involves ‘recursive’ sum $\oplus$

(30) $\llbracket \text{Ada and two pets} \rrbracket = [\text{Ada}] \oplus [\text{Carl} + \text{Dean}, \text{Carl} + \text{Eric}, \text{Dean} + \text{Eric}]$

$= [\text{Ada} + \text{Carl} + \text{Dean}, \text{Ada} + \text{Carl} + \text{Eric}, \text{Ada} + \text{Dean} + \text{Eric}]$

(31) $\llbracket \text{smoke and dance} \rrbracket = [\text{smoke} + \text{dance}]$
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- Crucial step: Cumulativity built into composition rules. Operation $C$ combines plural sets $P_{\langle a,b \rangle}^*$ and $x_{a^*}^*$, returning a plural set of type $b^*$.

- Consequence: By default, a constituent that contains a plural expression is itself a plural expression. It inherits the ‘part structure’ of its plural subconstituents (cf. focus projection / Hamblin sets).

(32) Ada and Bea P and Q

a. function set: $[P_{\langle e,t \rangle}^* + Q_{\langle e,t \rangle}^*]$

b. argument set: $[Ada_e + Bea_e]$

- We consider all covers of some function plurality and some argument plurality

(33) $\{\langle P, Ada \rangle, \langle Q, Bea \rangle\}$

- For each cover $R$, we form the sum of values $\{P(x) \mid (P, x) \in R\}$.

(34) $P(Ada) + Q(Bea)$

- These sums are collected into a plural set

(35) $[P(Ada)+Q(Bea), P(Bea)+Q(Ada), \ldots]$
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\[(32) \quad Ada \text{ and } Bea \quad P \text{ and } Q\]

a. function set: $[P_{\langle e,t \rangle} + Q_{\langle e,t \rangle}]$

b. argument set: $[Ada_e + Bea_e]$

- We consider all covers of some function plurality and some argument plurality

\[(33) \quad \{ (P, Ada), (Q, Bea) \}\]

- For each cover $R$, we form the sum of values $\{ P(x) | (P, x) \in R \}$.

\[(34) \quad P(Ada) + Q(Bea)\]

- These sums are collected into a plural set

\[(35) \quad [P(Ada)+Q(Bea), P(Bea)+Q(Ada), \ldots ]\]
Cumulative reading of **COORD**: Sample derivation

This cumulation process is iterated at every compositional step up to the sentence level:

(36) \textit{Ada and Bea fed Carl and Dean}

\begin{align*}
\text{(37)} & \quad \text{fed}(\text{Carl})(\text{Ada}) + \text{fed}(\text{Dean})(\text{Bea}), \\
& \quad \text{fed}(\text{Carl})(\text{Bea}) + \text{fed}(\text{Dean})(\text{Ada}), \ldots \\
\end{align*}

At the sentence level, we get a set of pluralities of propositions

Truth

A plural set $S$ of propositions is true iff $S$ contains at least one element $p$ such that all atomic parts of $p$ are true.
Cumulative reading of **COORD**: Sample derivation

This cumulation process is iterated at every compositional step up to the sentence level:

(36)  \textit{Ada and Bea fed Carl and Dean}

(37)  \[
\text{[fed(Carl)(Ada) + fed(Dean)(Bea),} \\
\text{fed(Carl)(Bea) + fed(Dean)(Ada), \ldots ]}
\]

At the sentence level, we get a set of pluralities of propositions

\textbf{Truth}

A plural set \( S \) of propositions is true iff \( S \) contains at least one element \( p \) such that all atomic parts of \( p \) are true.
Cumulative reading of COORD: Sample derivation

This cumulation process is iterated at every compositional step up to the sentence level:

(36)  $Ada$ and $Bea$ fed $Carl$ and $Dean$

(37)  \[
\text{fed}(Carl)(Ada) + \text{fed}(Dean)(Bea), \\
\text{fed}(Carl)(Bea) + \text{fed}(Dean)(Ada), \ldots \]

At the sentence level, we get a set of pluralities of propositions

Truth
A plural set $S$ of propositions is true iff $S$ contains at least one element $p$ such that all atomic parts of $p$ are true.
Cumulative reading of \textit{COORD}: Sample derivation

This cumulation process is iterated at every compositional step up to the sentence level:

\begin{align*}
(36) & \quad \textit{Ada and Bea fed Carl and Dean} \\
(37) & \quad [\text{fed}(\text{Carl})(\text{Ada}) + \text{fed}(\text{Dean})(\text{Bea})], \quad \text{fed}(\text{Carl})(\text{Bea}) + \text{fed}(\text{Dean})(\text{Ada}), \ldots ]
\end{align*}

At the sentence level, we get a set of pluralities of propositions

\begin{itemize}
\item [Truth]
A plural set $S$ of propositions is true iff $S$ contains \textbf{at least one} element $p$ such that all atomic parts of $p$ are true.
\end{itemize}
Our next goal

Integrate distributive conjunctions into this type of system so that . . .

1. the conjuncts have quantifier type
2. COORD denotes the ‘recursive sum’ operation, as for other types
3. we derive asymmetric behavior wrt. cumulativity:

(38) \[
[a \mu Ada] [\text{COORD} [a \mu Bea]] [\text{fed} [Carl \text{COORD} Dean]] \]

(39) \[
[Ada \text{COORD} Bea] \text{fed} [a \mu Carl] [\text{COORD} [a \mu Dean]]] \]

purely distributive

may be cumulative
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(39) $[[\text{Ada COORD} \text{Bea}] \text{fed} [\mu \text{Carl} [\text{COORD} [\mu \text{Dean}]]]]$

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1. the conjuncts have quantifier type
2. COORD denotes the ‘recursive sum’ operation, as for other types
3. we derive asymmetric behavior wrt. cumulativity:

$$((\mu \text{Ada}) \ [\text{COORD} \ [\mu \text{Bea}]]) \ [\text{fed} \ [\text{Carl} \ \text{COORD} \ \text{Dean}]]$$

$$([\text{Ada} \ \text{COORD} \ \text{Bea}] \ \text{fed} \ [\mu \text{Carl} \ [\text{COORD} \ [\mu \text{Dean}]]])$$

purely distributive
may be cumulative
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1. the conjuncts have quantifier type
2. COORD denotes the ‘recursive sum’ operation, as for other types
3. we derive asymmetric behavior wrt. cumulativity:

(38) \[[\mu \text{Ada} [\text{COORD } [\mu \text{Bea}]]] \text{fed } [\text{Carl COORD Dean}]] \text{ purely distributive}

(39) \[[\text{Ada COORD Bea} \text{ fed } [\mu \text{Carl} [\text{COORD } [\mu \text{Dean}]]]] \text{ may be cumulative} \]
Our next goal

Integrate distributive conjunctions into this type of system so that . . .

1. the conjuncts have quantifier type
2. COORD denotes the ‘recursive sum’ operation, as for other types
3. we derive asymmetric behavior wrt. cumulativity:

(38) \[ \mu \text{Ada} \text{COORD} [\mu \text{Bea}]] \text{fed} [\mu \text{Carl} \text{COORD} \text{Dean}] \]

(39) \[ [\text{Ada COORD Bea}] \text{fed} [\mu \text{Carl} \text{COORD} [\mu \text{Dean}]]] \]

purely distributive
may be cumulative
Cross-linguistic evidence for a plural meaning of COORD

An analytical problem

Analysis, part 1: Plural projection (informally)

Analysis, part 2: Distributive conjunctions and plural projection (informally)
Semantics of distributive conjunctions

- Starting point: the conjuncts of distributive conjunctions are quantifiers. In the Plural Projection framework, the arguments of quantifiers are plural sets (type \( \langle e, t \rangle^* \)).
- Each conjunct denotation \( x \) is mapped to a quantifier \( Q_x \) that takes a plural set:
  \[
  Q_{\text{Carl}} = \lambda P^* \langle e, t \rangle^* \cdot C(P^*, [\text{Carl}])
  \]
- The entire conjunction gives us a plurality of quantifiers of this kind
  \[
  \langle [\mu \text{Carl}] \text{COORD} + [\mu \text{Dean}] \rangle = [Q_{\text{Carl}} + Q_{\text{Dean}}]
  \]

How does this give us the cumulativity asymmetry?
Semantics of distributive conjunctions

- Starting point: the conjuncts of distributive conjunctions are quantifiers. In the Plural Projection framework, the arguments of quantifiers are plural sets (type $\langle e, t \rangle^*$).
- Each conjunct denotation $x$ is mapped to a quantifier $Q_x$ that takes a plural set:
  \[
  (40) \quad Q_{\text{Carl}} = \lambda P^*_{\langle e, t \rangle^*} \cdot C(P^*, [\text{Carl}])
  \]
- The entire conjunction gives us a plurality of quantifiers of this kind:
  \[
  (41) \quad [[[[\mu \text{ Carl}][\text{COORD}_+ [\mu \text{ Dean}]]]]] = [Q_{\text{Carl}} + Q_{\text{Dean}}]
  \]

How does this give us the cumulativity asymmetry?
Semantics of distributive conjunctions

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• The entire conjunction gives us a plurality of quantifiers of this kind

$$[[[\mu \text{ Carl}] \ [\text{COORD} + [\mu \text{ Dean}]]]] = [Q_{\text{Carl}} + Q_{\text{Dean}}]$$

How does this give us the cumulativity asymmetry?
Semantics of distributive conjunctions

- Starting point: the conjuncts of distributive conjunctions are quantifiers. In the Plural Projection framework, the arguments of quantifiers are plural sets (type $\langle e, t \rangle^*$).
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$$[[[\mu \text{Carl}] \text{COORD}_+ [\mu \text{Dean}]]] = [Q_{\text{Carl}} + Q_{\text{Dean}}]$$

How does this give us the cumulativity asymmetry?
Distributive reading wrt. lower plurals

(42) \[[\mu \text{ Ada}] \text{ [COORD } [\mu \text{ Bea}]]\] \text{ [fed [Carl COORD Dean]]}

• Here the quantifier conjunction \([Q_{\text{Ada}} + Q_{\text{Bea}}]\) must apply to \([\text{fed(Carl)} + \text{fed(Dean)}]\).

• This means that we apply each quantifier separately to the plural set of predicates:

(43) a. \(Q_{\text{Ada}}(\text{fed(Carl)} + \text{fed(Dean)}) = \text{fed(Carl)(Ada) + fed(Dean)(Ada)}\)

b. \(Q_{\text{Bea}}(\text{fed(Carl)} + \text{fed(Dean)}) = \text{fed(Carl)(Bea) + fed(Dean)(Bea)}\)

• Our cumulation rule combines these sets via the ‘recursive sum’ operation:

(44) \[[\text{fed(Carl)(Ada) + fed(Dean)(Ada) + fed(Carl)(Bea) + fed(Dean)(Bea)}]\]

• We get a plural set of propositions that encodes the distributive reading, since each girl is mapped to both pets.

• The crucial difference is that the high type of the conjuncts \(Q_{\text{Ada}}\) and \(Q_{\text{Bea}}\) blocks the usual cumulation with the parts of the predicate plurality.
Distributive reading wrt. lower plurals

(42) [[[μ Ada] [COORD [μ Bea]]] [fed [Carl COORD Dean]]]

• Here the quantifier conjunction [Q_{Ada} + Q_{Bea}] must apply to [fed(Carl) + fed(Dean)].

• This means that we apply each quantifier separately to the plural set of predicates:

(43) a. \( Q_{Ada}([fed(Carl) + fed(Dean)]) = [fed(Carl)(Ada) + fed(Dean)(Ada)] \)

b. \( Q_{Bea}([fed(Carl) + fed(Dean)]) = [fed(Carl)(Bea) + fed(Dean)(Bea)] \)

• Our cumulation rule combines these sets via the ‘recursive sum’ operation:

(44) [fed(Carl)(Ada) + fed(Dean)(Ada) + fed(Carl)(Bea) + fed(Dean)(Bea)]

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• The crucial difference is that the high type of the conjuncts \( Q_{Ada} \) and \( Q_{Bea} \) blocks the usual cumulation with the parts of the predicate plurality.
Distributive reading wrt. lower plurals

(42)  [[\mu Ada] [COORD [\mu Bea]]] [fed [Carl COORD Dean]]

- Here the quantifier conjunction \([Q_{Ada} + Q_{Bea}]\) must apply to \([fed(Carl) + fed(Dean)]\).
- This means that we apply each quantifier separately to the plural set of predicates:

(43)  a.  \(Q_{Ada}([fed(Carl) + fed(Dean)]) = [fed(Carl)(Ada) + fed(Dean)(Ada)]\)
    b.  \(Q_{Bea}([fed(Carl) + fed(Dean)]) = [fed(Carl)(Bea) + fed(Dean)(Bea)]\)

- Our cumulation rule combines these sets via the ‘recursive sum’ operation:

(44)  \([fed(Carl)(Ada) + fed(Dean)(Ada) + fed(Carl)(Bea) + fed(Dean)(Bea)]\)

- We get a plural set of propositions that encodes the distributive reading, since each girl is mapped to both pets.
- The crucial difference is that the high type of the conjuncts \(Q_{Ada}\) and \(Q_{Bea}\) blocks the usual cumulation with the parts of the predicate plurality.
Distributive reading wrt. lower plurals

\[(\lambda Ada\) \[\text{COORD} \ (\lambda Bea)]\] [fed [Carl COORD Dean]]

• Here the quantifier conjunction \([Q_{Ada} + Q_{Bea}]\) must apply to [fed(Carl) + fed(Dean)].

• This means that we apply each quantifier separately to the plural set of predicates:

\[(43)\]
\[a. \ Q_{Ada}([\text{fed}(\text{Carl}) + \text{fed}(\text{Dean})]) = [\text{fed}(\text{Carl})(Ada) + \text{fed}(\text{Dean})(Ada)]
\[b. \ Q_{Bea}([\text{fed}(\text{Carl}) + \text{fed}(\text{Dean})]) = [\text{fed}(\text{Carl})(Bea) + \text{fed}(\text{Dean})(Bea)]\]

• Our cumulation rule combines these sets via the ‘recursive sum’ operation:

\[(44)\] [fed(Carl)(Ada) + fed(Dean)(Ada) + fed(Carl)(Bea) + fed(Dean)(Bea)]

• We get a plural set of propositions that encodes the distributive reading, since each girl is mapped to both pets.

• The crucial difference is that the high type of the conjuncts \(Q_{Ada}\) and \(Q_{Bea}\) blocks the usual cumulation with the parts of the predicate plurality.
Distributive reading wrt. lower plurals

(42) \([[\mu \text{Ada}] \text{COORD} [\mu \text{Bea}]]] \text{fed} [\text{Carl} \text{COORD} \text{Dean}]\)

- Here the quantifier conjunction \([Q_{\text{Ada}} + Q_{\text{Bea}}]\) must apply to \([\text{fed}(\text{Carl}) + \text{fed}(\text{Dean})]\).
- This means that we apply each quantifier separately to the plural set of predicates:

  (43) a. \(Q_{\text{Ada}}([\text{fed}(\text{Carl}) + \text{fed}(\text{Dean})]) = [\text{fed}(\text{Carl})(\text{Ada}) + \text{fed}(\text{Dean})(\text{Ada})]\)
  
  b. \(Q_{\text{Bea}}([\text{fed}(\text{Carl}) + \text{fed}(\text{Dean})]) = [\text{fed}(\text{Carl})(\text{Bea}) + \text{fed}(\text{Dean})(\text{Bea})]\)

- Our cumulation rule combines these sets via the ‘recursive sum’ operation:

  (44) \([\text{fed}(\text{Carl})(\text{Ada}) + \text{fed}(\text{Dean})(\text{Ada}) + \text{fed}(\text{Carl})(\text{Bea}) + \text{fed}(\text{Dean})(\text{Bea})]\)

- We get a plural set of propositions that encodes the distributive reading, since each girl is mapped to both pets.

- The crucial difference is that the high type of the conjuncts \(Q_{\text{Ada}}\) and \(Q_{\text{Bea}}\) blocks the usual cumulation with the parts of the predicate plurality.
Distributive reading wrt. lower plurals

(42) \([[\mu \text{Ada}] [\text{COORD } [\mu \text{Bea}]]] [\text{fed } [\text{Carl COORD Dean}]]\)

• Here the quantifier conjunction \([Q_{\text{Ada}} + Q_{\text{Bea}}]\) must apply to \([\text{fed} (\text{Carl}) + \text{fed} (\text{Dean})]\).

• This means that we apply each quantifier separately to the plural set of predicates:

(43) a. \(Q_{\text{Ada}}([\text{fed} (\text{Carl}) + \text{fed} (\text{Dean})]) = [\text{fed} (\text{Carl})(\text{Ada}) + \text{fed} (\text{Dean})(\text{Ada})]\)

b. \(Q_{\text{Bea}}([\text{fed} (\text{Carl}) + \text{fed} (\text{Dean})]) = [\text{fed} (\text{Carl})(\text{Bea}) + \text{fed} (\text{Dean})(\text{Bea})]\)

• Our cumulation rule combines these sets via the ‘recursive sum’ operation:

(44) \([\text{fed} (\text{Carl})(\text{Ada}) + \text{fed} (\text{Dean})(\text{Ada}) + \text{fed} (\text{Carl})(\text{Bea}) + \text{fed} (\text{Dean})(\text{Bea})]\)

• We get a plural set of propositions that encodes the distributive reading, since each girl is mapped to both pets.

• The crucial difference is that the high type of the conjuncts \(Q_{\text{Ada}}\) and \(Q_{\text{Bea}}\) blocks the usual cumulation with the parts of the predicate plurality.

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Cumulative reading wrt. higher plurals

(45) \[[[\texttt{Ada COORD Bea}] \texttt{fed} [\mu \texttt{Carl}][\texttt{COORD} [\mu \texttt{Dean}].DateTimePicker]]\]

- We need to combine \([Q_{\texttt{Carl}} + Q_{\texttt{Dean}}]\) with the plural set \([\texttt{fed}]\). Due to the high type of the conjuncts, our usual cumulation rule is blocked.
- We apply both quantifiers separately to the argument \([\texttt{fed}]\):
  
  (46)  
  a. \(Q_{\texttt{Carl}}([\texttt{fed}]) = [\texttt{fed}({\texttt{Carl}})]\)  
  b. \(Q_{\texttt{Dean}}([\texttt{fed}]) = [\texttt{fed}({\texttt{Dean}})]\)

- Our compositional system forces us to combine these results via the ‘recursive sum’ \(\oplus\), which we take to be at the core of conjunction:

  (47) \([\texttt{fed}({\texttt{Carl}})] \oplus [\texttt{fed}({\texttt{Dean}})]\)  
  \(= [\texttt{fed}({\texttt{Carl}}) + \texttt{fed}({\texttt{Dean}})]\)

- This combines with \([\texttt{Ada} + \texttt{Bea}]\) via a normal application of the cumulation rule.
Cumulative reading wrt. higher plurals

(45) \[ [[\text{Ada COORD Bea}] \text{ fed } [\mu \text{ Carl}] \text{ COORD } [\mu \text{ Dean}]]] \]

- We need to combine \([Q_{\text{Carl}} + Q_{\text{Dean}}]\) with the plural set \([\text{fed}]\). Due to the high type of the conjuncts, our usual cumulation rule is blocked.
- We apply both quantifiers separately to the argument \([\text{fed}]\):
  
  (46)  
  a. \(Q_{\text{Carl}}([\text{fed}]) = [\text{fed}(\text{Carl})]\)  
  b. \(Q_{\text{Dean}}([\text{fed}]) = [\text{fed}(\text{Dean})]\)
- Our compositional system forces us to combine these results via the ‘recursive sum’ \(\oplus\), which we take to be at the core of conjunction:

  (47) \([\text{fed}(\text{Carl})] \oplus [\text{fed}(\text{Dean})]\)  
  = \([\text{fed}(\text{Carl}) + \text{fed}(\text{Dean})]\)
- This combines with \([\text{Ada} + \text{Bea}]\) via a normal application of the cumulation rule.
Cumulative reading wrt. higher plurals

(45) \text{[[Ada COORD Bea] fed [\[\mu \text{ Carl}\] [COORD [\[\mu \text{ Dean}\]]]]]}

- We need to combine \([Q_{\text{Carl}} + Q_{\text{Dean}}]\) with the plural set \([\text{fed}]\). Due to the high type of the conjuncts, our usual cumulation rule is blocked.

- We apply both quantifiers separately to the argument \([\text{fed}]\):

\[(46)\]
\[
a. \quad Q_{\text{Carl}}([\text{fed}]) = [\text{fed(\text{Carl})}]
b. \quad Q_{\text{Dean}}([\text{fed}]) = [\text{fed(\text{Dean})}]\]

- Our compositional system forces us to combine these results via the ‘recursive sum’ \(\oplus\), which we take to be at the core of conjunction:

\[(47)\]
\[
[\text{fed(\text{Carl})}] \oplus [\text{fed(\text{Dean})}]
= [\text{fed(\text{Carl})} + \text{fed(\text{Dean})}]\]

- This combines with \([\text{Ada} + \text{Bea}]\) via a normal application of the cumulation rule.
Cumulative reading wrt. higher plurals

(45)  [[[Ada COORD Bea] fed [µ Carl] [COORD [µ Dean]]]]

- We need to combine \([Q_{Carl} + Q_{Dean}]\) with the plural set \([fed]\). Due to the high type of the conjuncts, our usual cumulation rule is blocked.
- We apply both quantifiers separately to the argument \([fed]\):

  (46)  a.  \(Q_{Carl}([fed]) = [fed(Carl)]\)
        b.  \(Q_{Dean}([fed]) = [fed(Dean)]\)

- Our compositional system forces us to combine these results via the ‘recursive sum’ \(⊕\), which we take to be at the core of conjunction:

  (47)  \([fed(Carl)] ⊕ [fed(Dean)]\)
       = \([fed(Carl) + fed(Dean)]\)

- This combines with \([Ada + Bea]\) via a normal application of the cumulation rule.
Cumulative reading wrt. higher plurals

(45) \[[\text{Ada COORD Bea}] \text{fed } [\mu \text{ Carl}] [\text{COORD } [\mu \text{ Dean}]]\]

• We need to combine \([Q_{\text{Carl}} + Q_{\text{Dean}}]\) with the plural set \([\text{fed}]\). Due to the high type of the conjuncts, our usual cumulation rule is blocked.

• We apply both quantifiers separately to the argument \([\text{fed}]\):

\[(46) \begin{align*}
a. \quad &Q_{\text{Carl}}([\text{fed}]) = [\text{fed}(\text{Carl})] \\
b. \quad &Q_{\text{Dean}}([\text{fed}]) = [\text{fed}(\text{Dean})]
\end{align*}\]

• Our compositional system forces us to combine these results via the ‘recursive sum’ \(\oplus\), which we take to be at the core of conjunction:

\[(47) \quad [\text{fed}(\text{Carl})] \oplus [\text{fed}(\text{Dean})] = [\text{fed}(\text{Carl}) + \text{fed}(\text{Dean})]\]

• This combines with \([\text{Ada} + \text{Bea}]\) via a normal application of the cumulation rule.
We considered cross-linguistic evidence for a plural lexical meaning of COORD in individual conjunction.

This raises the question how to derive the meaning of ‘distributive’ conjunction patterns like Polish $i A i B$.

A closer look at the data suggests that

- In some languages, even ‘distributive’ conjunction patterns permit cumulative readings relative to structurally higher plural expressions.
- This supports our claim that even distributive conjunctions have plurality formation at their core.
- They share this asymmetric behavior with quantifier conjunctions e.g. in German.

We analyzed distributive conjunctions as quantifier conjunctions within the plural projection framework.

Since this system builds cumulativity directly into the composition rules, it can model the cumulativity asymmetry we observe.
We considered cross-linguistic evidence for a plural lexical meaning of `COORD` in individual conjunction. This raises the question how to derive the meaning of `distributive` conjunction patterns like Polish `i A i B`.

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Since this system builds cumulativity directly into the composition rules, it can model the cumulativity asymmetry we observe
1. We considered cross-linguistic evidence for a plural lexical meaning of \textsc{coord} in individual conjunction.

2. This raises the question how to derive the meaning of ‘distributive’ conjunction patterns like Polish $i \ A \ i \ B$.

3. A closer look at the data suggests that
   - In some languages, even ‘distributive’ conjunction patterns permit cumulative readings relative to structurally higher plural expressions
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4. We analyzed distributive conjunctions as quantifier conjunctions within the plural projection framework

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This raises the question how to derive the meaning of ‘distributive’ conjunction patterns like Polish *i A i B*.

A closer look at the data suggests that

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A closer look at the data suggests that:

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We analyzed distributive conjunctions as quantifier conjunctions within the plural projection framework

Since this system builds cumulativity directly into the composition rules, it can model the cumulativity asymmetry we observe
Thanks to . . .

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Appendix 1: Languages in sample

**individual conjunction:**
Akan, Bas’a’a, Baule, Cantonese, Chickasaw, Dagara, Dutch, Estonian, Greek, Hungarian, Igbo, Iraqi Arabic, Italian, Ivorian French, German, Japanese, Korean, Latvian, Nones, Polish, Russian, SerBoCroatian, Sicilian, Tagalog, Turkish, Wuhu Chinese

**VP-conjunction:**
Baule, Dutch Estonian, Cantonese, Iraqi Arabic, Italian, Japanese, Latvian, SerBoCroatian, Sicilian, Tagalog
## Appendix 2: conjunction strategies for individuals

<table>
<thead>
<tr>
<th>Coordination of Proper Names</th>
<th>D-only</th>
<th>ND-only</th>
<th>D/ND</th>
<th>ext. Marker needed for D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B ne C</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>(Akan, Twi (Niger-Congo, Kwa))</td>
<td></td>
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<td></td>
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<tr>
<td>A, B ni C</td>
<td></td>
<td></td>
<td>x</td>
<td>x [PV]</td>
</tr>
<tr>
<td>(Basaa (Niger-Congo, Bantu))</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>A, B tung C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Cantonese, Guangzhou (Sino-Tibetan, Chinese))</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A, B ni C</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>(Dagara (Burkina))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A, B en C</td>
<td></td>
<td>[SV]</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>A, B en ook C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>zowel A, B als ook C [SV]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Dutch (Indo-European, Germanic))</td>
<td></td>
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<tr>
<td>A, B ja C</td>
<td></td>
<td>[SV]</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>A, B ning C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nii A, B kui (ka) C</td>
<td></td>
<td>[SV]</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>A, B ja C-gi</td>
<td></td>
<td>[SV]</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Estonian (Uralic, Finno-Ugric))</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A, B und C</td>
<td></td>
<td>[SV]</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>sowohl A als auch B als auch C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(German (Indo-European, Germanic))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A, B ce C</td>
<td></td>
<td>[SV]</td>
<td>x</td>
<td>x [SV]</td>
</tr>
<tr>
<td>A, B ala ce C</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Greek (Indo-European, Greek))</td>
<td></td>
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<tr>
<td>A o B o C</td>
<td></td>
<td></td>
<td>x</td>
<td>x [PV]</td>
</tr>
<tr>
<td>(Iraqi Arabic (Afro-Asiatic, Semitic))</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A, B e C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>sia A sia B (e) sia C [SV]</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>(Italian (Indo-European, Italic))</td>
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<tr>
<td>A, B et puis C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>(Ivorian French (Indo-European, Italic))</td>
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</table>

[SV] = speaker variation; [PV] = predicate variation
Appendix 2: conjunction strategies for individuals

<table>
<thead>
<tr>
<th>Coordination of Proper Names</th>
<th>D-only</th>
<th>ND-only</th>
<th>D/ND</th>
<th>ext. Marker needed for D</th>
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<tbody>
<tr>
<td>A-to B-to C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>A-ya B-ya C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>A-mo B-mo C-mo</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
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<tr>
<td>A-to B sosite C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Japanese (Japonic))</td>
<td></td>
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<tr>
<td>A-wa B-wa C</td>
<td></td>
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<td>x</td>
<td></td>
</tr>
<tr>
<td>(Korean (Koreanic))</td>
<td></td>
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<tr>
<td>A, B un C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Latvian (Indo-European, Balto-Slavic))</td>
<td></td>
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<tr>
<td>A, B e C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Nones (Indo-European, Italic))</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>A va B va C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>(Persian (Indo-European, Iranian))</td>
<td></td>
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<td></td>
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<tr>
<td>A, B i C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>i A i B i C</td>
<td></td>
<td></td>
<td>x [SV]</td>
<td></td>
</tr>
<tr>
<td>(Polish (Indo-European, Balto-Slavic))</td>
<td></td>
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<td></td>
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<tr>
<td>A (i) B i C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>i A i B i C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>A, B ali i C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Serbo-Croatian (Indo-European, Balto-Slavic))</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A, B e C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>A, B e mmakari C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>(Sicilian (Indo-European, Italic))</td>
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<tr>
<td>A, B ve C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>A dA, B dA (ve) C dA ^</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Turkish (Turkic))</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A, B ha-you C</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>(Wuhu Chinese (Sino-Tibetan, Chinese))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[SV] = speaker variation
Appendix 3: Evidence for predicate-level distributivity operators

- To study the semantic contribution of additional markers within the predicate, the conjunction itself is held constant.

\[(48) \mathbf{C}_1 [A \text{ COORD } B] [P] \] vs. \[\mathbf{C}_2 [A \text{ COORD } B] [\mu P] \]

- With some conjunction patterns, a predicate-level marker is required for a distributive interpretation (e.g. Basa’a A, B ni C). Languages differ wrt. whether OP$_{pred}$ may be covert (e.g. English) or has to be overt (e.g. Basa’a).

\[(49) [A, B \text{ ni } C] \text{ bá-bí-kosná dikóó dísámal} \]
\[A \text{ COORD C 2.SM-PST2-receive 13.thousands 13.six} \]
\[\text{‘A, B and C received six thousand francs } \text{in total.’} \]
\[\text{cumulative only} \]

\[(50) [A, B \text{ ni } C] \text{ bá-bí-kosná dikóó dísámal, híkií mut} \]
\[A \text{ COORD C 2.SM-PST2-receive 13.thousands 13.six each person} \]
\[\text{‘A, B and C each received six thousand francs.’} \]
\[\text{distributive only} \]

- We did not find any iterative conjunction patterns for which a predicate-level marker is required for a cumulative interpretation.

- This suggests that the cumulative reading of the predicate is the basic one cross-linguistically.

- But for all conjunction patterns in our sample, one can get a distributive reading for the entire sentence (possibly with extra marking).

- We therefore assume that OP$_{pred}$ is universally available and there is no corresponding operator to derive the cumulative reading.
Appendix 3: Evidence for predicate-level distributivity operators

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(48) \([C_1 \, [A \, \text{COORD} \, B] \, [P] \, ] \, \text{vs.} \, [C_2 \, [A \, \text{COORD} \, B] \, [\mu \, P] \, ]\)

- With some conjunction patterns, a predicate-level marker is required for a distributive interpretation (e.g. Basa’a A, B ni C). Languages differ wrt. whether \(\text{OP}_{\text{pred}}\) may be covert (e.g. English) or has to be overt (e.g. Basa’a).

(49) \([A, \, B \, ni \, C] \, \text{bá-bí-kosná} \, \text{dikóó} \, \text{dísámal} \)
\( A \, B \, \text{COORD} \, C \, 2.\text{SM-PST2-receive} \, 13.\text{thousands} \, 13.\text{six} \)
‘A, B and C received six thousand francs in total.’ cumulative only

(50) \([A, \, B \, ni \, C] \, \text{bá-bí-kosná} \, \text{dikóó} \, \text{dísámal, híkií mut} \)
\( A \, B \, \text{COORD} \, C \, 2.\text{SM-PST2-receive} \, 13.\text{thousands} \, 13.\text{six} \) each person
‘A, B and C each received six thousand francs.’ distributive only

Basa’a P.R. Bassong, Terraling

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\[(48) \quad [C_1 [A \text{COORD} B] [P]] \text{ vs. } [C_2 [A \text{COORD} B] [\mu P ]] \]

• With some conjunction patterns, a predicate-level marker is required for a distributive interpretation (e.g. Basa’a A, B ni C). Languages differ wrt. whether OP\textsubscript{pred} may be covert (e.g. English) or has to be overt (e.g. Basa’a).

\[(49) \quad [A, B \text{ni} C] \text{bá-bí-kosná dikóó dísámal} \\
A \quad \text{COORD C} \quad 2.\text{SM-PST2-receive} \quad 13.\text{thousands} \quad 13.\text{six} \\
\text{‘A, B and C received six thousand francs in total.’ cumulative only} \]

\[(50) \quad [A, B \text{ni} C] \text{bá-bí-kosná dikóó dísámal, híkií mut} \\
A \quad \text{COORD C} \quad 2.\text{SM-PST2-receive} \quad 13.\text{thousands} \quad 13.\text{six each person} \\
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\[(C_1 [A \text{COORD} B] [P]) \text{ vs. } [C_2 [A \text{COORD} B] [\mu P]]\]

• With some conjunction patterns, a predicate-level marker is required for a distributive interpretation (e.g. Basa’a A, B ni C). Languages differ wrt. whether OP\textsubscript{pred} may be covert (e.g. English) or has to be overt (e.g. Basa’a).

\[(A, B ni C \text{á´a-b´ı-kosn´a } \text{dik´o´o } \text{d´ıs´amal}\]
\hspace{1cm} A \ B \text{COORD} C \text{ 2.SM-PST2-receive 13.thousands 13.six}
\hspace{1cm} ‘A, B and C received six thousand francs in total.’ \hspace{1cm} \text{cumulative only}

\[(A, B ni C \text{á´a-b´ı-kosn´a } \text{dik´o´o } \text{d´ıs´amal}, \text{híkií mut}\]
\hspace{1cm} A \ B \text{COORD} C \text{ 2.SM-PST2-receive 13.thousands 13.six } \text{each person}
\hspace{1cm} ‘A, B and C each received six thousand francs.’ \hspace{1cm} \text{distributive only}

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\[(49) \quad [A, B \text{ ni } C] \ bá-bí-kosná \ dikóó \ dísámal \]
A B COORD C 2.SM-PST2-receive 13.thousands 13.six
‘A, B and C received six thousand francs in total.’ cumulative only

\[(50) \quad [A, B \text{ ni } C] \ bá-bí-kosná \ dikóó \ dísámal, \ híkií \ mut \]
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Basa’a P.R. Bassong, Terraling

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\[(C_1 [A \text{COORD} B] [P]) \text{ vs. } [C_2 [A \text{COORD} B] [\mu P]]\]

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\[(A, B ni C) \text{ bá-bí-kosná dikóó dísámal} \]
\[
A \ B \text{COORD C} \ 2.\text{SM-PST2-receive} \ 13.\text{thousands} \ 13.\text{six} \\
\text{‘A, B and C received six thousand francs in total.’ cumulative only}
\]

\[(A, B ni C) \text{ bá-bí-kosná dikóó dísámal, híkií mut} \]
\[
A \ B \text{COORD C} \ 2.\text{SM-PST2-receive} \ 13.\text{thousands} \ 13.\text{six} \text{ each person} \\
\text{‘A, B and C each received six thousand francs.’ distributive only}
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Appendix 4: Cross-linguistic predictions

- In the Plural Projection system, the plural analysis of COORD is generalized across categories.
- Many (although not all) languages realize COORD in the same way for different semantic categories.

Prediction

In such languages, if the cumulative reading is available for individual conjunctions, we expect to find it for other categories as well.

- We find cumulative VP-conjunctions in English and German (Link 1984, Krifka 1990, Schmitt 2013, 2019)
  
  (51)  a. The three children smoked and danced.
       b. SCENARIO: C1 smoked. C2 danced. C3 danced.  (51-a) true

- This also seems to be the case in our current Terraling-sample on VP-conjunction (11 languages from 6 language families)
Appendix 4: Cross-linguistic predictions

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  \[(51) \begin{align*}
  a. & \quad \text{The three children smoked and danced}. \\
  b. & \quad \text{SCENARIO: C1 smoked. C2 danced. C3 danced.} \quad (51\text{-a) true}
  \end{align*}\]

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Appendix 4: Cross-linguistic predictions

- In the Plural Projection system, the plural analysis of \textsc{coord} is generalized across categories.
- Many (although not all) languages realize \textsc{coord} in the same way for different semantic categories.

**Prediction**

In such languages, if the cumulative reading is available for individual conjunctions, we expect to find it for other categories as well.

- We find cumulative VP-conjunctions in English and German (Link 1984, Krifka 1990, Schmitt 2013, 2019)
  
  (51)  
  
  a. *The three children smoked and danced.*
  

  (51-a) true

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In such languages, if the cumulative reading is available for individual conjunctions, we expect to find it for other categories as well.

- We find cumulative VP-conjunctions in English and German (Link 1984, Krifka 1990, Schmitt 2013, 2019)

  (51)  
  a. *The three children smoked and danced.*

  *(51-a) true*  

- This also seems to be the case in our current Terraling-sample on VP-conjunction (11 languages from 6 language families)
Appendix 4: Cross-linguistic predictions

The markers $\mu$ in ‘distributive’ individual conjunctions may also occur in predicate conjunctions.

Prediction – Part I

We should find languages in which VP-conjunctions with $\mu$ permit a cumulative reading for VP-conjunctions, but not individual conjunctions in subject position.

Rationale: The subject asymmetrically c-commands the VP.

Preliminary results suggest that this prediction could be correct.

(52) a. Te trzy kobiety wczoraj i paliły i piły i tańczyły.  
these three women yesterday I smoke.PST.PL.F I drink.PST.PL.F I dance.PST.PL.F  
‘These three women smoked and drank and danced yesterday.’

b. SCENARIO: W1 smoked. W1 and W3 drank. W2 and W3 danced.  

Prediction – Part II

We do not expect languages in which $\mu$ forces a distributive reading for VP-conjunctions, without also doing so for individual conjunctions in subject position.
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The markers $\mu$ in ‘distributive’ individual conjunctions may also occur in predicate conjunctions.

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   ‘These three women smoked and drank and danced yesterday.’

   b. SCENARIO: W1 smoked. W1 and W3 drank. W2 and W3 danced.

(52-a) true

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The markers $\mu$ in ‘distributive’ individual conjunctions may also occur in predicate conjunctions.

**Prediction – Part I**

We should find languages in which VP-conjunctions with $\mu$ permit a cumulative reading for VP-conjunctions, but not individual conjunctions in subject position.

Rationale: The subject asymmetrically c-commands the VP.

Preliminary results suggest that this prediction could be correct.

(52) a. Te trzy kobiety wczoraj i paliły i pili i tańczyły.

These three women yesterday I smoke.PST.PL.F I drink.PST.PL.F I dance.PST.PL.F

‘These three women smoked and drank and danced yesterday.’

b. SCENARIO: W1 smoked. W1 and W3 drank. W2 and W3 danced.

Polish

**Prediction – Part II**

We do not expect languages in which $\mu$ forces a distributive reading for VP-conjunctions, without also doing so for individual conjunctions in subject position.
Appendix 4: Cross-linguistic predictions

The markers $\mu$ in ‘distributive’ individual conjunctions may also occur in predicate conjunctions.

**Prediction – Part I**

We should find languages in which VP-conjunctions with $\mu$ permit a cumulative reading for VP-conjunctions, but not individual conjunctions in subject position.  
**Rationale:** The subject asymmetrically c-commands the VP.

Preliminary results suggest that this prediction could be correct.

(52)  

a. *Te trzy kobiety wczoraj i paliły i piły i tańczyły.*  
these three women yesterday I smoke.PST.PL.F I drink.PST.PL.F I dance.PST.PL.F  
‘These three women smoked and drank and danced yesterday.’  

b. **SCENARIO:** W1 smoked. W1 and W3 drank. W2 and W3 danced.  

(52-a) **true**

**Prediction – Part II**

We do not expect languages in which $\mu$ forces a distributive reading for VP-conjunctions, without also doing so for individual conjunctions in subject position.
Appendix 4: Cross-linguistic predictions

The markers \( \mu \) in ‘distributive’ individual conjunctions may also occur in predicate conjunctions.

**Prediction – Part I**

We should find languages in which VP-conjunctions with \( \mu \) permit a cumulative reading for VP-conjunctions, but not individual conjunctions in subject position.

Rationale: The subject asymmetrically c-commands the VP.

Preliminary results suggest that this prediction could be correct.

(52)  

a.  

\[ Te \text{ trzy kobiety wczoraj } i \text{ paliły } i \text{ piły } i \text{ tańczyły.} \]

these three women yesterday I smoke.PST.PL.F I drink.PST.PL.F I dance.PST.PL.F

‘These three women smoked and drank and danced yesterday.’

Polish

b.  

SCENARIO: W1 smoked. W1 and W3 drank. W2 and W3 danced.

(52-a) true

**Prediction – Part II**

We do not expect languages in which \( \mu \) forces a distributive reading for VP-conjunctions, without also doing so for individual conjunctions in subject position.